FINAL REPORT

E-Waste Inventorization of Bastar Division





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Executive Summary

E-waste is one of the fastest growing waste streams in the world. In developed countries, it equals 1% of total solid waste generation on an average. In this context, Ministry of Environment & Forest, Government of India at first notified E-waste guidelines followed by Hazardous Waste (Management, Handling & Transboundary) Rules in 2008. This was followed by formulation of E-waste (Management & Handling) Rules 2011, which came into effect from 1st May 2012. In order to implement these regulations, each state mandated to prepare their E-waste inventory which can assist State Pollution Control Boards (SPCB) to monitor & regulate E-waste Management as per E-waste rules. Each of the State Pollution Control Board's have been assigned the responsibility for inventorization of E-waste in their State, grant and renewal of authorization, registration of recyclers, monitoring of compliances of authorization and registration conditions and action against violation of these rules. In view of the dues and responsibility defined under the E-waste rule, 2011, Chhattisgarh Environment Conservation Board (CECB) has planned for inventorization of E-waste in the seven divisions of this State. IRG Systems South Asia Pvt. Ltd. has been assigned the task to carryout the inventorization in the seven districts of Bastar Division. The current effort will assist to prepare an inventory of E-waste generated in the state so that an action plan can be formulated for future interventions.

The objective of the E-waste Assessment is to identify and quantify the E-waste generation for reuse, recycle and final disposal in the study area by adopting uniform approach and methodology. SoW as per ToR includes assessment of E-waste generation, present handling practices, storage, and channelization for its recycling or disposal, by producers, consumer, or bulk consumers. The report shall also include the detail list of producers, consumer or bulk consumers, collection centers, dismantlers and recyclers with the name, address contact no. and their practices for E-waste handling & management. Finally, the inventorization of E-waste shall be done for different categories (Information Technology and Telecommunication and consumer / household appliances) listed in schedule – 1 of E-waste Rules 2012. The study area includes Bastar, Bijapur, Dantewada, Kanker, Kondagaon, Narayanpur, and Sukma districts of Bastar Division.

This **Final Inventory Assessment Report** has been compiled in six chapters. This report is being compiled giving inventory of various stakeholders and present handling practices, storages & channelization for recycling.

Some of the major features of E-waste regulation having implication on E-waste inventory assessment indicate that no target has been fixed to collect E-waste from the time of enforcement. Producer is not bound by any collection target. There are no mandatory provisions for producers in the rules to declare quantity of EEE placed in the market since 2012. No mechanism for tracking purchase of EEE by bulk consumers exists.

Therefore, monitoring of E-waste inventory through evaluation of Form 2 or Form 3 in accordance with Rule 4(9) of E-waste Rule by CECB in the state is possible only through the producers data obtained from centralized agency e.g. CPCB or the state where these producers are registered after 2012. CPCB data shows that as of September 2013. Therefore, CECB can track & monitor E-waste inventory in the state through the dismantler's / recycler's data obtained from centralized agency e.g. CPCB or the state where dismantler's / recycler's are registered. This also indicates that E-waste is either dismantled or recycled in informal sector in the state. Producers are majorly responsible for all the activities including financing of E-waste management. It indicates that producers may be fulfilling their responsibility through collection system catering to dismantlers & recycler within and outside the state. Therefore, collection centres registered in the state may offer a limited opportunity of E-waste inventory tracking & monitoring mechanism in the state. Assessment on the upstream side of the E-waste chain especially of both types of consumers (bulk & individual consumer), also indicate that only bulk consumer offer opportunity of E-waste inventory tracking & monitoring. Though, bulk consumers are required to maintain records of E-waste, they are not required to file the returns. Since no mechanism exist for tracking purchase of EEE by bulk consumers and producers are not required to declare quantity of EEE placed in the market since 2012, E-waste inventory assessment has to rely on available historical market research data. Therefore, there is need to identify different producers, profile of consumers & bulk consumers, collection centre, dismantlers & recyclers who are catering to E-waste in the state.

Tracer technique, which was pilot tested in Chhattisgarh has been used in major urban centers/towns in Chhattisgarh to fix E-waste trade value chain. A tentative E-waste trade value chain for study area which has emerged out of field work from tracer techniques indicates the following profile of stakeholders & their inventory.

<u>Producers</u>: EEE producers / manufacturers do not exist in the study area. However, their products are being sold in the division. Secondary data confirms that EEE producers do not have manufacturing facilities in the division and therefore they are not registered with CECB. Since these producers are responsible for their products under EPR, their detailed **inventory** as per schedule 1 of E-waste (Management & Handling) rules are given in Annexure 1.

<u>Distributors / Traders / Retailers</u>: EEE from these producers are sold in the study area through Distributor / Trader / Retail network as well as directly through the company. Items like Centralized Data Processing, Mainframes, Mini-computers of Schedule 1 are used by large corporate, State and Central Government agencies falling under the category of bulk consumers whose profile is given below. **Inventory** of Distributors / Traders / Retailers selling items other than mentioned above in the study area are given in Annexure 2. However, retailers / dealers do not fall under the purview of E-waste (Management & Handling) Rules 2011, unless they serve as collection centre or drop off point.

<u>Consumers</u>: There are two types of consumers, which are found in the seven districts of study area, Individual Consumers & Bulk Consumers. **Inventory** of bulk consumers in the seven districts is given in Annexure 3.

<u>Collection Centres / Channel</u>: Tracer analysis indicates that EEE, which becomes E-waste in the study area partly gets collected & transported in the informal sector and partly in formal sector. Primary survey carried out through Tracer technique indicates that bulk of E-waste generated in the study area goes to informal sector. Majority of the producer / manufacturer have established collection channel in the study area. These collection channels work through following mechanism.

- 1. Single point call centre
- 2. Distributors / Retailers
- 3. Service Centres
- 4. Physically established collection centre / drop off point

The producers use a combination of these mechanisms. Inventory of Service centres in the study area are given in Annexure 4. Inventory of Physically established collection centres are given in Annexure 5. Majority of producers use call centre as well as dealer's network for collection of E-waste. There are two possibilities of onward transportation & disposal of E-waste. The first possibility is the disposal through informal sector & the second is through registered recycler. An inventory location of major scrap vendor / dismantler, temporary stockpile site / informal collection centre & landfill site is given in Annexure 6.

Small scrap dealer purchase waste from Household / Commercial Area / Institution, etc. At first stage, they segregate the waste than break the item and collect valuable items like Aluminum, Copper, Iron & Steel, Compressor, motor, etc. from E-waste. They sell their collected item to the large scrap dealer. They visit nearby area on daily/weekly basis and purchase the waste. These scrap dealers are not licensed by the municipalities but are part of the networks of large scrap dealers. Dismantling and segregation of E-waste occurs in a major way at large scrap dealers. Photo documentation captured district-wise of Bastar division of Chhattisgarh in given in Annexure 8. Some of the major findings of the disposal mechanism are:

- Electronic items go to mechanic shops from households for repairing, and mechanic replace damaged / defunct parts/components from it and then they sold it to scrap dealers.
- Mechanics sell E-waste to scrap dealer by weight / Pcs. mainly of ICT items (IT as per Schedule 1); TV circuit Rs. 15-45/kg; Compressor Rs. 300-400/Pcs.; Washing Machine Motor Rs. 200/Pcs.; Copper Rs. 200-350/kg; DVD Circuit Rs. 20-25/kg; Mobile kit Rs. 1000-2000/kg; SMPS Rs. 50/Pcs, Mother Board Rs. 90/Pcs.; Hard disk Rs. 120/Pcs.; CD Writer Rs. 35-40/Pcs.
- Scrap vendors sold E-waste to scrap dealer by weight at Rs. 150-250 per kg

- Scrap vendors sold damage mobile phone to scrap dealer as individual piece at Rs. 30-50 per piece
- Scrap dealer comes from Delhi yearly twice/thrice for collecting of E-waste
- There is no organized mechanism for collection, transportation and disposal of E-Waste in Bastar division.
- No mechanism exists in the state to monitor and track its inventory, collection, transportation and disposal.

<u>Repair Shops (AC/WM/REF)</u>: One person repairs one of these items every day. E-waste fractions/ waste Parts, like plastic body of these items, etc. is dumped into community bin and valuable item sold to nearby scrap dealer. Some of the respondent informed that Item which is not in repairable condition is returned to the owner of the product who in turn sells to the scrap dealer. Majority of the product are in repairable condition.

<u>Repair Shops (TV / PC / Mobile Phone)</u>: Majority of mobile phones, TV & computers repair shop owners are local citizens. Waste Parts, like plastic body of these items, etc. are dumped into community bin and valuable item sold to nearby scrap dealer. They also store valuable item and use it to repair other EEE. In case of mobile phone, they utilize maximum parts while waste parts are dumped in municipal bin. Majority of the product are in repairable condition.

Data matrix versus methodology used for E-waste inventory assessment indicates "Market Supply" method and "Carnegie Mellon" method can be applied for WEEE / E-waste inventory assessment in seven districts of Bastar division. However, a combination of Carnegie Mellon method & tracer tracking has been selected for inventory assessment since it covers all the aspects of material flow chain. Assessment of data from these stakeholders through tracer tracking has resulted in assessment of obsolescence rate or average life of equipment described in chapter 5. Major sources of secondary data included Saturation Level – National census data was obtained from office of the Registrar General & Census Operation, Govt. of India, National Sample Survey Organization (NSSO), Department of Statistics, Government of India, State Statistics from Department of Statistics, Government of Chhattisgarh, Telecom Regulatory Authority of India (TRAI), Ministry of Communications & Information Technology (MOCIT), Government of India, Industry Association like Manufacturers Association for Information Technology (MAIT), Electronic Industries Association of India (ELCINA), Telecom Equipment Manufacturers Association of India (TEMA) & Research Institutions e.g. National Council for Applied Economic Research (NCAER). Data related to average life time, storage data, reuse, recycling & disposal at landfill site was obtained through "tracer tracking" technique & primary survey.

The description of each of this method also describes constraints and advantages of each of these methods. The data requirements for each methodology based on mathematical expressions are given in Annexure 9. The extent of data required depends on the extent of geographical boundary, which could be national, regional or city boundary. Conceptually, the source of data can be identified by understanding the "material flow chain" within the given geographical boundary. A list of sources of data in study area, which was required for application of inventory assessment methodology, is given in Annexure 10

Analysis shows that cell phone have the highest installed base followed by Computers, TV, printers, fixed line telephone, refrigerators, washing machines and Air Conditioners. In Bastar cellular phone, fixed line phone, TV, washing machine and refrigerator has the highest installed base followed by districts of Bastar division.

Inventory estimates in Bastar division indicate that E-waste generation ranges from **2876.78** tons in 2011 to **7533.54** tons in 2020. In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes (91%) of the total inventory followed by Computer (4%), Washing machine (1%), Air conditioner (1%), Refregirator (1%), Printer (1%), Cellular phone (0%) & Fixed Line Phone (1%)

In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (67%), Computer will constitute about (27%) of the total inventory followed by Printer (3%), Refrigerator (1%), Air conditioner (1%), Washing machine (1%), Cellular phone (0%) & Fixed Line Phone (0%).

Some major observations are that Operating margin for Television waste per kilogram is Rs. 0.44. Operating margin for waste refrigerator is Rs. 11.46 per kilogram. For that of Washing Machine is Rs. 13.03 per kilogram. For that of Air Conditioners is Rs. 18.40 per kilogram. For scrap old Personal Computer is Rs. 6.98

per kg. For waste cellular phones is Rs. 24.20 per kg. The operating margin ranges from Rs. 0.44 to Rs. 24.20 per kilogram. Scrap of Mobile / cellular phones gives the maximum operating margin of Rs. 24.20 while scrap from television gives the minimum profit of Rs. 0.44 per kilogram. This indicates that informal sector if brought into formal sector considering taxation involved will only dismantle / recycle cellular phones followed by ACs and WMs to some extent. Therefore, there is a need to formulate financial instrument for making dismantling / recycling of white goods viable.

Market risks matrix highlight the availability of raw material, its collection and transportation as risks of high & medium intensities. Collection mechanism directly impacts the availability of raw material. Therefore, there is a need for both strict implementations of regulations as well as financial instrument for diverting E-waste inventory in to the formal sector.

Chapter 1: Introduction & Background

1.0 Introduction & Background

E-waste is one of the fastest growing waste streams in the world. In developed countries, it equals 1% of total solid waste generation on an average. As the fastest growing component of municipal waste across the world, it is estimated that more than 50 MT of E-waste is generated globally every year. The rapid change in technology, low initial cost, and planned obsolescence has resulted in its fast growth. These rapidly increasing numbers of electronic equipment and appliances have the potential to create serious environmental and health impacts at the "end of life" if not treated and disposed in an environmentally sound manner. E-waste is also a source of resource as some of these materials and valuable parts used in manufacture of electrical and electronic (EEE) items can be recycled and re-used. The harnessing of E-waste as a "resource" provides potential economic opportunities through the development of collection, recovery and recycling facilities. As per CPCB / MoEF 2006 estimates, India generated 1, 46,000 metric tones of E-waste from six items, which were projected to exceed 7, 00,000 metric tones by 2012. A report of the United Nations predicted that by 2020, E-waste from old computers would jump by 500 percent on 2007 levels in India [2]. In this context, Ministry of Environment & Forest, Government of India at first notified E-waste guidelines followed by Hazardous Waste (Management, Handling & Transboundary) Rules in 2008. This was followed by formulation of E-waste (Management & Handling) Rules 2011, which came into effect from 1st May 2012. In order to implement these regulations, each state is mandated to prepare their E-waste inventory which can assist State Pollution Control Boards (SPCB) to monitor & regulate E-waste Management as per E-waste rules.

In this context, Chhattisgarh Environment Conservation Board invited Proposals for Inventorization of Ewaste in Raipur, Bilaspur, Durg, Bastar and Sarguja divisions of the State of Chhattisgarh. IRGSSA submitted its technical & financial proposal to CECB to carry out E-waste inventorization in Raipur, Bilaspur, Durg, Bastar and Sarguja divisions of the State of Chhattisgarh.

1.1 Need for Study

Despite of enactment of law for handling E-waste in India, this particular waste is being disposed off unaudited, in absence of appropriate inventory of E-waste in most of the states / cities. As per National Ewaste inventory estimates carried out by CPCB in 2006, Chhattisgarh state ranks among top twenty states generating E-waste in India. Therefore, in Chhattisgarh an effective inventory comprising the details of Ewaste and related components is yet to be created to manage & handle E-waste in eco-friendly manner and to combat the problem associated this waste. In this context, it is proposed to prepare an Inventory of Ewaste & related components in five divisions of Chhattisgarh viz. Raipur, Bilaspur, Durg, Bastar and Sarguja. The overall aim of this initiative is to assess the generators, quantity and present practices for handling of Ewaste in these divisions.

The current effort is aimed to prepare an action plan for E-waste for implementation of the legislations framed. The items to be covered in this assessment include personal computers, mobile phones, televisions, washing machines and refrigerators etc. as mentioned in E-waste (Management & Handling) Rules, 2011. A list of these items as per ToR is given in **Table 1.1**.

	Table 1.1: Categories of Electrical and Electronic Equipment
Sr. No.	Categories of Electrical and Electronic Equipment
i.	Information Technology and Telecommunication Equipment
	Centralized Data Processing
	Mainframes, Minicomputers
	Personal Computers (Central Processing Unit with input and output devices)
	Laptop Computers (Central Processing Unit with input and output devices)
	Notebook computers
	Notepad Computers
	Printers including cartridges
	Copying equipment

Sr. No.	Categories of Electrical and Electronic Equipment
	Electrical and Electronic typewriters
	User terminals and systems
	Facsimile
	Telex
	Telephones
	Pay telephones
	Cordless telephones
	Cellular telephones
	Answering systems
 11.	Consumer Electrical and Electronics
	Television sets (including sets based on liquid Crystal Display and Light Emitting Diode technology),
	Refrigerator, Washing Machine, Air conditioners excluding centralized air conditioning plants.

1.2 Objective

The objective of the Rapid E-waste assessment is to identify and quantify the E-waste generation for reuse, recycle and final disposal in the study area by adopting uniform approach and methodology. The main objectives of this study are as follows:

- ➤ To assess identify and quantify the WEEE generation.
- ► To examine the existing WEEE recycling system
- To study the problems / risks posed by the recycling system at present/ future
- > To estimate the existing and future quantity of WEEE in the study area
- To evaluate the capacities / capabilities of existing stakeholders and infrastructure for reuse, recycle and disposal of E-wastes
- > To analyze the environmental and social sustainability of present system.
- ➢ To determine E-trade economics for WEEE
- Preparation of directory of the stakeholders
- Conduct 01 sensitizing workshops in the each study area

1.3 Scope of Work (SoW)

In order to achieve the above objectives identified by CECB, IRGSSA has developed a comprehensive Methodology addressing the need to develop and implement an effective E-waste management based on the need to quantify and characterize this waste stream, identify major waste generators, assess risks involved and develop and implement a scientific, safe and environmentally sound management system, including policies and technologies.

The project aims to promote identification and implementation of environmentally sound and commercially viable technologies for the various elements of waste management *viz* collection, segregation, transportation, treatment, recovery and/ or recycle and disposal. The fundamental approach can be summarized in the following three phases.

Phase 1: Mobilization and work plan

Team will be mobilized & work plan will be prepared & presented to CECB.

Phase 2: Data Collection / Field Work

IRGSSA would be following the approach suggested by CECB. In order to execute this assignment, it is essential to establish the E-waste business chain linking different stakeholders to understand the trade economics and associated environmental impacts. An example of this chain is given in **Figure 1.1**.



Figure 1.1: Conceptual WEEE business chain

This chain will be mapped geographically in the study area to describe the following:

- ➢ The stakeholders
- > Their respective geographical distribution in the study area and
- ➢ WEEE generation cycle
- Material flow across stakeholders

Study Area: As per ToR, the study area is Raipur, Bilaspur, Durg, Bastar and Sarguja Division. However, the current report is being submitted for Bastar Division. In this division Bastar, Bijapur, Dantewada, Kanker, Kondagaon, Narayanpur, and Sukma seven districts are covered.

This study would lead to the identification of stakeholders, classification of organization as organized / unorganized sector. Further their geographical location would be determined in the terms of their operating base coverage. Conceptually, some of the major stakeholders would include:

Ist Group

- ➢ The Importers, Manufacturers
- > The distributors, traders and retailers
- The consumers Individual households, Business sector, IT sector, BPO, teaching institutions, Railways, Airlines, Defence establishments, Transport Corporations, PUCs etc.

2nd Group

- > The Collectors Scrap dealers, Big Bazaars or malls who are buying the e-waste
- > The Recyclers dissemblers, dismantlers, material recoveries,
- The Road side vendors
- The authorized / unauthorized Auctioneers, the sellers of the used electronic goods on the footpaths.

The study would also aim at establishing E-waste trade chain using conceptual input output analysis. This idea has been developed based on "E-waste material flows" through region and on its way its disintegration and processing in numerous steps until it rejoins the raw streams or ends in a final disposal. This will be done through "tracer techniques", which includes identification of tracer for each item and its tracking through the chain from the start of dismantling process till its final disposal.

Inventorization

Inventorization of E-waste would be done as follows:

- Inventory of obsolescence rate of each electronic product (viz. Personal computer / TV / Mobile phones as mentioned in the e-waste rules and guidelines issued by CPCB) using scenario analysis from secondary / market research data.
- Confirm obsolescence rate from data of primary survey using "tracer technique".
- Identify a tracer for each product and follow it from the start of dismantling process till its final disposal.
- The inventorization other than households (on sample basis) would also be on actual basis.

The Inventorization other than households (whereas sample basis at least 500 nos in rural and urban area of each district) should be on actual basis.

Analysis of existing E-waste recycling system & quantification of E-waste

This will include description & documentation of each process used in dismantling of an EEE and the location details. Carry out photo documentation and geographical setting of each step. Estimate the quantity of material dismantled at each step. Estimate the quantity of E-waste for a particular year based on market projections & obsolescence rate.

Phase 3: Report findings

A Final Inventory Assessment Report will be prepared for each division & findings will be presented in one workshop, one each for five divisions.

1.4 Approach & Methodology

IRGSSA will follow a very comprehensive approach and methodology as described below. This is based on UNEP's manuals 1 and 2 and its application in a number of countries globally including India. The consortium will carry out the following activities and will follow the following step wise approach and methodology for each of these activities.

Activity 1: Development of Policy & Regulatory Framework

Step 1: Carry out due diligence on E-waste policy / laws / regulations eg. EPR.

- Step 2: Identify the gaps with respect to existing environmental regulations and recommend tentative content, extent and coverage of E-waste policy/ laws/ regulatory framework.
- Step 3: Carry out due diligence on expected E-waste institutional mechanism like collection and transportation system and registry e.g. Collective and clearing house system, B2C and B2B model. Identify the gaps with respect to existing collection and transportation system and recommend tentative collection and transport framework.

Activity 2: Assessment of E-waste Market

- Step 1: Determine E-waste item of interest as per Schedule 1 of E-waste (Management & Handling) Rules 2011. This will assist in studying the items of interest ex. PCs, TVs, cellular telephones, and refrigerators etc. Determine the brands, local, national and international, which are available in the market for each item and the year of their introduction in the market. Determine brands which existed earlier. This can be determined through review of secondary data from industry association or by interacting with local dealers. If the product is manufactured under a brand name, the broad feature of technology used to manufacture item is generally disclosed. This will also assist in identifying its dealer's network, existing facilities for item's manufacture and repair and its membership with local industry association.
- Step 2: Determine average weight and size of local, national and international E-waste item from each brand ex. capacity of refrigerator (liters) / washing machine, size of monitor / TV / cellular phone. The variation in size of each item should be documented under each brand. Average weight and size along with percentage composition should be estimated. This can be further confirmed while carrying out field survey for documenting dismantling operation.
- Step 3: Determine broad components out of the 26 components of E- waste items. Determine composition of E-waste item from available source like industry association / manufacturer. Determine technology of E-waste item e.g. ODS based refrigerator / 386 / 486 / Pentium series of PCs and laptops / CRT / front loading / top loading washing machines etc. Determine approximate quantity of recoverable elements from each item based on outputs of step 2. Determine possible hazardous substance in E-waste item.



Figure 1.2: Geographical mapping of different attributes

- Step 4: Establish geographical boundary / system boundary of study area. Procure maps of the area and prepare base map of the area with physical features marked on it. If the detailed map is not available easily then procure city map and fix up the municipal boundaries. Alternately, maps of the study area can be prepared based on standard map search engines available on the internet. The base map will be used for generation of different thematic layers as shown in **Figure 1.2**. This mapping will give an insight into the possible sources of E-waste and assist in carrying out the primary survey.
- Step 5: Identify different stakeholders from Group 1 & Group 2 who could be E-waste generators and mark them as layer two on the base map. Physically verify by carrying out preliminary reconnaissance survey of the identified locations of the stakeholders. Mark the tentative locations by taking latitudes and longitudes of the identified locations through GPS instrument. Identify the stakeholders, which are in the formal / organized sector and which are in the informal sector.
- *Step 6:* Prepare a tentative E-waste trade value chain as per conceptual life cycle; four phase model and E-waste trade value chain. These figures should be customized as per preliminary survey, which will be confirmed and established during field survey.
- Step 7: Identify E-waste dismantling sites, recycling sites and landfill / dump sites. Physically verify these sites by preliminary reconnaissance survey and marking the tentative locations by recording their latitudes and longitudes through GPS instrument.
- Step 8: Identify data needs from these stakeholders based on identified stakeholders in step 5 and trade value chain identified in step 6.
- Activity 3: Selection of Methodology for E-waste Inventory
- Step 1: Identify data requirements. This is carried out by classifying data needs under the heads of saturation level, households, calculated sales, stock data, average life, storage data, reuse, recycle and landfill for each electronic item ex. PC, TV, refrigerator, cellular phone, etc.
- Step 2: Identify tentative sources of data for each electrical and electronic item. This will be based on preparing preliminary or detailed interview guide / checklist / questionnaires for data collection for each time.
- Step 3: Document secondary sources of data for each electrical and electronic equipment and visit the respective agency to procure data i.e. published / unpublished / historical.
- Step 4: Check the availability, reliability, amount and range and completeness of data against following decision criteria.

<u>Availability of data</u>

- 1. Number of sources of data, which can provide data for study area. Generally, more than one source of data is preferred for item of interest.
- 2. In what format, data is available i.e. yearly, half yearly, cumulative or distributed.
- 3. Whether the data is published/ unpublished, confidential/ public.
- 4. Mode of procurement of data.

Reliability of data

- 1. Data of at least two sources should match.
- 2. If there is any variation in sources of data, check the methodology of calculating and compiling the data from each source. If there is a difference in the calculation and compilation of data, then check the factor responsible for the difference.
- 3. Check the trends from the data obtained from different sources and correlations with other data.

Amount and Range of data

- 1. Check the availability of historical data for each E-waste item.
- 2. Historical data should be available for more than anticipated average life time of the E-waste item.

Completeness of data

- 1. Historical data should be complete without any gap.
- 2. If gap exists then source, which provide data with minimum gap should be selected so that the gaps can be supplemented.
- 3. Incomplete data can be supplemented by trend analysis or by national / regional / city level assumptions.

Step 5: Prepare the constraint matrix by mapping outputs of steps 4 and step 5. Decide the most suitable and applicable methodology for E-waste inventory assessment

Activity 4: E-waste Inventory Assessment:

Sub Activity1: Establishment of the study area and its geographical limit

This activity will include the establishment of geographical limits of study area i.e. geographically defining the area. This will include assessment of landuse maps of the study area, fixing of rural and urban boundaries and mapping of tentative locations of stakeholders. The investigation team will geographically verify the tentative locations where generation, stockpiling, collection, handling and brokering, processing and production of other items from E-waste are taking place by using transect walk.

Sub Activity 2: Identification of E-waste and establishment of E-waste trade value chain

This activity will include identification of specific E-waste item and its tracer (CRT / Compressor / LCD screen / any other) followed by tracking of tracer's geographical movement within the identified geographical limits of the area to its final end of life, e.g. places where items are unloaded, traded, transported, dismantled, recycled, reused, repaired and disposed, using output of activity 1. The following steps are involved in field investigations.

- Step 1: Identify the E-waste streams of specific E-waste item
- Step 2: Identify the E-waste processes i.e. unloaded, treated, transported, dismantled, recycled, reused, repaired, and disposed.
- Step 3: Follow the E-waste tracer through the process in the E- waste stream by using tracer/ hazardous process walk.

A typical, E-waste trade chain will be established in a geographical context after verification of the tentative trade value chain obtained as an output of activity 1 and activity 2. This superimposition of E-waste trade value chain on a map will facilitate spatial analysis.

Sub Activity 3: Estimate the E-waste and obsolescence rate/ average life through secondary data by following "approach and methodology upstream of demarcation" mentioned. By using secondary data e.g. market research data like market supply and imports data, installed base of the E-waste item. The key to estimate E-waste is fixing of obsolescence rate based on market research data, industry data or on consumer behaviour. Since obsolescence rate is dynamic in nature, therefore, a range is fixed with upper and lower limits. Carry out sensitivity analysis for E-waste inventory using upper and lower limits of obsolescence rate.

Sub Activity 4: Verification of obsolescence rate / average lifespan through primary data. The obsolescence rate / average life can be verified through identification of E- waste stream and E-waste processes and tracking of tracer item. The following steps are involved in tracer verification.

- Step 1: Identify the tracer item
- Step 2: Follow the tracer item through the process in the E-waste stream

- Step 3: Identify all the organized and unorganized market of a tracer in the geographical area.
- Step 4: Establish the extent of dismantling / recycling happening in a geographical boundary.

The primary survey methodologies used for tracer technique and outputs are described in Table 1.2.

Objective	Detail	Primary Survey Methodologies	Output
WEEE / E- waste stream	Material flow	• Follow tracer materials: semi- structured interviews about quantities, quality, economics, and labor.	 Key-players are known (dealers, disassembly workers, recycler) Material flow (quantities / Labor in E-waste streams are identified
	Input quantities / Import	 Interviews with E- waste producers (manufacturers / retailers, auctions) to find out E-waste quantities Survey of key-players for import: structured questionnaires / interviews 	 E-waste quantity input is estimated Percentage of imported / household E-waste is known
	Reuse	• Surveys of scrap dealers, retailers, computer repair shops: structured interviews (using questionnaires)	 Quantities of reused entire equipment are estimated Quantities of reused equipment parts are estimated
	Disposal	• Sampling on different landfills (using questionnaires)	• Existence of E-waste fractions in landfills is known
Recycling technologies	Recycling technology	• Transect walks in different districts (semi-structured interviews)	 Applied recycling technologies are known Labor needed for different recycling processes is known
	Hazardous processes	• Semi-structured interviews in districts, where potentially hazardous processes.	• Hazards in different recycling processes are identified

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The structured and semi structured interviews can be conducted using questionnaires. The questionnaire has been developed to quantify and photo document each step in the E-waste value chain.

Sub Activity 5: Identify the products, by products and waste products and back calculate E-waste dismantled.

Identify products, by products and waste products. This can be carried out by using a combination of qualitative and quantitative estimations with the identified stakeholders across the value chain using photo documentation of sampled E-waste tracer. Using this data, back calculate to check the best fit scenario of Ewaste inventory obtained as an output from activity 3. The output from back calculation should confirm the obsolescence rate / average life of E-Waste within the range used in activity 3. This obsolescence rate is used for calculating E-waste projections based on historical data.

Sub Activity 6: Establish E-waste trade economics

Each stakeholder in the dismantling processes is linked to the other and the trade between the two takes place based on profit. Therefore, the basic parameters driving this trade, which should be estimated, are as follows.

- 1. Input cost
- 2. Selling Price
- 3. Operating margin

Estimate input cost in terms of raw material cost / energy cost and labour cost. Estimate raw material cost / energy cost and labour cost using data collected from questionnaire add the two costs to arrive at input cost. Estimate selling price of the product by using data from questionnaire. Establish operating margin as the difference between selling price and input cost.

Sub Activity 7: Identify and assess the impacts

Identify the effluents / solid waste / emissions from each of the process. Establish their quantity if possible. Establish the geographical location of their discharge and history of the site. Classify impacts into environment, health and business impacts. Use relative ranking technique to quantify impacts. Relative ranking technique is based on scores where each sector i.e. health, environment and business are assigned with individual score subject to identified negative and positives impacts on the workers, surroundings and economy.

Activity 5: Compilation of draft & final reports.

Activity 6: Workshops in each division.

1.5 Format of the Report

This **Final Inventory Assessment Report** has been compiled in six chapters. The table of contents of each chapter is given below.

Chapter 1 Introduction and Background: Introduction; Objective of the Study as per ToR; Scope of Work (SoW) as per ToR; Approach and Methodology; Format of the Report.

Chapter 2 Policy & Regulatory Framework: Overview of Regulatory Framework; Policy, Regulations, their Scope and Institutional Responsibility; Reforms in Waste Management; E-waste and Environmental Legislation in India and Chhattisgarh.

Chapter 3 Assessment of E-waste Market: Introduction; E-waste Composition; Mechanism of E-waste Trade; Conclusions.

Chapter 4 Methodology for E-waste Inventory: Introduction; Methods for Inventory Assessment; Material Flow Chain, Data Sources and Data Gaps in Chhattisgarh; Constraints / Limitations and Selection of Methodology; Methodology / Approach & Instruments Used; Conclusion.

Chapter 5 E-waste Inventory Assessment: Introduction; Market Size Assessment of Electrical and Electronic Equipment (EEE) in Chhattisgarh; Obsolescence Rate / Average Life; E-waste Inventory; E-waste Processing in Chhattisgarh; Environmental Pollution; Market Risks; Conclusions.

Chapter 6 Conclusions & Recommendations: Regulations; E-waste Market; Methodology for Inventory Assessment; E-waste Inventory.

Chapter 2: Policy & Regulatory Framework

2.0 Overview of Regulatory Framework

E-waste management comes under the broad regulatory framework related to environment, foreign trade and local rules & regulations. A number of policy & regulatory initiatives have come into effect since 2006. The following sections describe the policy framework, relevant rules and regulations, which regulates E-waste management and emerging framework under extended producer responsibility (EPR). Further, their implications in the context of current situation in the study area have been described.

2.1 Policy, Regulations and their Scope

During the 1990s, Ministry of Environment & Forests (MoEF) adopted pollution control policy by formulating multi-pronged strategies in the form of regulations, legislations, agreements, fiscal incentives and other measures to abate pollution. National Environmental Policy, which was declared in 2006, identified pollution abatement as an important issue affecting human health and poverty. The policy focuses on optimizing resource efficiency and minimizing pollution loads. An analysis of policy statements reveals that there has been a gradual shift from simple pollution control to the pollution abatement leading to reduction, recovery and recycling. Policy states about strengthening informal sector through technological upgradation & incentivization. It states about promotion of segregation, reuse & recycling & benign disposal of waste. The policy further states involvement of private sector for hazardous waste management. The policy also focuses on optimizing resource efficiency and minimizing pollution loads. National Environment Policy clearly states about the need for preparation of guidelines & regulations for E-waste management in India.

2.1.1 E-Waste and Environmental Legislation in India

The Environment (Protection) Act 1986, an umbrella act also covers industrial waste and provides broad guidelines to address it. Under the umbrella act, a number of rules have been formulated to address hazardous waste like Hazardous Waste (Management Handling & Transboundary) Rules, Battery (Management & Handling) Rules & Bio Medical (Management & Handling) Rules. Specific laws for electronic waste have been notified in May 2011, effective from 1st May 2012 in the country. Further, India is also a signatory to international conventions like Basel Convention, whose provisions are applicable for export and import of E-waste. These provisions find expression in terms of Rules 13, 14, 15 & 16 of the HW (Management, Handling and Transboundary Movement) Rules, 2008. Therefore, there are two regulatory scenarios related to E-waste management as shown in **Table 2.1**. At first, E-waste (Management & Handling) Rules 2011 & Hazardous Waste (Management, Handling & Transboundary) Movement Rules 2008 have been described. This is followed by description of guidelines for implementation of regulations.

Table 2.1: E-waste Regulatory Scenario				
Regulations / Guidelines	E-waste M Pre 1 st May 2012	anagement Post 1 st May 2012	Export & Imp Pre 1 st May 2012	port of E-waste Post 1 st May 2012
E-waste (Management & Handling) Rules 2011		\checkmark		
Hazardous Waste (Management, Handling & Transboundary) Rules 2008	\checkmark		\checkmark	\checkmark
Guidelines for Environmentally Sound Management of E-waste 2008	\checkmark	\checkmark		
Guidelines for Implementation of E-waste Regulations 2012	\checkmark	\checkmark		
Source: IRGSSA				

Table 2.1 clearly indicates that pre 1st May 2012 Hazardous Waste (Management Handling) Rules were used to regulate E-waste management. It is specifically relevant in case of E-waste recyclers, who got registered prior to 1st May 2012 & whose registration extends beyond this date.

CPCB data shows that as of September 2013, Chhattisgarh has M/s Navrachna Recycling Pvt. Ltd. & M/s ADV Metal Combine Private Limited has two E-waste dismantler / recycler, located at Rajnandgaon & Durg districts having a license. Therefore, this indicates that E-waste is either dismantled or recycled in both formal and informal sector in state because of their limited capacity.

2.1.2 E-Waste (Management and Handling) Rules, 2011

Salient features of the E-waste rules are given below.

- These rules are applicable to every producer(s), collection centre(s), dismantler(s), recycler(s), consumer(s) or bulk consumer(s) involved in the manufacture, sale, purchase and processing of electrical and electronic equipment or components as specified in Schedule-I. However, micro, small and medium enterprises are not covered under this regulation.
- The rules clearly define electrical and electronic equipment (EEE) and E-waste. Definition of E-waste categorizes them into two broad categories, i.e., IT and Telecommunication Equipment and Consumer Electrical and Electronics. As per Schedule-I of the rules, seventeen items have been specified under the IT and Telecommunication Equipment category and four items have been specified under the Consumer Electrical and Electronics category. The categories of E-waste covered under the rules are provided in Section 1.4 of Chapter 1.
- The rules also clearly define producers, bulk consumer, consumer, collection centre, transporter, dismantler and recycler. These form an integral part of material flow chain. The physical, financial & compliance responsibilities of each of the above stakeholders, as specified in the rules have been summarised in **Table 2.2** is given below.
- The rules provide direction to domestic EEE manufacturers/ producers to be RoHS (reduction in the use of hazardous substance) compliant within three years. It also allows imports of only RoHS compliant EEE.

Responsibilities		Producer	Consumer	Bulk Consumer	Collection Centre	Dismantler	Recycler / Reprocessor
Collection	Manufacturing	\checkmark					
	End of Life	\checkmark					
Take-back	Individual	\checkmark					
	Collectively	\checkmark					
Transportation to	Producer		\checkmark	\checkmark			
	Collection Centre	\checkmark	\checkmark	\checkmark			
	Dismantlers/ Recyclers	\checkmark	\checkmark		\checkmark	\checkmark	
	TSDF* Facility	\checkmark				\checkmark	\checkmark
Storage					\checkmark	\checkmark	\checkmark
Financing		\checkmark					
Registration		\checkmark			\checkmark	\checkmark	
Filing of Annual Returns		\checkmark			\checkmark	\checkmark	\checkmark
Return of Annual Inventory Handled		\checkmark		\checkmark	\checkmark	\checkmark	\checkmark

Table 2.2: Responsibilities of Stakeholders for Collection, Transportation, Storage and Disposal of E-waste

Note: \sqrt{means} "Yes", TSDF means Treatment Storage and Disposal Source: IRGSSA

Table 2.2 indicates that producers' major responsibility for all the activities including financing of E-waste management. Since, the state has two registered dismantler & recycler with limited capacity, it indicates that producers may be fulfilling their responsibility through collection system catering to dismantlers & recycler outside the state.

Therefore, there is need to identify different producers, profile of consumers & bulk consumers & collection centre in the study area and dismantlers & recyclers who are catering to E-waste.

2.1.3 The Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008

The Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008, defines hazardous waste as "any waste" which by reason of any of its physical, chemical, reactive, toxic, flammable, explosive or corrosive characteristics causes danger or likely to cause danger to health or environment, whether alone or when on contact with other wastes or substances, and shall include:

- Waste substances that are generated in the 36 processes indicated in column 2 of Schedule I and consist of wholly or partly of the waste substances referred to in column 3 of same schedule.
- Waste substances that consist wholly or partly of substances indicated in Schedule II, unless the concentration of substances is less than the limit indicated in the same Schedule.
- Waste substances that are indicated in Part A or Part B of Schedule III in respect of import or export of such wastes in accordance with rules 12,13, 14, 15 and 16 or the wastes other than those specified in Part A or Part B if they possess any of the hazardous characteristics in Part C of that schedule.
- Schedule IV includes E-waste as item 18 in its list of hazardous wastes requiring registration for recycling/ reprocessing. This item covers components of waste electrical and electronic assemblies comprising accumulators and other batteries included on list A, mercury switches, activated glass cullets from cathode ray tubes and other activated glass and PCB-capacitors, or any other component contaminated with Schedule 2 constituents (e.g. cadmium, mercury, lead, polychlorinated biphenyl) to an extent that they exhibited hazard characteristics indicated in part C of this schedule.
- Rule 9 of Chapter III on procedures for recycling, reprocessing or reuse of hazardous waste states that the occupier generating hazardous waste specified in schedule IV may sell it only to recycler having a valid registration from the CPCB for recycling or recovery.

2.1.4 Basel Convention and its Application to E-waste

The Basel Convention defines waste by disposal destination or recovery processes. These various processes are listed in Anne IV of the Convention. For example, virtually any material that will be recycled or processed in order to reclaim a metal, or to reclaim an organic or inorganic substance for further use, is deemed a waste. Electronic components that are used without further processing are likely to not be defined as a waste. The convention has provided for two lists. List A found in Annex VII is presumed to be hazardous and thus covered by the Basel convention; and list B, found in Annex IX, is presumed to be non-hazardous and thus not subject to Basel convention. The waste listed in list A is waste that poses serious threats to environment and human health. As a result of their adverse effects these substances require special handling and disposal processes.

The Basel Annex-VII hazardous waste lists the following applicable entries to e-waste:

A1010 Metal wastes and waste consisting of alloys of any of the following: antimony, arsenic, beryllium, cadmium, mercury, selenium, tellurium, thallium.

A1020 Waste having as constituents or contaminants, excluding metal waste in massive form, any of the following: antimony compounds, beryllium, beryllium compounds, cadmium, cadmium compound, lead, lead compounds, selenium, selenium compounds, tellurium, tellurium compound.

A1030 Wastes having as constituents or contaminants any of the following: arsenic, Arsenic compounds, mercury, mercury compound, thallium, thallium compounds.

A1160 Waste lead-acid batteries, whole or crushed.

A1170 Unsorted waste batteries excluding mixtures of only list B batteries. Waste batteries not specified on list B containing Annex I constituents to an extent to render them hazardous. [Note: List B batteries include: waste batteries conforming to a specification, excluding those made with lead, cadmium or mercury]

A1180 Waste electrical and electronic assemblies or scraps containing components such as accumulators and other batteries included on list A, mercury- switches, glass from cathode ray tubes and other activated glass and PCB- capacitors, or contaminated with Annex 1 constituents (e.g. cadmium, mercury, lead, polychlorinated biphenyl) to an extent that they exhibit hazard characteristics contain in Annex III.

A2010 Glass waste from cathode ray tubes and other activated glass destined for direct reuse and not for recycling or final disposal.

It is also important to note that the Basel convention's list B includes:

B1110 Electrical and electronic assemblies (including printed circuit board, electronic components and wires) destined for direct reuse and not for recycling or final disposal.

From the above we can conclude that at the very least, circuit board, CRTs, and other electronic boards or components and assemblies containing lead based solders and copper beryllium alloys (which include most computer circuit boards and much other electronic equipment), are hazardous wastes according to Basel convention. Likewise, whole, used, discarded computers, printers, and monitors that contain such circuit boards or CRTs that are not to be reused directly are to be considered as hazardous waste and subject to the Basel convention.

The provisions of Basel Convention & its provisions under Hazardous Waste Rules are not applicable currently in Chhattisgarh unless export and import of E-waste is carried out by any registered dismantler / recycler. Therefore, they have been described considering E-waste management intervention in future.

2.1.5 Guidelines for environmentally sound management of E-waste, 2008

Guidelines for environmentally sound management of E-waste have been formulated by CPCB in 2008, which provide broad framework to recyclers and regulators on the technologies as well as issues related to compliance.

The objective of these Guidelines is to provide guidance for identification of various sources of waste electrical and electronic equipments (E-waste) and prescribed procedures for handling E-waste in an environmentally sound manner.

These Guidelines are reference document for the management, handling and disposal of E-wastes. These are intended to provide guidance and broad outline, however, the specific methods of treatment and disposal for specific wastes needs to be worked out according to the hazardous / risk potential of the waste under question. These Guidelines provide the minimum practice required to be followed in the management of E-wastes and the State Department of Environment or State Pollution Control Board may prescribe more stringent norms as deemed necessary.

These Guidelines shall apply to all those who handle e-waste which includes the generators, collectors, transporters, dismantlers, recycler and stakeholders of E-wastes irrespective of their scale of operation

These guidelines under classification of E-waste, describe Composition of E-waste; Components of E-waste; Possible hazardous substances present in E-waste; E-waste scenario; Basis of Defining E-waste; Proposed definition of E-waste; Reduction of the Hazardous Substances (RoHS) in the Electronic & Electrical Equipments and Extended Producer Responsibility (EPR). It gives guidelines for environmentally sound

management for E-waste. Under this head, it describes E-waste Composition and Recycle Potential; Assessment of Hazardousness of E-waste; Recycling, Reuse and Recovery Options; Treatment & Disposal Options and E-waste Recycling / Treatment technologies in India.

Further, it describes environmentally sound treatment technology for E-waste, consisting of description of environmentally sound E-waste treatment technologies; Environmental Impacts of the 1st, 2nd and 3rd level E-waste treatment system; Technology Currently used in India; Best available technology and Available operating facilities. Lastly it describes guidelines for establishment of integrated E-waste recycling & treatment facility consisting of Facility operation requirements; Procedures for setting up & management of integrated E-waste facility and Procedures for compliance with the existing regulations and guidelines.

In the context of current study, these guidelines provide guidance related to assessment of current handling practices, storages & channelization of E-waste in the study area as per SoW.

2.1.6 Guidelines for Implementation of E-waste Rules, 2011

MoEF/CPCB after consulting various stake holders felt the need for preparing a guidance document for implementation of the provisions of the E-Waste (Management & Handling) Rules, 2011 that may help the Producers, Consumer & Bulk Consumer, Collection Center, Dismantler, Recycler and Regulatory agencies (SPCBs/PCCs) for effective compliance / implementation of these rules. This document also provides guidance on setting up collection mechanism, dismantling and recycling operations. Further, guidelines also clarifies issues related to RoHS e.g. the rules call for the reduction in the use of hazardous substances in electrical and electronic equipment. Every producer of equipment listed in Schedule 1 of the Rule shall ensure that the covered products do not contain lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls or poly-brominated di-phenyl ethers above a specified threshold. The threshold for cadmium is 0.01% by weight in homogeneous material, for all other substances, the threshold is 0.1% by weight in homogeneous material. Various clarifications offered by the guidelines are given below.

1. Clarification regarding definitions

- **Producer** is any person who, irrespective of the selling technique used, "manufactures and offers to sell electrical and electronic equipment under his own brand; or offers to sell under his own brand, assembled electrical and electronic equipment produced by other manufacturers or suppliers; or offers to sell imported electrical and electronic equipment" and has to take authorization under these Rules for implementation of EPR.
- **Bulk Consumers** are bulk users of electrical and electronic equipment such as central government or state government departments, public sector undertakings, banks, educational institutions, multinational organizations, international agencies and private companies that are registered under the Factories Act, 1948 and Companies Act, 1956; they have to maintain records on E-waste generated and channelized to registered/authorized collection centres / recycler / dismantler.
- Extended Producer Responsibility is a responsibility of any producer of electrical or electronic equipment, for their products beyond manufacturing until environmentally sound management of their end of life products.
- Collection Centre is a centre established individually or jointly or a registered society or a designated agency or a company or an association to collect E-waste which has to obtain authorization under E-Waste Rules, 2011.
- **Dismantler** is any person or registered society or a designated agency or a company or an association engaged in dismantling of used electrical and electronic equipment into their components who has to obtain authorization and registration E-Waste Rules, 2011. The association may include a consortium as well.
- Recycler is any person who is engaged in recycling or reprocessing of used electrical and electronic

equipment or assemblies or their component. Recycling facility may be set up by an individual or a company or a joint venture or a consortium.

• **SPCBs / PCCs** have been given the responsibility as regulatory agencies for ensuring implementation of the E-waste Rules in their respective States.

2. Clarification regarding scope and requirements for compliance to EPR:

- Producers intending to sell their EEEs listed in Schedule-I are required to take authorization only in the place where their manufacturing facilities and corporate head offices are located. In case, of producers importing EEEs listed in Schedule-I, authorization may be taken from SPCB of the State where the port of landing is located.
- Since these products are sold across the country, SPCB/PCC concerned granting the authorization would inform the CPCB of the details of the authorization granted. CPCB would maintain a centralized database on their website, which will be available to all stakeholders. Producers will also place this information on their website and provide details of products sold to the SPCB from whom they have obtained authorization. SPCBs will provide consolidated information to CPCB on an annual basis which CPCB will maintain on the centralized database.
- In the application for authorization, it should be clearly mentioned, how the producer would ensure channelization of the E-waste at the end of its life; details of his own collection centres or take-back systems or the collection centres authorized by him, shall be specified.
- As per the EPR under the Rules, the producers are required to achieve 100% collection and channelization of the end of the life equipment. However, for the purpose of monitoring, targets need to be fixed. Such targets should be based on the life of the product, type of the product, usage and consumption patterns and other relevant factors. CPCB will, therefore, set up a Committee, which will examine the issue of fixing targets, based on the aforesaid factors and also taking into consideration the level of compliance achieved during the first two years.
- Producer who has manufacturing facility shall comply with prevailing environmental regulations under Water (P&C) Act, 1974, Air (P&C) Act, 1981, Hazardous Waste (M, H&TM) Rules, 2008 and other relevant regulations. In the case of a manufacturer, who has obtained authorization under the Hazardous Waste (Management, Handling & Transboundary Movement) Rules, 2008 need not take separate authorization under the e-waste rules till the validity/expiry of that authorization. Subsequent authorization has to be taken under the E- waste rules, 2011 to ensure that electronic scraps, rejects etc. generated during the manufacturing shall be sent or channelized to registered E-waste recycling facilities. Such producer shall obtain authorization only from SPCB/PCC of the State where the manufacturing facility is located.
- The producer is required to maintain records in form 2 along with the details of the e-waste handled/generated and has to submit the annual returns in form 3 in accordance with Rule 4(9) of these Rules.
- Producer shall finance the EPR system either by setting up individual collection system or by joining a common collection system by authorizing them.

Scope of EPR for the Producer:

- i. Producer may assess their individual requirements and design a collection or product take back system as they deem appropriate as long as it facilitates channelization of E-waste for environmentally sound management.
- ii. Producer may arrange for collection from both, individual and bulk consumers and channelize the waste to collection centres or recyclers/dismantlers.
- iii. The producer may opt to implement EPR on his own individually or collectively. There can be

two distinct models; (i.) individual producer responsibility where producer implements EPR managed on his own by setting up his own authorized collection centres or (ii.) collective producers responsibility, where producers may authorize common collection centres (CCC) independently or by joining a consortium as a member. Producers importing EEE listed in schedule – I, may take authorization from the State where the landing port is located

iv. In the E-waste rules, the logo has been printed without a bar below the symbol, whereas the present practice commonly followed by the producer, the Logo has a bar below the symbol. Logo without the bar below the symbol and the logo with bar below the symbol as shown below are acceptable. Symbol may be placed on the products or printed in the accompanying product documentation.



- v. As per Rule 4(6) of the E-waste Rules, 2011 the producer is responsible for creating awareness for the consumer about the product that has been placed on the market. The information should essentially convey the message for the compliance under the rules and the responsibility undertaken by the producer on safe handling and disposal of the end-of-life product. Various modes for creation of awareness such as publications, advertisements, posters, information booklets, use of Television, radio, newspaper etc., could be adopted for communicating the information. The details of awareness programs under taken shall be provided to SPCBs/PCCs while submitting annual returns as per Form 3.
- vi. Under Rule 4(5) it is mandatory for the producer to publicize the contact details of the authorized collection centres and collection points or their collection mechanism to the consumers and such information should be periodically updated. The detailed information should comprise of the full address, telephone number, fax number e-mail etc for each State. The helpline number (like call centre) may also be publicized so that the consumer can reach the nearest collection centre from where he/she is located.
- vii. Awareness is essential regarding the hazardous constituents present in the equipment as well as the safe handling and disposal of the product after its use. In case of the products complying with the provisions of rule 13(1), the same should be indicated in the product information booklet.
- viii. Producer may manage a system directly or with a help of any professional agency on his behalf for collection and channelization system of E-waste by involving relevant stakeholders such as consumer, bulk consumer, NGOs, informal sector, resident associations, retailers, dealers, etc.
- ix. The scope of implementing the EPR by the producers is also explained in the schematic diagram given in **Figure 2.1**.



Figure 2.1: Scope of implementing EPR for Producers Source: E-waste Regulation Guidelines 2012

3. Clarifications regarding Collection Centres

A collection centre is a store/warehouse where the E-waste collected from consumers, bulk consumers, urban local bodies and retail outlets/collection-points/collection-bins/mobile-units etc. established by producers or collection centres, can be received and stored safely for necessary channelization for dismantling/recycling. These guidelines suggest the following options and requirements for setting up Collection Centres;

- i. Collection centres can be established by various ways. If a collection centre is set up for a particular producer, it may be called individual collection centre. If a collection centre caters the EPR requirements of multiple producers it may be called common collection centre. All collection centres require authorization from SPCBs / PCCs of respective States.
- ii. In case a producer himself sets up a collection centre, he shall take separate authorization from SPCBs / PCCs for setting up such individual collection centre.
- iii. Producer may organize take-back system through their retailers or through service centres and set up collection points or bins or drop-off points and link them to their authorized individual collection centres. Such collection points can also be set-up by authorized common collection centres.
- iv. Producer may organize take-back system through their retailers or service centres and set up collection points or bins and channelize the E-waste directly to registered dismantlers or recyclers.
- v. The collection points can be designated places where E-waste can be collected through residential areas, office complexes, commercial complexes, retail outlets, customer care stores, educational and research institutions, resident welfare associations (RWAs), NGOs working with rag pickers, etc. These collection points can be financed by producers or common collection centres (on behalf of producers) to channelize the E-waste to registered dismantler or recyclers. The E-waste collected through these points should be transported to collection centres or registered dismantling or recycling plants within a stipulated time period as per rule 12. These collection points do not require taking authorization from SPCBs/PCCs.
- vi. Collection Bins could be installed in public places such as kerbsides, restaurants, malls, offices etc. which can be owned by the authorized collection centres or the producer. The contact details of authorized collection agencies should be printed on these bins for reference purposes of the general public. The E-waste collected in these bins should be transported to collection centres or

channelized to registered dismantler or recyclers by the producers. These collection Bins do not require authorization.

- vii. Mobile collection vans can also act as collection systems for door to door collection of E-waste or from institutions / individuals / small enterprises and such vans shall be linked to collection centre or provided by producer to channelize the E-waste to collection centres or registered dismantler or recyclers. A mobile collection van does not require authorization but their detail has to be provided to SPCBs / PCCs while seeking authorization by the producers or collection centres.
- viii. SPCBs shall ensure that authorized collection centres comply with the provisions of the Rules and ensure that the E-waste collected by them is stored in a secured manner and no damage is caused to the environment during storage and transportation till the e-waste reaches registered dismantler (s) or recycler (s) by undertaking periodic inspections and verifications
- ix. The Rules specify that Collection Centres are allowed to store E-waste for a maximum period of 180 days. However, this period may be extended up to one year in the exceptional cases with genuine reasons when the Collection Centres are located in the States, which do not have any registered dismantling or recycling facility and are unable to send the e-waste for recycling within the stipulated time period.

The criteria for setting up collection centres are

- i. The collection, transportation, storage and handling of E-Waste in the collection centres has to be done carefully without breaking the end of life equipments.
- ii. Collection centers, established under these Rules, need not seek Consent to Establish and Consent to Operate under the Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981.
- iii. Producers who has pan India presence having large number of distributors/dealers in each of the State and has large warehouses already in place can use the space if available in these ware house for establishing collection centre. However, the space used for collection centre has to be clearly demarcated (by enclosure or partition) from the space meant for new goods.
- iv. The storage capacity of any collection centre should be commensurate with available area, volume of operations (in weight) and type of E-waste.
- v. The collection centre where Refrigerator and Air conditioners are also stored should have adequate facilities for handling / arresting leakage of compressor oils, CFCs/HCFCs if any.
- vi. Covered shed/spaces may be used for storage of E-Waste generated from IT and Telecommunication equipments while open spaces can be used for storage of refrigerators / washing machines /air conditioners. In case of storage of E-waste, generated from IT and Telecommunication equipment, in open spaces, containers with lids/covers may be used. E-waste comprising of IT & TE waste preferably be segregated and stored at collection centre in suitable racks/containers/bins.
- vii. Containers of appropriate size and shape may be used for segregation of E-waste items generated from IT and Telecommunication equipments to facilitate effective collection and handling operations. Containers can be made either of wood or plastic or mild steel or any appropriate material with sufficient strength and shapes (top open containers, caged boxes, rakes etc.) for holding the E-waste. These containers/racks may be placed in such a way that there should be adequate space for movement of workers and material.







viii. Producer can assess their individual requirements and design a collection or product take back systems as they deem appropriate as long as it facilitates channelization of WEEE for environmentally sound management.

4. Clarification regarding E-waste Dismantler

As per these rules any person or registered society or a designated agency or a company or an association can engage in dismantling of end of life electrical and electronic equipments into their components by obtaining registration and authorization from the respective SPCB/PCC.

- Dismantling operation can be manual, semi manual and automatic involving physical segregation operations for plastics, glass, steel, non-ferrous material, wires, gases, liquids and printed circuit boards. Dismantlers may perform the following operations.
 - 1. Decontamination
 - 2. Manual dismantling using appropriate tools, PPEs and dust control equipment.
 - 3. Hammering
 - 4. Shredding
 - 5. Segregation and
 - 6. Specialized separation processes
 - a) CRT cutting into funnel and panel including removal of phosphor coating from the panel as well as lead paste binding the panel with the funnel.
 - The first step is to decontaminate E-waste and render it non-hazardous by separating hazardous components and materials. Hazardous electronic components such Hg switches, Poly Chlorinated Biphenyl (PCBs) etc. can be recovered and sent to TSDFs for treatment and disposal. In case of refrigerators and air conditioner, the refrigerant gases such as chlorofluorocarbon (CFCs), hydrochlorofluorocarbons (HCFCs) etc. can be collected by using gas recovery equipment for their recovery and storage. The refrigerant gases may be re-used or may be diposed by thermal destruction adopting any of the following options:
 - i. By incineration in existing common HW incinerators
 - ii. By co-processing in cement kiln
 - iii. By plasma destruction
- Dismantling operations shall not include Fine grinding / wet shredding / wet grinding operations. Dismantling operations shall not be permitted for chemical leaching or heating process or melting the material. Dismantlers shall not shred segregated LCDs.
- Dismantler shall have adequate facilities for disposal of bag filter residue and floor cleaning dust in secure manner or shall obtain membership with TSDF for safe disposal.
- Dismantlers can be permitted shredding or cutting of printed circuit boards not below the size of 20mm which have to be handled by employing minimal manual handling and with adequate air pollution control systems.

5. Clarification regarding E-waste Recyclers

As per these rules any person who is engaged in recycling or reprocessing of used electrical and electronic equipment or assemblies or their component is a recycler. Recyclers may also set up their own authorized collection centres and may establish linkages with producers/bulk generators/other collection agencies. They may also establish a scheme for household collection of e-waste or may establish tie–ups with other agencies involved in collection of E-waste from individual consumers.

The functions of the recycling facilities are similar to the dismantlers but implements high degree technologies for recycling or recovery operations. There shall be no restriction on degree of operations that can be permitted for recyclers. The following processes can be employed by recyclers;

- 1. Manual / semi-manual / automatic dismantling operations
- 2. Shredding / crushing / grinding / enrichment operations
- 3. Pyro-metallurgical operations Smelting furnace
- 4. Hydro metallurgical operations

- 5. Electro-weaning
- 6. CRT cutting
- 7. Toner cartridge recycling
- 8. Melting, casting, molding operations (for metals and plastics)
- A recycling facility can be permitted to receive any kind of E-waste covered under E-waste Rules.
- The recycling facilities shall comply with the requirements as specified for dismantlers in the above section for the operations specified therein.
- A recycling facility shall install adequate waste water treatment facilities for process wastewater and air pollution control equipment depending on type of operations undertaken.
- Suitable space de dusting equipment shall be installed where manual dismantling, shredding operations are carried out.
- Suitable fume hoods connected with bag dust collectors followed by wet (chemical) scrubbers shall be installed for control of fugitive emissions from furnaces or chemical reactor fumes.
- In additions to dismantling operations, recyclers may adopt suitable technologies for shredding, wet grinding, gravity / magnetic/density/eddy current / electromagnetic separators with adequate air pollution control equipment. It shall be ensured that dust control equipment comprises of mechanical dust collectors followed by fabric filters or two stage fabric filters or fabric filter followed by wet (chemical) scrubbers.
- Adequate facilities for onsite collection and storage of bag filter residues, floor cleaning dust and other hazardous material shall be provided and sent to secure land fill facility by obtaining membership with TSDF operator.
- The degree of refining and % recovery of resource or precious material present in the E-waste shall be given due importance.

6. Clarification regarding Recycling of CRT Monitor and TVs

- Large volumes of CRTs are expected to be generated in coming years. Care should be taken for recycling of CRTs as it contains harmful substances.
- CRT monitors and TVs can be manually removed from plastic/ wooden casing. The CRT is split into leaded funnel and unleaded panel glass using different splitting technology in a closed chamber under low vacuum environment and the funnel section is then lifted off from the panel glass section and the internal metal gasket is removed for facilitating the removal of internal phosphor coating.
- The CRT can be split manually adopting Ni-Chrome hot wire cutting, Diamond wire method or Diamond saw separation
- Manual shredding, cutting, and segregation operations for CRTs should be carried out in vacuum chambers where the dust is extracted through cyclones, bag filters, ID fan and a suitable chimney. The operators should use gloves fixed to the walls of the vacuum chamber while handling CRTs as shown in the figure below.





- The internal phosphor coating from the inner side of panel glass is removed by using an abrasive wire brush and collected separately. The extracted air is cleaned through high efficiency bag-filter system to collect the phosphor dust. The phosphor dust so collected in the filter bags should be sent to TSDF.
- Segregated CRTs can also be shredded in automatic shredding machines connected with dust

control systems. The mixed shredded glass is separated into leaded glass and glass cullet using electro-magnetic field or by density separation.

7. Clarification Regarding Bulk Consumers

- As per these rules a bulk consumer has to ensure that the e-waste generated by them have to be channelized to authorized collection centres or registered dismantler or recycler or is returned to the producer through its pick up or take back services or through its collection points.
- The bulk consumer has to maintain records of e-waste generated by them in Form 2 and make such records available for scrutiny to SPCBs / PCCs whenever demanded.

8. Clarification regarding reduction in the use of Hazardous Substances (RoHS) in the manufacture of electrical and electronic equipments:

The e-waste rules specifies limit for hazardous substance in the components of electrical and electronic equipments. The limits are detailed below

- i. Every producer of electrical and electronic equipments as per Schedule I shall ensure that new electrical and electronic equipments should not have concentration value more than 0.1% by weight in homogenous materials for Lead, Mercury, Cadmium, Hexavalent Chromium, Polybrominated biphenyls or polybrominated diphenyl ethers and for Cadmium more than 0.01% by weight in homogenous materials. The above maximum concentration limit should be achieved before 01-05-2014. The above limits will not apply to components of electrical and electronic equipment manufactured or placed in the market six years before the date of commencement of these rules. The above limits will also not apply to applications listed in Schedule II of the e-waste rules and electronic equipments used for defense purpose.
- ii. Import or placement in the market for new electrical and electronic equipment shall be permitted only for those equipment which are RoHS compliant.
- iii. Components of electrical and electronic equipment manufactured or placed in the market before the date of 01-05-2014 are exempted from above provisions.
- iv. The reductions have to be achieved before 1 May 2014 i.e. within two years from the dates of commencement of these rules. Certain applications listed in Schedule II are exempted from the above requirement and there is also an exemption for components of electrical and electronic equipment manufactured or placed in the market six years before the date of commencement of the reduction.

9. Clarification regarding interstate transportation or E-waste

- Transportation of e-waste, being sent for dismantling or recycling to a facility in a State other than the State, where it is generated or collected, does not require 'No objection certificate' from the SPCBs/PCCs concerned.
- However, Transporter of the E-waste is required to give prior intimation to the SPCBs/PCCs concerned i.e. the States in which the E-waste is generated, transited and being sent for the purpose of recycling or dismantling.

10. Clarification Over-all Compliance Mechanism

A compliance mechanism has been set out in E-waste Rules for producers, collection centers, consumer, bulk consumers, dismantler, recyclers and the regulatory authorities (SPCB's, PCCs, CPCB and MoEF). It also sets out the responsibilities for producers to finance and organize the take back and recycling system. However, while ensuring that the given compliance mechanism is followed the same be can be visualized in the following schematic flow sheet given in **Figure 2.2**.



Figure 2.2: Implementation of E-Waste Rules 2011 Source: E-waste Regulation Guidelines 2012

2.2 Institutional Structure

The Ministry of Environment and Forests, Government of India, is the nodal agency at the central level for policy, planning, promoting and coordinating the environmental programs. A number of enforcement agencies assist the Ministry of Environment and Forests at the state level in executing the assigned responsibilities. The Central Pollution Control Board (CPCB) advises on the policy and enforcement. State Pollution Control Boards (SPCB) carry out the enforcement at the state level. The roles & responsibilities of different agencies under E-waste rules are provided in **Table 2.3**.

Sr. No.	Authority/(ies)	Duties
1.	Central Pollution Control Board, Delhi	 i. Coordination with State Pollution Control Boards/ Committees of UT ii. Preparation of Guidelines for Environmentally Sound Management of e-waste iii. Conduct assessment of e-waste generation and processing iv. Recommend standards and specifications for processing and recycling e-waste v. Documentation, compilation of data on e-waste and uploading on websites of CPCB vi. Conducting training & awareness programmes. vii. Submit Annual Report to the Ministry. viii. Any other function delegated by the Ministry under these rules. ix. Enforcement of provisions regarding reduction in use of hazardous substances (RoHS) in manufacture of electrical & electronic equipment. x. Initiatives for IT industry for reducing hazardous substances. xii Set targets for RoHS compliance in manufacture of electrical & electronic equipment. xii Incentives and certification for green design/products
2.	State Pollution Control Boards/ Committees of Union Territories	 i. Inventorization of e-waste. ii. Grant & renewal of Authorization iii. Registration of recyclers of e-waste iv. Monitoring compliance of authorization and registration conditions v. Maintain information on the conditions imposed for authorization etc. vi. Implementation of programmes to encourage environmentally sound recycling vii. Action against violations of these rules

Table 2.3: List of Authorities and Corresponding Duties as per E-waste (Management and Handling) Rules, 2011

Sr. No.	Authority/(ies)	Duties
		viii. Any other function delegated by the Ministry under these rules
3.	Urban Local Bodies (Municipal Committee/Council/C orporation)	(i) To ensure that e-waste if found to be mixed with Municipal Solid Waste is properly segregated, collected and is channelized to either authorized collection centre or dismantler or recycler.(ii) To ensure that e-waste pertaining to orphan products is collected and channelized to either authorized collection centre or dismantler or recycler.

Source: E-waste Rules 2012

The roles and responsibilities of different agencies related to hazardous waste and its export and import is given below in Table 2.4.

Sr. No.	Authority/(ies)	Duties and Corresponding Rule
1.	Ministry of Environment and forests, under the Environment (protection) Act, 1986	 i. Identification of hazardous wastes ii. Permission to exporters of hazardous wastes iii. Permission to importers of hazardous wastes. iv. Permission for transit of hazardous wastes through India. v. Sponsoring of training and awareness program on Hazardous Waste and Management related activities.
2.	Central Pollution Control Board constituted under the Water (Prevention and Control of Pollution) Act, 1974	 i. Coordination of activities of the State Pollution Control Boards/ committees. ii. Conduct training courses for authorities dealing with management of hazardous substances. iii. Recommend standards for treatment, disposal of waste and leachates. Recommend procedures for characterisation of hazardous wastes. iv. Sector specific documentation to identify waste for inclusion in Hazardous Wastes (Management, Handling and transboundary Movement) Rules 2008. v. Prepare guidelines to prevent/ reduce/ minimize the generation and handling of hazardous wastes. vi Any other function under rules delegated by MoEE
3.	State Government/ Union Territory Government and Administration	 i. Identification of site (s) for common hazardous waste treatment, storage and disposal facility (TSDF). ii. Assess EIA reports and convey the decision of approval of site or otherwise. iii. Acquire the site or inform operator of facility or occupier or association of occupiers to acquire site. iv. Notification of sites v. Publish periodically an inventory of all disposal sites in the state/union territory
4.	State Pollution Control Boards constituted under the Water (Prevention and Control of Pollution) Act, 1974	 i. Inventorization of hazardous waste ii. Grant and renew authorization iii. Monitor the compliance of the various provisions and conditions of authorization including conditions of permission for issued by MoEF exports and imports. iv. Examining the applications for imports submitted by the importers and forwarding the same to MoEF. v. Implementation of programs to prevent/ reduce/ minimize the generation of hazardous wastes. vi. Registration and renewal of registration of Recyclers/ Re-Processors. viii. Action against violations of Hazardous Wastes (Management, Handling and Transboundary Movement) Rules 2008. viiii. Any other function under these rules assigned by MoEF from time to time.
5.	Directorate General of Foreign Trade constituted under the Foreign Trade (Development & regulation) Act 1992	 Grant licence for import of hazardous wastes Refuse licence for hazardous wastes prohibited for imports and exports.

Table 2.4: The authority, duties and corresponding rule as per Schedule VII of the HW Rules, 2008

Sr. No.	Authority/(ies)	Duties and Corresponding Rule
6.	Port Authorities under	i. Verify the documents
	Indian Port Act 1908 and	ii. Inform the ministry of Environment and Forests, Govt. of India of
	Customs Authorities under	any illegal traffic
	the customs Act, 1962	iii. Analyze wastes permitted for imports and exports.
		iv. Train officials on the provisions of the Hazardous Wastes Rules and
		in analysis of hazardous wastes.
		v. Take action against export/import Acts, 1908/ Customs Act 1962.
-		

Source: Hazardous Waste (Management, Handling & Transboundary) Rules 2008

Applicability of E-waste Rules is given in Table 2.5.

Table 2.5: E-Waste (M&H) Rules - 2011 applicability											
Sr. No.	Type of Applicant	To Maintain Records	To Maintain Record in Form -2	Filling Annual Return in Form - 3	Authorization Form-I	Registration Form-IV	RoHS Compliance				
1. (Consumer	X	X	Х	Х	Х	Х				
2.1	Bulk Consumer		\checkmark	Х	Х	Х	Х				
3. U	Jrban Local Bodies		X	X	X	X	Х				
4. (Collection Centre					X	X				
]	Producer –offer to		\checkmark	\checkmark		Х					
5. s	ell										
6.1	Producer - importer					X					
7. l I	Producer - Manufacturing EEE	; √		\checkmark		Х					
8. I	Dismantler						Х				
9.1	Recycler		\checkmark			\checkmark	Х				
Source: E-waste Rules guidelines											
	X = Not applicab	ole		√= Applicable							

Clarification of the role of State Pollution Control Boards as per E-waste Guideline 2012.

- SPCB/PCC shall also ensure that Producer having manufacturing facility or corporate head office in their State shall obtain authorization. SPCB/PCC shall also ensure that a Producer having their port of landing of imported equipments in their State obtains authorization.
- Shall ensure that manufacturer has set-up adequate collection mechanism to cater the collection needs from entire State.
- The number of collection centres or take-back systems may depend on quantum of sales, number of urban centres in that State.
- The authorization granted to each producer shall be evaluated on case to case basis depending on their proposed EPR implementation scheme. The details of EPR with respect to authorized collection centres, collection points, take-back systems, authorized recyclers, authorized dismantlers and details of agreement between producers, authorized collection centre, dismantler and recycler are required for evaluation.
- Shall ensure that the collection centres, who have applied for authorization, should have adequate space for storing the quantity of e-waste for which application has been made.
- Shall ensure that adequate numbers of containers proportionate to the applied capacity are available for storing e-waste.
- Shall ensure that collection centre should not store e-waste for a period exceeding one hundred and eighty days. The storage period may be extended to one year in those States which do not have any registered dismantling and recycling facility or in such cases where the e-waste needs to be stored for development of a process for its recycling or reuse.
- Shall ensure that collection centre should have arrangement in place for transferring the e-waste to the registered dismantler or recycler.
- Shall ensure that dismantlers and recyclers who have applied for authorization and registration, possess appropriate facilities, technical capabilities and equipment to handle e-waste safely. The land may be owned by the dismantlers/recyclers or could be on lease.

- SPCBs/PCCs shall ensure that no one starts dismantling or recycling of e-waste without having prior permission (registration and authorization) to do so from SPCBs/PCCs.
- Shall ensure that dismantler and recyclers should have appropriate equipments for dismantling and recycling of e-waste.
- Grant of registration for dismantling and or recycling has to be evaluated on case to case basis depending on their capacity and level of operation. The SPCBs/PCCs should ensure that dismantler should not exceed their mandate for processing any e-waste for recovery or refining of materials.
- SPCBs/PCCs shall ensure that dismantlers have well set mechanism for providing dismantled material to recyclers. Action Plan for channelizing the disposal of dismantled component in an environmentally sound manner has to be provided by dismantler.
- SPCBs/PCCs shall ensure that dismantlers/recyclers should be members of TSDF.
- SPCBs/PCCs shall ensure that dismantlers/recyclers should file their annual returns within the stipulated time period.
- SPCBs/PCCs shall place on their web site the conditions imposed on the collection centre, dismantler and recycler while granting authorization and registration and ensure that these conditions are strictly met with by the facility concerned.
- SPCBs/PCCs should regularly monitor the compliance of authorization and registration.

Role of Municipal Authorities

- There is possibility of mixing of e-waste with municipal solid waste. In such cases, the Urban Local bodies (Municipal Committees/ Councils/ Corporations) are required to ensure that E-waste if found to be mixed with MSW is properly segregated, collected and is channelized to either authorized collection centre or dismantler or recycler.
- The Urban Local bodies (Municipal Committees/Councils/ Corporations) are also required to ensure that e-waste generated from non branded or assembled electrical and electronic equipment as specified in Schedule I is collected and channelized to either authorized collection centre or dismantler or recycler. The ULBs are also required to collect E-waste generated from those EEEs which are covered under the rules and produced by a company, which has closed its operation or has stopped product support.
- ULBs may also set up their own collection points at MSW disposal site, public places; residential locality etc to collect the E-waste and such collection points shall be connected to authorized collection centres/dismantlers/recyclers.

2.3 Overall Assessment with respect to Emerging Regulatory Scenario

Major conclusions drawn from regulatory assessment having implications an E-waste management in the state are given below.

National Environment Policy 2006

National Environment Policy 2006 provided overall guidelines on waste management including E-waste. These provided road map for preparation of guidelines and regulation policy. At first guidelines came into effect in 2008, which provided a minimum practice required for environmentally sound management of E-waste.

Guidelines Environment sound Management of E waste

These guidelines also provided the basis for amendment of Hazardous Waste (Management, Handling & Transboundary Movement) Rules 2008 & E-waste was included as part of Schedule IV. This development brought E-waste recycling into the ambit of hazardous waste regulations and facilitated control of export & import of E-waste. A number of E-waste recyclers got registered under these rules indicating the part formalization of the E-waste trade value chain but diversion less than 5% of the E-waste generation to these recyclers paved the way for separate E-waste regulation based on EPR.

E-waste (Management & Handling) Rule 2011

In 2011, new E-waste (Management & Handling) Rules were notified, which came into effect in 2012. These rules were formulated in close consultation with producers & their associations and other stakeholder. Some of the major features of this regulation having implication on E-waste inventory assessment are given below.

- No target has been fixed to collect E-waste from the time of enforcement. Producer is not bound by any collection target.
- There are no mandatory provisions for producers in the rules to declare quantity of EEE placed in the market since 2012.
- No mechanism for tracking purchase of EEE by bulk consumers exists.

Draft E-waste (Management & Handling) Rules 2016

Draft E-waste (Management & Handling) Rules have been disclosed and are expected to be notified any day. These rules have been formulated in close consultation with major stakeholders in E-waste trade value chain. Some of the major features of this regulation having implication on E-waste inventory assessment are given below.

- All the above three points (1, 2 & 3) have been addressed in the draft rules.
- Draft rules recommend financial mechanism to address financial implications for E-waste management.
- Responsibilities of Consumers especially bulk consumers have been increased.

2.4 Conclusions

None of the major brands manufacturing / importing items mentioned in Schedule 1 of the E-waste rules have manufacturing facilities or corporate head offices located in Chhattisgarh Therefore, monitoring of E-waste inventory through evaluation of Form 2 or Form 3 in accordance with Rule 4(9) of E-waste Rule by CECB in the state is possible only through the producers data obtained from centralized agency e.g. CPCB or the state where these producers are registered after 2012.

CPCB data shows that as of September 2013, Chhattisgarh has two E-waste dismantler / recycler M/s Navrachna Recycling Pvt. Ltd. & M/s ADV Metal Combine Private Limited. Therefore, CECB can track & monitor E-waste inventory in the state through the dismantler's / recycler's data obtained from centralized agency e.g. CPCB or the state where dismantler's / recycler's are registered. This also indicates that E-waste is either dismantled or recycled in both formal & informal sector in the state.

Table 2.2 indicates that producers are majorly responsible for all the activities including financing of E-waste management. Since, the state has two registered dismantler & recycler, it indicates that producers may be fulfilling their responsibility through collection system catering to dismantlers & recycler both inside & outside the state.

Assessment on the upstream side of the E-waste chain especially of both types of consumers (bulk & individual consumer), also indicate that only bulk consumer offer opportunity of E-waste inventory tracking & monitoring. Though, bulk consumers are required to maintain records of E-waste, they are not required to file the returns.

Since no mechanism exist for tracking purchase of EEE by bulk consumers and also producers are not required to declare quantity of EEE placed in the market since 2012, E-waste inventory assessment has to rely on available historical market research data.

Therefore, there is a need to identify different producers, profile of consumers & bulk consumers, collection centre, dismantlers & recyclers who are catering to E-waste in the seven districts in the study area.

Chapter 3: Assessment of E-waste Market

3.0 Introduction

The increasing market penetration of the consumer electronics will lead to reduced life of electronics items and greater generation of E-waste in Chhattisgarh. Therefore, an assessment of E-waste market structure requires an understanding of E-waste as a "tradable commodity" and its "mechanism of trading". In Chhattisgarh E-waste as a "tradable commodity" can be described in terms of its composition and its potential for material recovery. "Mechanism of Trading" can be described in terms of E-waste trade value chain. This chain will identify different stakeholders consisting of producers, consumer or bulk consumers, collection centers, dismantlers and recyclers, while mechanism of trading will determine E-waste generation, present handling practices, storage and channelization for its recycling or disposal. The following sections describe each of these items to facilitate an understanding of E-waste market in five divisions of Chhattisgarh.

3.1 E-Waste Composition

E-waste Composition has been described in terms of components, which contain items of economic value. At first E-waste has been classified into 19 components forming "building blocks", which are easily "identifiable" and "removable", followed by their respective hazardousness.

3.1.1 E-waste Components

A number of components, which are assembled to produce "Electrical and Electronic Equipment" are metal, motor / compressor, cooling, plastic, insulation, glass, LCD, rubber, wiring / electrical, concrete, transformer, circuit board, fluorescent lamp, incandescent lamp, heating element, thermostat, FR / BFR – containing plastic, batteries, CFC / HCFC / HFC / HC & external electric cables. Specific component, which are found in Air Conditioners, refrigerator, washing machine, personal computers, cellular telephones, TVs and other items as per schedule 1 are described in **Table 3.1**.

Large household appliance like Air Conditioners / refrigerator may consist of electric motor, a circuit board, a transformer, capacitor, thermal insulation, switches, wiring, plastic casing (containing flame retardants) etc. A typical washing machine may consist of the metal casing, inner and outer drums, a motor, a pump, washing cycle controller unit, switches and other components. IT and telecom equipments sector is observing a trend of "micro miniaturization", while CRTs in monitor are being replaced by LCD screens. Further, there is an increasing trend of reduction in weights of these items.

Table 3.1 indicates that the range of different items found in E-waste is diverse classifying it a waste of complex nature. However, it shows that E-waste can be dismantled or disassembled into relatively small number of common components for further treatment. This disassembly results in segregation and treatment of E-waste.

3.1.2 E-waste Composition, Recyclability and Hazardousness

During market survey of major stakeholders in Bastar division, it was revealed that broadly E-waste consists of ferrous and non-ferrous metals, plastics, glass, wood, printed circuit boards, rubber and other items. Iron and steel constitutes about 50% of the E-waste followed by plastics, non - ferrous metals and other constituents. Non-ferrous metals consist of metals like copper, aluminum and precious metals ex. silver, gold, platinum, palladium etc. Therefore, these items are dismantled in informal sector. However, the presence of elements like lead, mercury, arsenic, cadmium, selenium, hexavalent chromium and flame retardants in E-waste and their components beyond threshold quantities render them hazardous in nature.

Sr. No.	Items of Electrical & Electronic Equipment's	Metal	Motor / Cooling	Plastic	Insulation	Glass	CRT	ICD	Rubber	Wiring / Electrical	Transformer	Magnetron	Circuit Board	Fluorescent lamp (in ballast)	Incandescent lamp	Heating element	Thermostat	FR / BFR – containing plastic	Batteries	CFC, HCFC, HFC, HC	External electric cables
I.	Information Technology and Tel	ecomm	unicatio	n Equip	ment																
1.	Centralized Data Processing																				
2.	Mainframes									\checkmark									\checkmark		
3.	Mini Computers				\checkmark		\checkmark		\checkmark	\checkmark			\checkmark						\checkmark		
4.	Personal Computing									\checkmark											
5.	Personal Computers (Central processing unit with input and output devices)		\checkmark		\checkmark		\checkmark			\checkmark	\checkmark	\checkmark	\checkmark						\checkmark		\checkmark
6.	Laptop Computers (Central processing unit with input and output devices)		\checkmark	\checkmark	\checkmark	\checkmark		\checkmark		\checkmark	\checkmark		\checkmark	\checkmark				\checkmark	\checkmark		\checkmark
7.	Notebook Computers	\checkmark			\checkmark	\checkmark		\checkmark	\checkmark	\checkmark			\checkmark	\checkmark							\checkmark
8.	Notepad Computers																				
9.	Printers including cartridges																				\checkmark
10.	Copying Equipment									\checkmark											
11.	User Terminals and Systems				\checkmark		\checkmark		\checkmark	\checkmark		\checkmark	\checkmark								\checkmark
12.	Facsimile									\checkmark											
13.	Telephones	\checkmark			\checkmark				\checkmark	\checkmark			\checkmark								\checkmark
14.	Pay Telephones									\checkmark			\checkmark						\checkmark		
15.	Cordless Telephones				\checkmark				\checkmark	\checkmark			\checkmark						\checkmark		\checkmark
16.	Cellular Telephones				\checkmark	\checkmark			\checkmark	\checkmark			\checkmark						\checkmark		\checkmark
17.	Answering Systems				\checkmark				\checkmark	\checkmark			\checkmark						\checkmark		\checkmark
II.	I. Consumer Electrical and Electronics																				
18.	Cathode Ray Tube (CRT) TV																				
19.	Liquid Crystal Display (LCD) TV																				
20.	Light Emitting Diode (LED) TV					\checkmark				\checkmark			\checkmark								
21.	Refrigerator																				
22.	Washing Machine																				
23.	Air Conditioners excluding centralized air conditioning plants	\checkmark	\checkmark	\checkmark	\checkmark					\checkmark			\checkmark				\checkmark	\checkmark		\checkmark	\checkmark
24.	Compact Fluorescent Lamp CFL																				

Table 3.1: Components in E-waste

 $\sqrt{\text{Present as a component}}$

• Possible presence as a component Source: Prepared from WEEE & Hazardous Waste, A report produced for DEFRA, UK Government, March 2004, AEA Technology

The possible substances of concern, which may be released during recovery of secondary raw material from E-waste, are given in **Table 3.2**.

Component	Possible Hazardous Content							
Metal								
Motor \ Compressor								
Cooling	ODS							
Plastic	Phthalate plasticize, BFR							
Insulation	Insulation ODS in foam, asbestos, refractory ceramic fiber							
Glass								
CRT	Lead, Antimony, Mercury, Phosphors							
LCD	Mercury							
Rubber	Phthalate plasticizer, BFR							
Wiring / Electrical	Phthalate plasticizer, Lead, BFR							
Concrete								
Transformer								
Circuit Board	Lead, Beryllium, Antimony, BFR							
Fluorescent Lamp	Mercury, Phosphorus, Flame Retardants							
Incandescent Lamp								
Heating Element								
Thermostat	Mercury							
BFR – containing plastic	BFRs							
Batteries	Lead, Lithium, Cadmium, Mercury							
CFC, HCFC, HFC, HC	Ozone depleting substances							
External electric cables	BFRs, plasticizers							

Table 3.2: Possible Hazardous Substances in E-waste Components

Source: Compiled from WEEE & Hazardous Waste, A report produced for DEFRA, March 2004, AEA Technology

Major components, which cause most concern, include lead, mercury, cadmium and chromium (VI), halogenated substances (e.g. CFCs), polychlorinated biphenyls, plastics and circuit boards that contain brominated flame retardants (BFRs). BFR can give rise to dioxins and furans during incineration and open burning of E-waste fractions at dump site can lead to other toxic release. Other materials and substances that can be present in E-waste are arsenic, asbestos, nickel and copper. These substances may act as a catalyst to increase the formation of dioxins during incineration.

3.2 Mechanism of E-Waste Trade

"Material Flow" along the "Life Cycle" of electrical and electronic equipment within a "Geographical Boundary" of Bastsar division of Chhattisgarh forms the basis of E- waste generation. The following sections describe a conceptual understanding of material flow, along the life of electrical and electronic equipment, its conversion into an "obsolete" item followed by its transformation into new material. A conceptual E-waste trade value chain showing material flow along the E-waste trade value chain is shown in **Figure 3.1**. This is followed by customization of the conceptual E-waste trade value chain for Bastar division.

Raw Material Input





Source: UNEP Manual Vol. I; Inventory Assessment Manual
The establishment of material flow within a geographical boundary assists in identifying, networks / chain connecting different phases of life cycle of electrical and electronic equipment and associated stakeholders. The material flow, when applied to "life cycle" of electrical and electronic equipment leads to evolution of the 'Four-Phase-Model', where each phase describes respective unit operations and different stakeholders. Each of these phases and associated stakeholders is described in **Table 3.3** and depicted in **Figure 3.2**. The dotted vertical line in the **Figure 3.2** indicates the stage of "obsolescence" in between the second and third phase of life cycle.

Table 3.3: Phases of material flow model

S.No.	Phase	Stakeholders
1.	<u>Phase I:</u> Unit Operations / Processes / Activities: Production and sales of electrical and electronic equipment including import, export, and input of equipment for re-use from repair of WEEE / E-waste.	Stakeholders: Manufacturers, importers, exporters, and retailers (brand new / second hand)
2.	<u>Phase II:</u> Unit Operations / Processes / Activities: Consumption of electrical and electronic equipment, use of electrical and electronic equipment in households, offices and industry.	Stakeholders: Consumers like households, commercial places like offices and industry
3.	<u>Phase III:</u> Unit Operations / Processes / Activities: Consumption of electrical and electronic equipment, use of electrical and electronic equipment in households, offices and industry.	Stakeholders: Consumers, importers, exporters, collectors, traders, dismantlers, waste treatment operators
4.	<u>Phase IV:</u> Unit Operations / Processes / Activities: Treatment / disposal alternatives for WEEE/E-waste ex. repair, decontaminating, dismantling, shredding, landfill and incineration.	Stakeholders: Dismantlers, Recycling, Hazards landfill site operators.
Courses De	at and from Waste from clostning, and clostnonic equitment (WEEE)	an antition damageness substances and

Source: Prepared from Waste from electrical and electronic equipment (WEEE) – quantities, dangerous substances and treatment methods, EEA Copenhagen, 2003

In developed countries, where E-waste management system is in operation, the entire trade value chain occurs in organized / formal sector. The blue line indicates the starting point of informal sector involvement in E-waste management in a developing country. An example of generic E-waste trade value chain in a developing country is shown in **Figure 3.3**. In majority of developing countries, the informal sector engagement starts from the point of collection and continues till the last stage in some capacity. However, other steps / unit operations like E-waste processing, production / end products may be present or absent in a country. Therefore, this chain can be further modified or customized with inter or intra linkages depending on the E-waste processing or end production in Bastar division.



Figure 3.2: Generic E-waste trade value chain in a developing country Source: UNEP Manual Vol. II; Inventory Assessment Manual



Figure 3.3: The 'Four-Phase-Model'

Source: Prepared from Waste from electrical and electronic equipment (WEEE) – quantities, dangerous substances and treatment methods, EEA Copenhagen, 2003

3.3 E-waste trade value chain in Bastar Division (7 districts)

A tentative E-waste trade value chain for study area which has emerged out of field work is shown in **Figure 3.4**. Tracer technique, which was pilot tested in Bastar division has been used in major seven districts in the division to fix E-waste trade value chain. A brief description of the identified stakeholders is given below.



Figure 3.4: Tentative E-waste trade value chain in Study Area

<u>Producers</u>

Figure 3.4 indicates that EEE producers / manufacturers do not exist in the study area. However, their products are being sold in the division. Secondary data confirms that EEE producers do not have manufacturing facilities in the division and therefore they are not registered with Chhattisgarh Pollution Control Board. Since these producers are responsible for their products under EPR, their detailed **inventory** as per schedule 1 of E-waste (Management & Handling) rules are given in Annexure 1.

Distributors / Traders / Retailers

EEE from these producers are sold in the study area through Distributor / Trader / Retail network as well as directly through the company. Items like Centralized Data Processing, Mainframes, Mini computers of Schedule 1 are used by large corporate, State and Central Government agencies falling under the category of bulk consumers whose profile is given below. **Inventory** of Distributors / Traders / Retailers selling items other than mentioned above in the study area is given in Annexure 2. However, retailers / dealers do not fall under the purview of E-waste (Management & Handling) Rules 2011, unless they serve as collection centre or drop off point.

<u>Consumers</u>

There are two types of consumers, which are found in the seven districts of study area; Individual Consumers & Bulk Consumers. **Inventory** of bulk consumers in the seven districts are given in Annexure 3.

Collection Centres / Channel

Tracer analysis indicates that EEE, which becomes E-waste in the study area partly gets collected & transported in the informal sector and partly in formal sector. Primary survey carried out through

Tracer technique indicates that bulk of E-waste generated in the study area goes to informal sector. Majority of the producer / manufacturer have established collection channel in the study area. These collection channels work through following mechanism.

- 1. Single point call centre
- 2. Distributors / Retailers
- 3. Service Centres
- 4. Physically established collection centre / drop off point

The producers use a combination of these mechanisms as given in Table 3.4.

Brands	Collection through Call Centre	Collection through Dealers / Retailer	Collection through Service Centre	Collection through Collection Centre / establishment	Remarks
LG	N		\checkmark	\checkmark	
Panasonic	\checkmark				
Samsung	\checkmark			\checkmark	Technician come to the site of E- waste discarded item, check the item and collect. (No compensate) provides certificate. (All the E-waste discarded item go to Haridwar, Rorkee) Attero Recycling Company.
Toshiba					Collection is carried out by a logistic service provider "M/s Kintetsu World Express Pvt. Ltd.", earlier "Gati"
Haier	\checkmark				
Kelvinator	V				Exchange your electronic item to your nearest dealer or where you buy the product
Electrolux	V				Exchange your electronic item to your nearest dealer or where you buy the product
Godrej	\checkmark				
Hitachi	V				Exchange offer contact to your dealer no collection center
BPL					Contact to your dealer where you buy the product
Akai					To the dealer he gives the cost of the product.
Sansui	V	\checkmark			E-waste Regarding no information Contact to nearest dealer
Philips	V				Call on customer care door to door collection of E-waste / discarded items of Philips
Whirlpool					To dealer he exchange your electronic item
			Printe	rs	
HP	\checkmark	\checkmark			Drop your items as dealer's drop off locations.

Table 3.4: Manufacturer's E-waste Collection Centre System in Bastar

Brands	Collection through Call Centre	Collection through Dealers / Retailer	Collection through Service Centre	Collection through Collection Centre / establishment	Remarks
Canon					
Brother					
TVSE	\checkmark				

Inventory of Service centres in the study area is given in Annexure 4. Inventory of Physically established collection centres is given in Annexure 5 **Table 3.4** indicates that majority of producers use call centre as well as dealer's network for collection of E-waste. There are two possibilities of onward transportation & disposal of E-waste. The first possibility is the disposal through informal sector & the second is through registered recycler. Since dealers are not covered under E-waste Rules, they are not legally bound to report.

<u>Informal Sector</u>

Tracer technique has been used in the Bastar division to fix E-waste trade value chain in the informal sector.

E-waste is collected & dismantled in informal sector in the study area. Further, its major fractions are transported outside the state mainly to Ghaziabad, Gwalior, Etawah & Delhi through informal sector traders. An inventory location of major scrap vendor / dismantler, temporary stockpile site / informal collection centre & landfill site is given in Annexure 6.

It has been found that Bastar Sukma, Patnapara, Aurabhata, Ward no 6, Ward no 5, Banglapura, Masjid pura, DNK Colony, Dharampura, Rautpura, Jagdevpur, Oeedam road, Jagdalpur, Motitalab, Dabrapara, Marketing society, Madhav waraKesh kai road, Sanjaypura, Jamkotipura, Bazarpura, Albeda, Pharas gaon and then transported to Ghaziabad, Gwalior, Etawah & Delhi. They used to come twice/thrice in a year. The motherboards and floppy drives are removed from the machines by scrap vendors and sold by weight and mobile phone sold as individual pieces to scrap dealers. None of these scrap vendors have the ability to identify the condition of these components. They are then typically sold - TV Circuit Rs. 20-50/kg & TV 250-300/Pcs.; Compressor Rs. 400-450/Pcs.; Copper Rs. 350-450/kg; Refrigerator Rs. 500-1200/Pcs.; Washing Machine Rs. 700-800/Pcs; CFL Rs. 300/kg and Mobile kit Rs. 30-50/Pcs.

- Electronic items goes to mechanic shops from households for repairing, and mechanic replaces damaged / defunct parts / components from it and then they sell it to scrap dealers.
- Mechanics sell E-waste to scrap dealer by weight / Pcs. mainly of ICT items (IT as per Schedule 1); TV circuit Rs. 15-45/kg; Compressor Rs. 300-400/Pcs.; Washing Machine Motor Rs. 200/Pcs.; Copper Rs. 200-350/kg; DVD Circuit Rs. 20-25/kg; Mobile kit Rs. 1000-2000/kg; SMPS Rs. 50/Pcs, Mother Board Rs. 90/Pcs.; Hard disk Rs. 120/Pcs.; CD Writer Rs. 35-40/Pcs.
- Small scrap vendors sell E-waste to big scrap dealer by weight / Pcs. TV Circuit Rs. 20-50/kg & TV 250-300/Pcs.; Compressor Rs. 400-450/Pcs.; Copper Rs. 350-450/kg; Refrigerator Rs. 500-1200/Pcs.; Washing Machine Rs. 700-800/Pcs; CFL Rs. 300/kg and Mobile kit Rs. 30-50/Pcs.
- Scrap dealers comes from Ghaziabad, Gwalior, Etawah & Delhi yearly twice / thrice for collection of E-waste.

- There is no organized mechanism for collection, transportation and disposal of E-Waste in Bastar division.
- No mechanism exists in the state to monitor and track its inventory, collection, transportation and disposal.

<u>Market Features</u>

E-waste Market concentration is mainly in Bastar district. This is due to higher penetration of EEE because of population concentration in this area. The EEE markets have been found to be small and price sensitive. Major brands, which have been observed, are Nokia, LG, Sony, Samsung, Panasonic, Philips, Videocon, Godrej, Onida, Whirlpool, Kelvinator, Haier, Hitachi, Voltas, Blue Star, Dell, HP, HCL and Lenovo. The new items after active life gets repaired and reused by the owner of the item. In case it becomes useless, it is left at repair centre, where it is cannibalized & finally its fractions are thrown in the dust bin.

Majority of material/ E-waste is transported to Ghaziabad, Gwalior, Etawah & Delhi with scattered temporary storage at different places of different towns.

Dump Sites (E-waste tracers)

Only Plastic and Glass parts of E-waste were found in Dump Site. Mixed waste was found in all dump sites. A summary of the process observed is shown in **Figure 3.5**.



Figure 3.5: Processes observed at dumpsite

Collection, Transportation & Processing (scrap dealers)

Small scrap dealer purchase waste from Household / Commercial Area / Institution, etc. At first stage, they segregate the waste than break the item and collect valuable items like Aluminum, Copper, Iron & Steel, Compressor, motor, etc. from E-waste. They sell their collected item to the large scrap dealer. They visit nearby area on daily/weekly basis and purchase the waste. These scrap dealers are not licensed by the municipalities but are part of the networks of large scrap dealers. Dismantling and segregation of E-waste occurs in a major way at large scrap dealers. A summary of the process observed is illustrated in **Figure 3.6**.



Figure 3.6: Processes observed at scrap dealers / junkyards

Repair Shops (AC/WM/REF)

One person repairs one of these items every day. E-waste fractions/ waste Parts, like plastic body of these items, etc. is dumped into community bin and valuable item sold to nearby scrap dealer. Some of the respondent informed that Item which is not in repairable condition is returned to the owner of the product who in turn sells to the scrap dealer. Majority of the product are in repairable condition. A summary of the process observed is shown in **Figure 3.7**.



Figure 3.7: Processes observed at AC, Washing Machine, and Refrigerator Repair Shop

<u>Repair Shops (TV / PC / Mobile Phone)</u>

Majority of mobile phones, TV & computers repair shop owners are local citizens. Waste Parts, like plastic body of these items, etc. are dumped into community bin and valuable item sold to nearby scrap dealer. They also store valuable item and use it to repair other EEE. Majority of the product are in repairable condition. A summary of the process observed is illustrated in **Figure 3.8**.



Figure 3.8: Processes observed at TV, Computer, and Mobile Phone Repair Shop

Summary E-Waste Process Study

There are various processes involved for recycling / reusing of electronic waste. The major process for different types of electronic items in Bastar, Bijapur, Dantewada, Kanker, Kondagaon, Narayanpur and Sukma are mentioned in **Table 3.5**.

Sr.	Drogoss name							
No.	Flocess name	Bastar	Bijapur	Dantewada	Kanker	Kondagaon	Narayanpur	Sukma
1	IC's Extraction from PCB	No	No	No	No	No	No	No
2	Surface Heating of PCB and Extraction of components	No	No	No	No	No	No	No
3	Dissembling of Monitor & TV and extraction of components	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4	Yoke core and Copper	No	No	No	No	No	No	No
5	Metallic Core of Transformer and Copper	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6	Rare Earth Core of Transformer and Copper	No	No	No	No	No	No	No
7	Rare Earth Core of Static Transformer	No	No	No	No	No	No	No
8	Wire PVC and Copper	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9	Plastic Shredder	No	No	No	No	No	No	No
10	Dismantling of Refrigerator and	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 3.5: Processes involved for E-waste recycling in different towns

Sr.	Drogoog namo			Process Sta				
No.	Process name	Bastar	Bijapur	Dantewada	Kanker	Kondagaon	Narayanpur	Sukma
	Compressor							
11	Gold Extractions from Pins and Comb	No	No	No	No	No	No	No
12	Acid Bath for PCB	No	No	No	No	No	No	No
13	Regunning CRT's	No	No	No	No	No	No	No
14	Glass Recovery from CRT	No	No	No	No	No	No	No
15	Gold Recovery	No	No	No	No	No	No	No

The process details of fifteen processes are given in **Table 3.5**. The analysis of this table shows that there is dismantling activity occurring in, Bastar, Bijapur, Dantewada, Kanker, Kondagaon, Narayanpur and Sukma. The entire amount of E-waste from these towns is transported to Ghaziabad, Gwalior, Etawah and Delhi for dismantling and further supply to Delhi market. Photo documentation captured in different towns of Bastar division is given in Annexure 8.

3.4 Conclusions

Major conclusions, which can be derived, include growing market of EEE in Bastar division. This growth may lead to increasing E-waste generation, which may further lead to higher pollution loads, health impacts and loss of recoverable items.

Chapter 4: Methodology for E-waste Inventory

4.0 Introduction

E-waste inventory forms the backbone of its E-waste management in a geographical area. There are, five methods, which have been used to determine E-waste inventory in both developed and developing countries. Each of these methods use "Material Flow" model. Therefore, the selection of E-waste inventory assessment methodology in seven districts of Chhattisgarh in Bastar division is based on the availability, reliability and analysis of data along the material flow chain within their geographical boundary. The following sections describe each of these methods, their application, constraints, advantages, data requirements and sources of data in the context of Chhattisgarh.

4.1 Methods for Inventory Assessment

Different methods of E-waste inventory assessment as per UNEP's Manual 1 on E-waste Inventory Assessment are given below.

- 1. The Time Step Method.
- 2. The Market Supply Method.
- 3. The Carnegie Mellon Method.
- 4. Approximation Method 1.
- 5. Approximation Method 2.

The data requirement for each methodology based on mathematical expressions is given in Annexure 9. The extent of data required depends on the extent of geographical boundary, which could be national, regional or city boundary. Conceptually, the source of data can be identified by understanding the "material flow chain" within the given geographical boundary.

The E-waste material flow chain in Chhattisgarh as described in **Figure 3.4** of Chapter 3 is again shown in **Figure 4.1** in the context of inventory assessment. **Figure 4.1** shows that in all the seven districts of the study area, the material flows from an organized / formal sector starting from production / manufacture till consumption phase, where major percentage of material enters into unorganized / informal sector. Therefore, the major constraints are related to availability, reliability, amount and range and completeness of the data along the chain.

Analysis of transfer of E-waste flow chain from formal to informal sector shows that the data for EEE in Chhattisgarh needs to be collected from secondary sources & primary survey. Therefore, E-waste inventory assessment in Chhattisgarh requires collection of available secondary data from the formal sector & its strengthening by primary survey in the informal sector followed by trend analysis.

4.2 Material Flow Chain, Data Sources and Data Gaps in Study Area

Figure 4.1 indicates that stakeholders existing in the study area are EEE retailers, consumers, service centres, E-waste collectors (to a limited extent) and two dismantlers in formal sector & other E-waste collectors (majority), & dismantlers in the informal sector in the study area. Therefore, secondary data related to stakeholders in the flow chain in the formal sector at temporal level was identified, collected and collated for quantification, while primary survey was carried out covering stakeholders in the informal sector in the study area. The detailed findings of the primary survey are given in Chapter 3.



Figure 4.1: E-waste material flow chain in Study Area

Major observations related to data availability are given below.

- Saturation Level National census data was obtained from office of the Registrar General & Census Operation, Govt. of India, National Sample Survey Organization (NSSO), Department of Statistics, Government of India, State Statistics from Department of Statistics, Government of Chhattisgarh, Telecom Regulatory Authority of India (TRAI), Ministry of Communications & Information Technology (MOCIT), Government of India, Industry Association like Manufacturers Association for Information Technology (MAIT), Electronic Industries Association of India (ELCINA), Telecom Equipment Manufacturers Association of India (TEMA) & Research Institutions e.g. National Council for Applied Economic Research (NCAER).
- 2. Number of Households Available with national census data (1991, 2001 & 2011).
- 3. Stock Data Stock levels at private/households, industry, commercial & sectors with Industry Association.
- 4. Data related to average life time, storage data, reuse, recycling & disposal at landfill site is not available from secondary sources & so primary survey was carried out in the study area.

Data Source/ Item	National/ Local Government Agencies	Industry/ Trade/ Recyclers/ Waste Disposal Operator's Association (Reports/ Published Data/ Field Work)	Market Research Agencies (Reports/ Published Data)
Saturation Level (Household & Industry)	National Census Data, (1991, 2001 & 2011)	Major Trading Agencies, (Retailers)	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
Number of Household	National Census Data, (1991, 2001 & 2011)		

Table 4.1: Tentative sources of data in Study Area

Data Source/ Item	National/ Local Government Agencies	Industry/ Trade/ Recyclers/ Waste Disposal Operator's Association (Reports/ Published Data/ Field Work)	Market Research Agencies (Reports/ Published Data)
Export Data	Not required		
Import Data	Not required		
Stock Data Private (Rural & Urban)	NSSO (1994 – 2010)	Industry Association, Scrap Dealers, Recyclers, EEE Retailers	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
Stock Data Industry	TRAI, MOCIT, Govt of India.	Industry Association, Scrap Dealers, Recyclers, EEE Retailers	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
Average Life Time, Technology Change	TRAI, MOCIT, Govt of India.	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications, Annual Reports of Major Brands
Storage Data		Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications, Newspapers
Reuse		Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications
Recycle		Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	
Disposal in Landfill	City Municipalities	Scrap Dealers, Recyclers, EEE Retailers	

A matrix describing inventory methodology versus data availability has been prepared after assessing the data obtained as per **Table 4.1** (based on data requirement methodology) and summarized in **Table 4.2**. The major inferences, which can be drawn from **Table 4.2** are given below.

Method ology/ Data Require ment	Saturation Level		Numbe	Calculated Sales			Stock Data		Avera	Store		Recycl	
	House hold	Industr y	r of Househ old	Export Data	Import Data	Manufac turing / Product ion	Priv ate	Indus try	ge Lifeti me	ge data	Reu se	e / disma ntling	Land fill
Time Step Method	Х		\checkmark	Х	Х		Х	Х					
Market				Х	Х								

Table 4.2: Data Matrix Vs Methodology

Method	Saturation Level		Numbe	Ca	Calculated Sales			Stock Data		Store		Recycl	
Data Require ment	House hold	Industr y	r of Househ old	Export Data	Import Data	Manufac turing / Product ion	Priv ate	Indus try	ge Lifeti me	ge data	Reu se	e / disma ntling	Land fill
Supply Method													
Carnegie Mellon Method				Х	Х				\checkmark	\checkmark		\checkmark	\checkmark
Approxim ation 1	Х	Х	\checkmark			\checkmark	Х	Х	\checkmark				
Approxim ation 2				Х	Х	\checkmark							

Note: √ means 'Available'/"Can be derived"; X means 'Not Available'; NV means 'No value'

Since E-waste market in Chhattisgarh is a continuously growing market, which has not reached saturation levels, therefore Time Step Method, Approximation 1 & Approximation 2 Method have not been used. Further, market supply method can be applied since it requires at least one set of data related to EEE penetration & one set of data after E-waste generation. Carnegie Mellon method appears to give better estimates than Market Supply Method since data related to reuse and storage can be estimated while assessing, average life time based on primary & secondary data analysis. Further, only E-waste fractions of no economic value have been found in landfill sites in the study area.

Some of the findings of the secondary & primary data survey, which have been observed, are given below. These findings have been used for carrying out inventory assessment of E-waste from items mentioned in Schedule 1 of E-waste rules 2011.

- 1. The office automation industry has undergone radical shift around 2006-07. The differentiation or gap between "Copier" and "Printer" segment of the Office Automation Industry had been bridged around the year 2006-07. The multi Functions Products (MFPs), which is Printer / Scanner / Fax / Copier, (including color MFPs) are the key drivers of this industry. Therefore, for E-waste inventory assessment, items Printers including cartridges, Copying Equipment, & Facsimile mentioned in Schedule 1 of E-waste rules, have been clubbed under one head of **"Printers including Cartridges"** for inventory assessment.
- 2. It is pertinent to state that Bharat Sanchar Nigam Limited is the only Telecom. Service Provider providing Telegraph Services to the citizens of the country across the length and breadth of the nation. As per BSNL there has been steep decline in the usage of Telegraph Services due to large scale penetration of Fixed Line Telephony, Mobile Services and Internet Services. SMS and E-mails have gained greater importance in Message Transmission over the years. Realizing the declining usage of Telegraph Services, the Establishment branch of BSNL Corporate Office defined Telegraph Services as diminishing services vide circular No. 19 1/2009/TE-II dated 19-02-2010. BSNL in order to keep pace with technological developments introduced Web Based Telegraph Messaging System in all circles by 31-03-2010. Further no Telex machines had been encountered at any of the scrap dealer in the study area.
- 3. Typewriter production stopped in India in 2010. Godrej & Boyce was the only typewriter producing company in the world. Although primary survey in the seven districts of the study area, indicated presence of mechanical typewriters in courts premises & few government offices. Further, primary survey at the scrap dealer also did not indicate any presence of electric or electronic typewriter coming into the dismantling or recycling chain.
- 4. NSSO data, Census data & data from research institution indicate temporal data compilation at national, state & district level for all types of TV (CRT, LCD & LED) clubbed together.

Therefore, all the three items under consumer Electrical & Electronics under schedule 1 of E-waste rules have been clubbed under the head TV for E-waste inventory assessment.

- 5. Temporal data from Census, NSSO, MOCIT, TRAI, TEMA market research institutions & telecom operators is classified under fixed line and cellular subscribers at national, state & district level. Further, cellular subscribers consist of GSM & WLL categories. Therefore, Pay telephones, Cordless telephones and Answering systems have been considered as sub-segments under fixed line subscriber segment since the consumers choice of instrument cannot be accomplished without subscription to a telephone connection. Therefore, E-waste inventory assessment has been carried out based on temporal fixed line and cellular telephone subscription at district level consisting of both rural & urban consumers.
- 6. Temporal data from Census, NSSO, MOCIT, MAIT market research institutions & telecom operators is classified under Desktop, PC, Notebooks & servers at national, state & district level. Further, Notebook consumers consist of netbooks & notepad computers, servers have also been considered consisting of mainframes & minicomputers subscribers consist of GSM & WLL categories. Therefore, E-waste inventory assessment has been carried out under the head of "computers".
- 7. Among the white goods both households and commercial segments drive the air conditioner market, while households drive the refrigerator, washing machine and TV market.

4.3 Methodology / Approach & Instruments Used

Carnegie Mellon method has been identified for E-waste inventory assessment in study area. Major data requirements in order to use this method are given below.

- 1. Information about stakeholders i.e. recycler / dismantler, scrap dealer, consumer etc.
- 2. Stock and generation of E-waste
- 3. Origin of new electrical and electronic equipment i.e. mode of procurement
- 4. Life time of electrical and electronic equipment
- 5. End of life management of electrical and electronic equipment
- 6. Process involved during dismantling
- 7. Final destination of E-waste fractions

In order to get the required data, two approaches have been adopted. These approaches are depicted in **Figure 4.2** and cover all the identified stakeholders in study area. Salient features of these approaches are given below.

Approach 1: Combination of primary and secondary data collection

Different types of data required has been identified collected, Collated & analyzed from the sources given in **Table 4.1**.

Approach 2: E-waste tracer tracking

In this approach, E-waste tracers are identified at dumpsites, which lead to identification of stakeholders further up on the upstream side of the material flow chain as given in **Figure 4.2**. These stakeholders include dismantlers, junkyard owners, repair shops and retail shops. Different processes carried out by stakeholders are identified, photo-documented and quantified. A list of dismantlers / recyclers, scrap dealers, trading agents, landfill sites and other agencies surveyed is given in chapter 3 and related Annexure 6.



Division

4.4 Conclusion

Data matrix versus methodology used for E-waste inventory assessment indicates "Market Supply" method and "Carnegie Mellon" method can be applied for E-waste inventory assessment in seven districts of Chhattisgarh in Bastar division. However, a combination of Carnegie Mellon method & tracer tracking has been selected for inventory assessment since it covers all the aspects of material flow chain. Assessment of data from these stakeholders through tracer tracking has resulted in assessment of obsolescence rate or average life of equipment described in chapter 5.

Chapter 5: E-Waste Inventory Assessment

5.1 Introduction

This chapter describes the E-waste inventory and market scenario for the E-waste management system in Bastar division. Since E-waste inventory forms the basis of planning for E-waste management system, an effort has been made to assess the E- waste inventory and market potential in the country. Following sections describe each of these items followed by pollution potential and risk profiling.

5.2 Market Size Assessment of Electrical and Electronic Equipment (EEE) in Bastar Division

The time series data related to market size of each of the EEE items has been computed from data obtained from different agencies as well as from trend analysis. This data was compiled from data sources described in chapter 4. The EEE market size for Air Conditioners, refrigerator, washing machine, personal computers, cellular telephones, TVs and other items as per schedule 1 is shown in **Table 5.1** to **Table 5.8**.

Year	Bastar	Bijapur	Dantewada	Kanker	Kondagaon	Narayanpur	Sukma
2006	2547	851	870	2291	1755	457	835
2007	15419	5049	5259	13819	10615	2722	4952
2008	23021	7384	7842	20566	15835	3996	7242
2009	30291	9518	10305	26986	20824	5172	9333
2010	36053	11097	12251	32045	24780	6055	10879
2011	39240	12003	13332	35222	27222	6576	11765
2012	43195	13089	14658	38730	29982	7231	12822
2013	46843	14062	15877	41981	32543	7834	13766
2014	50269	14948	17019	45059	34968	8397	14625
2015	53532	15767	18104	48025	37301	8933	15417
2016	56673	16534	19145	50925	39574	9446	16157
2017	59722	17258	20154	53794	41811	9942	16855
2018	62704	17946	21138	56662	44033	10426	17517
2019	65637	18606	22104	59556	46256	10900	18149
2020	68535	19240	23057	62500	48495	11367	18757

Table 5.1: Installed base for Cellular Telephone in Study Area (in numbers)

Source: Census 1991, 2001 & 2011, Telecom Regulatory Authority of India (TRAI)

Table 5.2: Installed base for Fixed Line Telephone in Study Area (in numbers)

Year	Bastar	Bijapur	Dantewada	Kanker	Kondagaon	Narayanpur	Sukma
2006	10888	3639	3718	9794	7503	1954	3570
2007	9103	2981	3105	8159	6267	1607	2924
2008	10473	3359	3567	9356	7203	1818	3294
2009	9507	2987	3234	8470	6536	1623	2929
2010	8670	2669	2946	7707	5959	1456	2616
2011	8446	2583	2869	7581	5859	1415	2532
2012	8105	2456	2751	7267	5626	1357	2406

Year	Bastar	Bijapur	Dantewada	Kanker	Kondagaon	Narayanpur	Sukma
2013	7779	2335	2637	6972	5404	1301	2286
2014	7466	2220	2528	6692	5194	1247	2172
2015	7166	2111	2423	6429	4993	1196	2064
2016	6878	2007	2324	6180	4803	1146	1961
2017	6602	1908	2228	5947	4622	1099	1863
2018	6337	1814	2136	5727	4450	1054	1770
2019	6083	1724	2049	5520	4287	1010	1682
2020	5840	1639	1965	5326	4132	969	1598

Source: Census 1991, 2001 & 2011, Telecom Regulatory Authority of India (TRAI)

Table 5.3: Installed base for Computers in Study Area (in numbers)

Year	Bastar	Bijapur	Dantewada	Kanker	Kondagaon	Narayanpur	Sukma
2006	1169	248	482	692	363	100	175
2007	1882	399	776	1114	585	161	282
2008	3162	670	1304	1872	982	270	474
2009	5407	1146	2229	3201	1680	462	811
2010	8733	1851	3600	5170	2713	746	1310
2011	13798	2924	5688	8168	4286	1178	2070
2012	21939	4649	9044	12987	6815	1873	3291
2013	35760	7578	14742	21169	11108	3053	5365
2014	57080	11983	23312	33475	17565	4827	8484
2015	91992	19262	37473	53809	28235	7759	13637
2016	148257	30962	60236	86496	45386	12472	21921
2017	238937	49771	96827	139038	72956	20048	35236
2018	385080	80004	155644	223497	117274	32227	56641
2019	620609	128603	250191	359261	188513	51803	91047
2020	1000196	206723	402170	577495	303025	83270	146354

Source: Census 1991, 2001 & 2011, MAIT, NSSO

Table 5.4: Installed base for Printers in Study Area (in numbers)

Year	Bastar	Bijapur	Dantewada	Kanker	Kondagaon	Narayanpur	Sukma
2006	175	37	72	104	54	15	26
2007	282	60	116	145	76	21	37
2008	474	101	196	356	187	51	90
2009	811	172	334	768	403	111	195
2010	1310	278	540	931	488	134	236
2011	2070	439	853	1225	643	177	311
2012	3291	697	1357	1818	954	262	461
2013	5364	1137	2211	2036	1069	294	516
2014	8562	1797	3497	2281	1197	329	578
2015	13799	2889	5621	2554	1340	368	647
2016	22239	4644	9035	2861	1501	413	725
2017	35841	7466	14524	3204	1681	462	812
2018	57762	12001	23347	33525	17591	4834	8496
2019	93091	19290	37529	53889	28277	7770	13657
2020	150029	31008	60326	86624	45454	12491	21953

Source: Census 1991, 2001 & 2011, MAIT, NSSO

Year	Bastar	Bijapur	Dantewada	Kanker	Kondagaon	Narayanpur	Sukma
2006	36804	10972	14338	27858	21523	6381	10700
2007	39248	11503	15200	30137	23278	6703	11217
2008	41769	12033	16087	32519	25109	7026	11732
2009	44371	12561	16998	35011	27019	7351	12246
2010	46126	13087	17569	37531	28891	7678	12757
2011	48846	13735	18515	40263	30965	8099	13384
2012	51651	14394	19487	43130	33133	8534	14021
2013	54543	15064	20486	46143	35399	8981	14669
2014	57525	15746	21513	49314	37770	9441	15327
2015	60599	16439	22569	52655	40251	9915	15996
2016	63767	17145	23654	56180	42850	10402	16676
2017	67031	17863	24769	59903	45573	10904	17367
2018	68630	18053	25383	62238	47150	11119	17541
2019	73862	19335	27092	68012	51424	11951	18783
2020	77433	20090	28302	72436	54570	12498	19508

Table 5.5: Installed base for TV in Study Area (in numbers)

Source: Census 1991, 2001 & 2011, ELCINA, NSSO

Table 5.6: Installed base for AC in Study Area (in numbers)

Year	Bastar	Bijapur	Dantewada	Kanker	Kondagaon	Narayanpur	Sukma
2006	214	51	105	99	78	40	54
2007	231	54	114	113	89	43	58
2008	250	57	122	129	100	46	61
2009	268	60	131	147	112	48	64
2010	278	63	136	166	125	51	67
2011	298	66	146	189	140	54	71
2012	319	69	155	213	156	57	74
2013	341	73	166	241	174	60	78
2014	364	76	177	272	193	64	81
2015	388	79	188	306	215	67	85
2016	412	83	200	345	238	70	88
2017	438	87	212	388	264	74	92
2018	465	90	224	435	292	77	96
2019	494	94	238	489	323	81	100
2020	523	98	252	548	356	85	103

Source: Census 1991, 2001 & 2011, ELCINA, NSSO

Table 5.7: Installed base for Washing Machine in Study Area (in numbers)

Year	Bastar	Bijapur	Dantewada	Kanker	Kondagaon	Narayanpur	Sukma
2006	284	77	123	88	139	48	75
2007	307	82	133	101	153	52	79
2008	331	86	144	116	168	55	83
2009	355	90	155	133	183	58	87
2010	370	94	161	151	199	61	91
2011	394	99	171	172	216	64	95
2012	418	103	182	195	234	68	99
2013	442	107	192	220	254	71	103
2014	467	111	203	247	274	74	107
2015	492	115	214	277	296	78	111
2016	517	119	225	310	319	81	115

Year	Bastar	Bijapur	Dantewada	Kanker	Kondagaon	Narayanpur	Sukma
2017	542	123	236	347	344	84	118
2018	568	126	247	387	370	87	122
2019	594	130	259	430	398	91	125
2020	620	133	270	478	428	94	128
C C	1001 2001 -2- 20	11 ELCINIAN	0.021				

Source: Census 1991, 2001 & 2011, ELCINA, NSSO

Table 5.8: Installed base for Refrigerator in Study Area (in numbers)

Year	Bastar	Bijapur	Dantewada	Kanker	Kondagaon	Narayanpur	Sukma
2006	469	120	217	168	203	79	117
2007	525	131	243	201	231	87	128
2008	584	142	271	239	263	96	138
2009	647	153	301	283	298	104	149
2010	692	165	323	334	337	114	160
2011	761	177	355	393	381	123	172
2012	834	190	391	460	430	134	185
2013	912	203	428	537	485	145	197
2014	995	217	468	625	546	156	210
2015	1083	231	510	726	614	168	224
2016	1177	245	555	841	691	180	237
2017	1276	260	603	973	777	193	251
2018	1382	275	654	1123	873	206	266
2019	1494	291	708	1294	980	220	281
2020	1613	307	766	1488	1100	235	296

Source: Census 1991, 2001 & 2011, ELCINA, NSSO

Analysis of **Table 5.1** to **Table 5.8** shows that cell phone have the highest installed base followed by Computers, TV, printers, fixed line telephone, refrigerators, washing machines and Air Conditioners. In Bastar cellular phone, fixed line phone, TV, Air condition, washing machine and refrigerator has the highest installed base followed by Bastar, Bijapur, Dantewada, Kanker, Kondagoan, Narayanpur and Sukma districts of Bastar division.

5.3 **Obsolescence Rate / Average Life**

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Obsolescence rate / Average life for electrical and electronic equipment (EEE) has been calculated based on results of the sampling carried out for consumers, dismantlers, retailers and dumpsites along the E-waste "trade value chain" described in chapter 3 & chapter 4 and summarized in Table **5.9.** The storage time takes into account storage at owner's premises, collection agency (scrap dealer) & dismantler's premises.

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	Table 5.9: Average Life and Storage of	E-waste
EEE Item	Average Life & Reuse (Years)	Storage (Years)
Cellular Phone	3	0.5 - 1
Computer	7	0.5 - 1
Printer	5	0.5 - 1.0
Washing Machine	12	0.5 - 12
TV	10	1
Refrigerator	12	0.5 - 1
Air Conditioners	12	1 - 2
Fixed Line Telephone	5	0.5 - 1

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A conservative estimate of the average life of each EEE item has been prepared by considering

highest values of average life and storage time considering the consumer behavior in seven districts. This estimate has been summarized in **Table 5.10**.

	Table 5.10. Obsolescence Rate of Tracer EEE					
Sr. No.	EEE	Average Life (Years)				
1	Cellular Phone	3				
2	Computer	7				
3	Printer	5				
4	Washing Machine	12				
5	TV	10				
6	Refrigerator	12				
7	Air Conditioner	12				
8	Fixed Line Telephone	5				

Table 5.10:	Obsolescence	Rate o	of Tracer	EEE
1 and 5.10.	Obsolescence	man	JI I I acci	

The average weights of each of the six items considered for computing E-waste inventory is given in **Table 5.11**.

	Table 5.11. Average weight of LLL
Item	Average Weight (Kg)
Cellular Phone	0.100
Computer / Laptop / Server	27.2 / 2.5 to 3 / 650
Printer (MFP)	6.5 – 7
Washing Machine	55
TV (CRT) / LCD / LED	31.6 (CRT) / 12 – 15 (LCD / LED)
Refrigerator	35
Air Conditioner	55
Fixed Line Telephone	0.5 - 1.5

Table 5.11: Average	weight of EEE
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5.4 Weee/E-Waste Inventory

The projected district wise E-waste inventory estimates both in numbers and weights for Bastar division starting from 2011 till 2020 have been described in **Table 5.12** to **Table 5.26** and presented in **Figure 5.1** to **Figure 5.7**.

			_	
Table 5 12. E-waste	Inventory	of Bastar	District	(in numbers)
	Inventory.	or Duotar	Distillet	(III IIuiiiocio)

		Fixed			Washin			
	Cellular	Line Telephon	Compute		g Machin		Refrigerat	Air Condition
Year	Phone	e	r	Printer	e	TV	or	er
2011	23021	10888	527	175	80	25666	120	130
2012	30291	9103	785	282	145	27756	198	133
2013	36053	10473	1169	474	168	29913	237	147
2014	39240	9507	1882	811	191	32138	278	162
2015	43195	8670	3162	1310	214	34435	322	177
2016	46843	8446	5407	2070	237	36804	368	182
2017	50269	8105	8733	3291	260	39248	417	198
2018	53532	7779	13798	5364	284	41769	469	214
2019	56673	7466	21939	8562	307	44371	525	231
2020	59722	7166	35760	13799	331	46126	584	250

		Fixed		-	Washin	, i	,	
	Cellular	Telephon	Compute		g Machin		Refrigerat	Air Condition
Year	Phone	e	r	Printer	e	TV	or	er
2011	3.45	10.89	11.03	1.23	4.43	793.46	4.21	7.15
2012	4.54	9.10	16.43	1.98	8.00	858.09	6.93	7.30
2013	5.41	10.47	24.48	3.32	9.25	924.76	8.30	8.08
2014	5.89	9.51	39.41	5.68	10.51	993.56	9.74	8.90
2015	6.48	8.67	66.21	9.17	11.77	1064.54	11.26	9.74
2016	7.03	8.45	113.22	14.49	13.04	1137.79	12.88	9.99
2017	7.54	8.11	182.85	23.04	14.31	1213.35	14.60	10.87
2018	8.03	7.78	288.90	37.55	15.60	1291.30	16.43	11.78
2019	8.50	7.47	459.34	59.93	16.90	1371.72	18.37	12.73
2020	8.96	7.17	748.73	96.59	18.22	1425.99	20.44	13.72





Figure 5.1: Item wise E-waste Projection of Bastar District

		Fixed			Washin			
	Cellular	Line Telephon	Compute		g Machin		Refrigerat	Air Condition
Year	Phone	e	r	Printer	e	TV	or	er
2011	7384	3639	117	37	21	8289	31	34
2012	9518	2981	166	60	45	8829	59	35
2013	11097	3359	248	101	51	9368	69	38
2014	12003	2987	399	172	57	9904	79	41
2015	13089	2669	670	278	62	10439	89	44
2016	14062	2583	1146	439	67	10972	99	45
2017	14948	2456	1851	697	72	11503	109	48
2018	15767	2335	2924	1137	77	12033	120	51
2019	16534	2220	4649	1797	82	12561	131	54
2020	17258	2111	7578	2889	86	13087	142	57

Table 5.14: E-waste	Inventory of B	iiapur District	(in numbers)
	my childry of D	Inapar District	(III IIuiiiocio)

				2	, 1	,	,	
		Fixed			Washin			
		Line			g			Air
	Cellular	Telephon	Compute		Machin		Refrigerat	Condition
Year	Phone	e	r	Printer	e	TV	or	er
2011	1.11	3.64	2.45	0.26	1.14	256.25	1.09	1.87
2012	1.43	2.98	3.48	0.42	2.47	272.95	2.06	1.95
2013	1.66	3.36	5.19	0.70	2.80	289.60	2.40	2.11
2014	1.80	2.99	8.35	1.20	3.12	306.19	2.75	2.28
2015	1.96	2.67	14.03	1.94	3.41	322.72	3.10	2.45
2016	2.11	2.58	23.99	3.07	3.70	339.20	3.46	2.46
2017	2.24	2.46	38.75	4.88	3.97	355.63	3.82	2.62
2018	2.37	2.34	61.22	7.96	4.23	372.00	4.19	2.79
2019	2.48	2.22	97.34	12.58	4.48	388.32	4.57	2.95
2020	2.59	2.11	158.67	20.22	4.72	404.59	4.96	3.12





Figure 5.2: Item wise E-waste Projection of Bijapur District

Year	Cellular Phone	Fixed Line Telephon e	Compute r	Printer	Washin g Machin e	TV	Refrigerat or	Air Condition er
2011	7842	3718	228	72	43	10359	64	69
2012	10305	3105	323	116	63	11113	90	66
2013	12251	3567	482	196	73	11887	108	73
2014	13332	3234	776	334	83	12682	127	80
2015	14658	2946	1304	540	93	13499	147	88
2016	15877	2869	2229	853	103	14338	169	90
2017	17019	2751	3600	1357	113	15200	192	97
2018	18104	2637	5688	2211	123	16087	217	105
2019	19145	2528	9044	3497	133	16998	243	114
2020	20154	2423	14742	5621	144	17569	271	122

Year	Cellular Phone	Fixed Line Telephon e	Compute r	Printer	Washin g Machin e	TV	Refrigerat or	Air Condition er
2011	1.18	3.72	4.77	0.51	2.37	320.24	2.26	3.79
2012	1.55	3.10	6.77	0.81	3.48	343.55	3.15	3.64
2013	1.84	3.57	10.09	1.37	4.02	367.48	3.77	4.02
2014	2.00	3.23	16.25	2.34	4.56	392.06	4.44	4.41
2015	2.20	2.95	27.29	3.78	5.11	417.31	5.15	4.83
2016	2.38	2.87	46.67	5.97	5.66	443.26	5.91	4.93
2017	2.55	2.75	75.38	9.50	6.21	469.92	6.72	5.35
2018	2.72	2.64	119.09	15.48	6.77	497.32	7.58	5.79
2019	2.87	2.53	189.36	24.48	7.34	525.48	8.50	6.25
2020	3.02	2.42	308.65	39.35	7.92	543.14	9.48	6.73





Figure 5.3: Item wise E-waste Projection of Dantewada District

		Fixed			Washin			
	Callular	Line	Compute		g Maahin		Defricent	Air Condition
Year	Phone	e	r	Printer	e	TV	or	er
2011	20566	9794	327	104	25	17804	38	45
2012	26986	8159	464	145	31	19653	47	44
2013	32045	9356	692	356	38	21578	60	51
2014	35222	8470	1114	768	46	23584	76	60
2015	38730	7707	1872	931	55	25676	94	69
2016	41981	7581	3201	1225	64	27858	115	75
2017	45059	7267	5170	1818	75	30137	139	86
2018	48025	6972	8168	2036	88	32519	168	99
2019	50925	6692	12987	2281	101	35011	201	113
2020	53794	6429	21169	2554	116	37531	239	129

Table 5.18: E-waste Inventory of Kanker District (in numbers)

Year	Cellular Phone	Fixed Line Telephon e	Compute	Printer	Washin g Machin	TV	Refrigerat	Air Condition er
2011	3.08	9.79	6.85	0.73	1.40	550.40	1.33	2.46
2012	4.05	8.16	9.73	1.01	1.70	607.57	1.64	2.42
2013	4.81	9.36	14.49	2.49	2.09	667.09	2.11	2.83
2014	5.28	8.47	23.33	5.38	2.52	729.11	2.65	3.29
2015	5.81	7.71	39.19	6.51	3.00	793.77	3.28	3.80
2016	6.30	7.58	67.02	8.58	3.54	861.23	4.02	4.14
2017	6.76	7.27	108.24	12.73	4.14	931.69	4.88	4.76
2018	7.20	6.97	171.02	14.25	4.82	1005.32	5.88	5.45
2019	7.64	6.69	271.92	15.97	5.56	1082.37	7.03	6.22
2020	8.07	6.43	443.23	17.88	6.39	1160.29	8.37	7.09





Figure 5.4: Item wise E-waste Projection of Kanker District

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			Fixed Line			Washin g			Air
		Cellular	Telephon	Compute		Machin		Refrigerat	Condition
	Year	Phone	e	r	Printer	e	TV	or	er
	2011	15835	7503	172	54	21	13759	31	36
	2012	20824	6267	244	76	65	15187	79	37
	2013	24780	7203	363	187	77	16674	95	43
	2014	27222	6536	585	403	88	18224	113	49
	2015	29982	5959	982	488	100	19839	133	57
	2016	32543	5859	1680	643	113	21523	154	61
	2017	34968	5626	2713	954	126	23278	177	69
	2018	37301	5404	4286	1069	139	25109	203	78
	2019	39574	5194	6815	1197	153	27019	231	89
	2020	41811	4993	11108	1340	168	28891	263	100

Table 5.20: E-waste	Inventory	of Kondagaon	District ((in numbers)
	In chicory	or monengaon	Diotifet	III IIGIIIO CIO

	Cellular	Fixed Line Telephon	Compute		Washin g Machin		Refrigerat	Air Condition
Year	Phone	e	r	Printer	e	TV	or	er
2011	2.38	7.50	3.59	0.38	1.15	425.36	1.09	1.95
2012	3.12	6.27	5.10	0.53	3.58	469.50	2.76	2.02
2013	3.72	7.20	7.60	1.31	4.21	515.48	3.34	2.35
2014	4.08	6.54	12.24	2.82	4.86	563.39	3.96	2.71
2015	4.50	5.96	20.57	3.42	5.52	613.32	4.64	3.11
2016	4.88	5.86	35.17	4.50	6.20	665.37	5.38	3.35
2017	5.25	5.63	56.80	6.68	6.90	719.64	6.19	3.81
2018	5.60	5.40	89.74	7.48	7.64	776.24	7.09	4.32
2019	5.94	5.19	142.68	8.38	8.41	835.30	8.09	4.87
2020	6.27	4.99	232.57	9.38	9.22	893.15	9.20	5.48





Figure 5.5: Item wise E-waste Projection of Kondagaon District

Year	Cellular Phone	Fixed Line Telephon e	Compute r	Printer	Washin g Machin e	TV	Refrigerat	Air Condition er
2011	3996	1954	47	15	14	4786	21	23
2012	5172	1607	67	21	27	5103	37	25
2013	6055	1818	100	51	31	5421	43	28
2014	6576	1623	161	111	35	5740	50	30
2015	7231	1456	270	134	38	6059	57	33
2016	7834	1415	462	177	42	6381	64	35
2017	8397	1357	746	262	45	6703	71	38
2018	8933	1301	1178	294	48	7026	79	40
2019	9446	1247	1873	329	52	7351	87	43
2020	9942	1196	3053	368	55	7678	96	46

Table 5.22: E-waste Inventory of Narayanpur District (in numbers)

Year	Cellular Phone	Fixed Line Telephon e	Compute r	Printer	Washin g Machin e	TV	Refrigerat or	Air Condition er
2011	0.60	1.95	0.99	0.10	0.78	147.97	0.74	1.27
2012	0.78	1.61	1.40	0.15	1.49	157.76	1.28	1.40
2013	0.91	1.82	2.09	0.36	1.70	167.58	1.51	1.53
2014	0.99	1.62	3.36	0.78	1.90	177.44	1.75	1.66
2015	1.08	1.46	5.65	0.94	2.10	187.33	1.99	1.79
2016	1.18	1.42	9.67	1.24	2.29	197.26	2.24	1.93
2017	1.26	1.36	15.61	1.84	2.48	207.22	2.50	2.07
2018	1.34	1.30	24.66	2.06	2.66	217.22	2.77	2.21
2019	1.42	1.25	39.22	2.30	2.84	227.27	3.05	2.36
2020	1.49	1.20	63.92	2.58	3.01	237.35	3.35	2.51

Table 5.23: E-waste Inventory of Narayanpur District (in Tons)



Figure 5.6: Item wise E-waste Projection of Narayanpur District

		Fixed			Washin			
	Cellular	Line Telephon	Compute		g Machin		Refrigerat	Air Condition
Year	Phone	e	r	Printer	e	TV	or	er
2011	7242	3570	83	26	20	8084	30	33
2012	9333	2924	118	37	44	8611	58	36
2013	10879	3294	175	90	49	9136	68	39
2014	11765	2929	282	195	55	9659	77	42
2015	12822	2616	474	236	60	10180	87	45
2016	13766	2532	811	311	65	10700	97	48
2017	14625	2406	1310	461	70	11217	107	51
2018	15417	2286	2070	516	75	11732	117	54
2019	16157	2172	3291	578	79	12246	128	58
2020	16855	2064	5365	647	83	12757	138	61

Table 5.24: E-waste Inventory of Sukma District (in numbers)

Year	Cellular Phone	Fixed Line Telephon e	Compute r	Printer	Washin g Machin e	TV	Refrigerat or	Air Condition er
2011	1.09	3.57	1.74	0.18	1.10	249.91	1.05	1.80
2012	1.40	2.92	2.46	0.26	2.40	266.21	2.03	1.98
2013	1.63	3.29	3.67	0.63	2.72	282.44	2.37	2.15
2014	1.76	2.93	5.91	1.36	3.02	298.62	2.71	2.31
2015	1.92	2.62	9.93	1.65	3.31	314.73	3.05	2.48
2016	2.06	2.53	16.99	2.17	3.59	330.78	3.40	2.65
2017	2.19	2.41	27.43	3.23	3.85	346.77	3.75	2.82
2018	2.31	2.29	43.34	3.61	4.10	362.70	4.11	2.99
2019	2.42	2.17	68.91	4.05	4.34	378.58	4.47	3.17
2020	2.53	2.06	112.33	4.53	4.57	394.39	4.84	3.34





Figure 5.7: Item wise E-waste Projection of Sukma District

Year	Bastar	Bijapur	Dantewada	Kanker	Kondagaon	Narayanpur	Sukma
2006	469	120	217	168	203	79	117
2007	525	131	243	201	231	87	128
2008	584	142	271	239	263	96	138
2009	647	153	301	283	298	104	149
2010	692	165	323	334	337	114	160
2011	761	177	355	393	381	123	172
2012	834	190	391	460	430	134	185
2013	912	203	428	537	485	145	197
2014	995	217	468	625	546	156	210
2015	1083	231	510	726	614	168	224
2016	1177	245	555	841	691	180	237
2017	1276	260	603	973	777	193	251
2018	1382	275	654	1123	873	206	266
2019	1494	291	708	1294	980	220	281
2020	1613	307	766	1488	1100	235	296

Table 5.26: All E-waste Items Inventory of Bastar Division (in Tons)



Figure 5.8: District wise Total E-waste Inventory Projection



Figure 5.9: Total E-waste Inventory Projection in Bastar Division from 2011 to 2020

The results of E-waste inventory estimates in (Tons) for Bastar division is given in **Table 5.26**. Major inferences, which can be drawn from E-waste inventory results, are given below.

1. Inventory estimates in Bastar division indicate that E-waste generation ranges from **2876.78** tons in 2011 to **7533.54** tons in 2020.

- In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes (91%) of the total inventory followed by Computer (4%), Washing machine (1%), Air conditioner (1%), Refregirator (1%), Printer (1%), Cellular phone (0%) & Fixed Line Phone (1%)
- 3. In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (67%), Computer will constitute about (27%) of the total inventory followed by Printer (3%), Refrigerator (1%), Air conditioner (1%), Washing machine (1%), Cellular phone (0%) & Fixed Line Phone (0%).



Figure 5.10: Item-wise E-waste in Percent for Bastar Division in 2015



Figure 5.11: Item-wise E-waste in Percent for Bastar Division in 2020

5.5 E-waste Processing in Bastar Division

There are various processes involved for dismantling, recycling / reuse of E-waste in Bastar division. These processes for different types of electronic items are given in **Table 5.27**. The photodocumentation of some of these processes observed. An analysis of the different processes observed to recover metals indicates that no chemical process is occurring in study area. Only physical processes, which prepare raw material for recycling industry is observed in the study area. Iron recovered from E-waste is recycled through induction arc furnace route in the study area.

Sr.	Process			Process St	atus	0		
No.	name	Bastar	Bijapur	Dantewada	Kanker	Kondagaon	Narayanpur	Sukma
1	IC's Extraction from PCB	No	No	No	No	No	No	No
2	Surface Heating of PCB and Extraction of components	No	No	No	No	No	No	No
3	Dissembling of Monitor & TV and extraction of components	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4	Yoke core and Copper	No	No	No	No	No	No	No
5	Metallic Core of Transformer and Copper	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6	Rare Earth Core of Transformer and Copper	No	No	No	No	No	No	No
7	Rare Earth Core of Static Transformer	No	No	No	No	No	No	No
8	Wire PVC and Copper	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9	Plastic Shredder	No	No	No	No	No	No	No
10	Dismantling of Refrigerator and Compressor	Yes	Yes	Yes	Yes	Yes	Yes	Yes
11	Gold Extractions from Pins and Comb	No	No	No	No	No	No	No

Table 5.27: E-waste dismantling process occurring in the study area

Sr.	Process			Process St	tatus			
No.	name	Bastar	Bijapur	Dantewada	Kanker	Kondagaon	Narayanpur	Sukma
12	Acid Bath for PCB	No	No	No	No	No	No	No
13	Regunning CRT's	No	No	No	No	No	No	No
14	Glass Recovery from CRT	No	No	No	No	No	No	No
15	Gold Recovery	No	No	No	No	No	No	No

Trade Economics

Trade economics has been studied in terms of various processes, which occur along the trade value chain. Each stakeholder in the processes studied is linked to the other and the trade between the two takes place based on value added. The fundamental parameters governing this trade are same as that of any other trade. These parameters are described below.

- 1. Input cost
- 2. Operating Margin
- 3. Selling price

Input costs have been classified into the following costs.

- 1. Raw material cost
- 2. Labour cost

Selling price is the price at which the products are sold. The difference between the selling price and the input costs gives the operating margin. Operating margin is an indicator of the profit and has been computed in terms of operating margin per kg of raw material.

The entire trade economics of each of the processes is summarized in **Table 5.28**. **Table 5.28** does not include capital, depreciation, taxation and transportation cost. Labour refers to workers involved in e-waste extraction industry only and only 300 working days in a year.

	1 and c		contonnico or Duor		able maniet	
Item	Rate /	Input Cost	Labour Cost per	Output Price	Profitability	%
	piece	per Kg.	Kg.	per Kg.		
TV	600	20.00	0.39	20.83	0.44	2.18
Ref	1000	22.22	0.39	34.07	11.46	50.69
WM	750	18.75	0.39	32.17	13.03	68.06
AC	3000	54.55	0.39	73.33	18.40	33.49
PC	1100	35.48	0.39	42.85	6.98	19.45
Mobile	38	38.00	0.39	62.59	24.20	63.04

Table 5.28: Trade economics of Bastar Division E-waste market

Some major observations from Table 5.28 are as follows:

- 1. Operating margin for Television waste per kilogram is Rs. 0.44
- 2. Operating margin for waste refrigerator is Rs. 11.46 per kilogram
- 3. For that of Washing Machine is Rs. 13.03 per kilogram
- 4. For that of Air Conditioners is Rs. 18.40 per kilogram
- 5. For scrap old Personal Computer is Rs. 6.98 per kg and

- 6. For waste cellular phones is Rs. 24.20 per kg
- 7. The operating margin ranges from Rs. 0.44 to Rs. 24.20 per kilogram. Scrap of Mobile / cellular phones gives the maximum operating margin of Rs. 24.20 while scrap from television gives the minimum profit of Rs. 0.44 per kilogram. This indicates that informal sector if brought into formal sector considering taxation involved will only dismantle / recycle cellular phones followed by ACs and WMs to some extent. Therefore, there is a need to formulate financial instrument for making dismantling / recycling of white goods viable.

5.6 Market Risks

Market risks based on the assessment of demand, supply, collection and transportation primarily address availability (quantity) of raw material as E-waste. These risks have been assessed and described below based on duration (short term, long term) along with their intensities.

- 1. Risks of availability of raw material (E-waste)
- 2. Risk associated with collection
- 3. Risk associated with transportation

Risk profiling giving the intensities as part of market assessment has been highlighted in Table 5.29 given below.

Table 5.29: Market Risk Matrix											
Risks/ intensities		High	Medium	Low							
Risks of availability	Short term		\checkmark								
of raw material	Long term		\checkmark								
Risk associated with	Short term	\checkmark									
collection	Long term		\checkmark								
Risk associated with	Short term										
transportation	Long term										
	Long term		\checkmark								

The intensities have been fixed as per following analysis.

- 1. Risks of availability of raw material has been assessed as medium since enough Ewaste potential exists in Bastar division to be processed both in the short term and long term especially after 2014. This will depend on the implementation of regulatory regime, which will enable the E-waste generators to send the waste to dismantling / recycling facility.
- 2. Risk associated with collection is expected to be high in the short term as there is no formal collection mechanism in place in the study area. In this situation, the recycling facility will face the risk of collecting E-waste from the source, which could be geographically dispersed. In the long term this risks expected to be medium as collection and transportation mechanism is expected to be institutionalized. In the short term, the recycling facility is expected to be making their own arrangements for collection from vendors.
- 3 Risk associated with transportation is expected to be low in both short and long term as there is transportation mechanism in place both at the local and national level to carry hazardous waste. Since some E-waste is already being transported outside study area, therefore transportation risk is expected to be of low intensity

5.7 Conclusions

Market risks matrix highlight the availability of raw material, its collection and transportation as

risks of high & medium intensities. Collection mechanism directly impacts the availability of raw material. Therefore, there is a need for both strict implementations of regulations as well as financial instrument for diverting E-waste inventory in to the formal sector.

Chapter 6: Conclusions & Recommendations

Major conclusions & recommendations, which have been arrived after assessment of E-waste regulations, E-waste material flow chain and inventory estimates are given below.

- Implementation of E-waste regulation is a major challenge
- There is no organized mechanism for collection, transportation and disposal of E-Waste in Bastar division.
- No mechanism exists in the state to monitor and track its inventory, collection, transportation and disposal.
- Currently, a majority of producers use call centre as well as dealer's network for collection of E-waste.
- Electronic items go to mechanic shops from households for repairing, and mechanic replace damaged / defunct parts/components from it and then they sold it to scrap dealers.
- Major conclusions, which can be derived, include growing market of EEE in Bastar division. This growth may lead to increasing E-waste generation, which may further lead to higher pollution loads, health impacts and loss of recoverable items.
- Mechanics sell E-waste to scrap dealer by weight / Pcs. mainly of ICT items (IT as per Schedule 1); TV circuit Rs. 15-45/kg; Compressor Rs. 300-400/Pcs.; Washing Machine Motor Rs. 200/Pcs.; Copper Rs. 200-350/kg; DVD Circuit Rs. 20-25/kg; Mobile kit Rs. 1000-2000/kg; SMPS Rs. 50/Pcs, Mother Board Rs. 90/Pcs.; Hard disk Rs. 120/Pcs.; CD Writer Rs. 35-40/Pcs.
- Scrap vendors sold E-waste to scrap dealer by weight at Rs. 150-250 per kg
- Scrap vendors sold damage mobile phone to scrap dealer as individual piece at Rs. 30-50 per piece
- Scrap dealer comes from Delhi yearly twice/thrice for collecting of E-waste.
- Since no mechanism exist for tracking purchase of EEE by bulk consumers and producers are not required to declare quantity of EEE placed in the market since 2012, E-waste inventory assessment has to rely on available historical market research data as well as data from collectors, dismantlers / recyclers.
- Data matrix versus methodology used for E-waste inventory assessment indicates "Market Supply" method and "Carnegie Mellon" method can be applied for E-waste inventory assessment in seven districts of Bastar Division in Chhattisgarh. However, a combination of Carnegie Mellon method & tracer tracking has been selected for inventory assessment since it covers all the aspects of material flow chain.
- Analysis shows that cell phone have the highest installed base followed by Computers, TV, printers, fixed line telephone, refrigerators, washing machines and Air Conditioners. In Bastar cellular phone, fixed line phone, TV, washing machine and refrigerator has the highest installed base followed by Bastar, Bijapur, Dantewada, Kanker, Kondagaon, Narayanpur and Sukma districts of Bastar division.
- Inventory estimates in Bastar division indicate that E-waste generation ranges from **2876.78** tons in 2011 to **7533.54** tons in 2020.
- In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes (91%) of the total inventory followed by Computer (4%), Washing machine (1%), Air conditioner (1%), Refregirator (1%), Printer (1%), Cellular phone (0%) & Fixed Line Phone (1%)
- In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (67%), Computer will constitute about (27%) of the total inventory followed by Printer (3%), Refrigerator (1%),

Air conditioner (1%), Washing machine (1%), Cellular phone (0%) & Fixed Line Phone (0%).

- An analysis of the different processes observed to recover metals indicates that no chemical process is occurring in study area. Only physical processes, which prepare raw material for recycling industry is observed in the study area. Iron recovered from E-waste is recycled through induction arc furnace route in the study area.
- Some major observations are that Operating margin for Television waste per kilogram is Rs. 0.44. Operating margin for waste refrigerator is Rs. 11.46 per kilogram. For that of Washing Machine is Rs. 13.03 per kilogram. For that of Air Conditioners is Rs. 18.40 per kilogram. For scrap old Personal Computer is Rs. 6.98 per kg and For waste cellular phones is Rs. 24.20 per kg. The operating margin ranges from Rs. 0.44 to Rs. 24.20 per kilogram. Scrap of Mobile / cellular phones gives the maximum operating margin of Rs. 24.20 while scrap from television gives the minimum profit of Rs. 0.44 per kilogram. This indicates that informal sector if brought into formal sector considering taxation involved will only dismantle / recycle cellular phones followed by ACs and WMs to some extent. Therefore, there is a need to formulate financial instrument for making dismantling / recycling of white goods viable.
- Market risks matrix highlight the availability of raw material, its collection and transportation as risks of high & medium intensities. Collection mechanism directly impacts the availability of raw material. Therefore, there is a need for both strict implementations of regulations as well as financial instrument for diverting E-waste inventory in to the formal sector.

List of producers – Annexure 1

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
	Television	LCD	BPL	Address Not Available Customer Care Number 1800 – 425 – 1800, 1800 – 425 – 2355
			Daenyx	A-30 & 31, Hosiery Complex, Phase II Extn. Noida - 201305 Uttar Pradesh (INDIA) Ph. No. +91-120- 3042721
			Haier	B-1/A-14, Mohan Co-operative Industrial Estate, Mathura Road, New Delhi-110044 Ph. No. 011-39496000/30674000 Toll Free No. 1800-200-9999 (24X7)
		Branch Offices	Hitachi	Hitachi India Pvt. Ltd. Units 802A and 802B, Tower 2, 8th Floor, Konnectus Building, Bhavbhuti Marg, Near Minto Bridge, Connaught Place, New Delhi – 110001 Ph. No. +91 (11) 30605252
				Hitachi India Pvt. Ltd Bangalore Branch Office Unit 103, 1st Floor, Shah Sultan Complex, No 17, Cunningham Road, Bangalore 560 052, India Ph. No. +91 (80) 2238 6986 / 987 / 984
				Hitachi India Pvt. Ltd. Mumbai Branch Office 508, Ascot Center, Next to Hilton hotel, Sahar Road, Andheri East, Mumbai 400099, India Ph. No. +91-22-28215625
				Hitachi India Pvt. Ltd. Chennai Branch Office 206, Apeejay House, No.12, Haddows Road, Nungambakkam, Chennai 600 006, India Ph. No. +91 (44) 2821 3108 / 3109 Hitachi Ltd. Infrastructure
Sr.	Product Name	Product Sub	Brand	Address / Contact Details
------	--------------	----------------	-------	-------------------------------------
140.		Category		
				Systems Company Mumbai
				Branch Office
				707, Trade Centre, Opp. to
				MTNL Bldg Bandra-Kurla
				Complex,
				Bandra (East) Mumbai 400 098
				Ph. No. +91+22-2650-0031
				Allied JB Friction Private
		Group		A-12, Site IV, Industrial Area,
		Companies		Sanibabad – 201010, Dist.
				$G_{\text{Haziabad}}(OP)$, India.
				Ph. No. 0120 4539600 - 700
				Aloka I rivitron Medical
				Diet # 45 Singet Industrial Dark
				Flot # AS, Sipcot fildustrial Park,
				Table Kanchiouram 602117
				TAMIL NADU
				Ph. No. 044 37183750
				Flyiac Logistics Pyt Ltd
				B = 1.205 2nd El Boomerang
				Chandivali Farm Road Near
				Powai Andheri East Mumbai 400
				072
				Ph. No. $022 - 33595900$
				Hitachi Chemical India
				Private Limited
				708. 7th Floor. Time Tower. M G
				Road, Gurgaon – 122 002 Ph.
				No. 0124 - 4246498
				Hitachi Consulting Software
				Services India Private Limited
				Plot No 9, Gachibowli,
				Hyderabad – 500032, IndiaPh.
				No. 040 - 4034 3000
				Hitachi Consulting India
				Private Limited
				Incubation Space A2, Magarpatta
				City SEZ, Hadapsar Road, Pune
				411013
				Ph. No. 020 – 6511 1001/2
				Hitachi Data Systems India
				Pvt. Ltd.
				#278/23, Trident Towers, 3rd
				floor, 10th Main, T. Mariappa
				Road, Jaynagar 2nd Block,
				Bangalore 560 011, India

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
110.		Category		
				Ph. No. +91 (80) 2657 6295
				Hitachi Hi-Rel Power
				Electronics Pvt. Ltd.B-52, 5th
				Floor, "Corporate House", Near
				Judges Bungalow, Bodakdev,
				Ahmedabad – 380 054 Gujarat –
				India
				Ph. No. +91 79 – 4900 2300
				Hitachi High Technologies
				(Singapore) Pte. Ltd.
				#602, 6th floor,
				Eros Corporate Towers, Nehru
				Place,
				New Delhi 110 019, India
				Ph. No. +91 (11) 4651 8450
				Hitachi Home and Life
				Solutions (India) Ltd.
				10th floor, Abhijeet,
				Mithakhali Six Road,
				Ahmedabad 380 006 Gujarat,
				Ph. No. +91 (79) 3041 4800
				Hitachi Koki India Ltd.
				Plot No. 9A, 1st Phase, Peenya
				Industrial Area, Bangalore 560
				058, India
				Ph. No. +91 (80) 411/0///
				Hitachi Lift India Pvt. Ltd.
				Units 504-506, 5rd Floor ABW
				Elegance Tower Jasola District
				Centre New Delni 110 025, India $D_{\rm e}$ N ₂ \pm 01 (11) 40(0.5200)
				Ph. No. +91 (11) 4060 5290
				Hitachi Maxell, Ltd. Chennai
				DBS Office Provinces Contan
				DDS Office Busilless Center
				Cardon Road, Noar Dalmaroua
				Hotel Nuncembelstem Channel
				India, Indigambakkam, Chemiai,
				$\begin{array}{c} \text{India} \\ \text{Pb} \text{No.} +91 \ (44) \ 4264 \ 9495 \end{array}$
				Hitachi Maxell I td Mumbai
				Ligison Office
				No 401 4th Floor "BANARASI
				HERITAGE" Mind Space Link
				Road Malad (West) Mumbai
				India
				Ph. No. +91 (22) 3212 8193
				Hitachi Metals (India) Pvt
				Ltd.

Sr. No.	Product Name	Product Sub	Brand	Address / Contact Details
		Category		
				Plot No. 94 & 95, Sector 8, IMI
				$\frac{1}{2} \frac{1}{2} \frac{1}$
				$711.100.\pm 91(124)41240007$ 481230074812400
				Hitachi Metalas (India) But
				I td
				Plot No. 94 & 95 Sector 8 IMT
				Manesar Gurgaon - 122050 (HR)
				Ph No ± 91 (124) 4124800 /
				4812300 / 4812400
				Hitachi NeST Control Systems
				Pvt. Ltd.
				No 103 First Floor Shah Sultan
				Complex No 17 Cunningham
				Road, Bangalore -560 052
				Karnataka. India
				Ph. No. 080 - 6789 8700
				Hitachi Plant Technologies
				India Pvt. Ltd.
				DPC 101, 102 and 103, First
				Floor, Block No. 4A, DLF
				Corporate Park, MG Road, Phase
				- III, DLF City, Gurgaon, Harvana
				Ph. No. +91+12-4455-2344
				Hitachi Transport System
				India Pvt. Ltd.
				116 & 117, 1st floor, Rectangle -
				1, D-4, District Centre, Saket,
				New Delhi 110 017, India
				Ph. No. +91 (11) 4052 5200
				Tata Hitachi Construction
				Machinery Co. Ltd.
				Jubilee Building, 44 Museum
				Road, Bangalore – 560 025
				Ph. No. 080 – 6695 3301 ~ 03
				Toyo Machinery & Metal Co.,
				Ltd. (India Liason Office)
				Units 304-306, 3rd Floor, ABW
				Elegance Tower, Jasola District
				Centre, New Delhi-110025
				Ph. No. 011 – 4060 5252
				LG Electronics India Pvt. Ltd,
				Plot No. 51, Udyog Vihar,
			LG	Surajpur Kasna Road,
				Greater Noida: 201306
				Uttar Pradesh
		Manufacturing	Markson	SGV Industries
		Facilities		Plot No.41 & 42,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Sector-6A, Sidcul Indl Area, Haridwar (Uttrakhand) Pin Code - 249401 Ph. 01334-239662/63/64
				Fax No. 01334- 239661 Email Id -
				store@sgvindustries.com Contact - Mr. Sunil Jain (Vice
				President) Mob. 9212669498 Mr. Rajender Sharma (Facility
				Incharge) Mob. 9212669503
				SINK Industries
				Gabriel Road Sector 2
				Parwanoo (HP)
				Pin Code - 173220
				Ph. 01792- 232711
				Contact- Mr. Alok Kumar
				(Facility Incharge) Mob.
				9212669513
				SNR Electronics Ltd.
				Plot No.2, HPISDC Indl. Area,
				Baddi, Tehsil Nalagarh,
				Dist. Solan,(H.P.).
				Pin Code - 173205
				Ph.01795-244703
				Fax - 01/95- 244/03
				Contact - Mr. Alok Kumar
				(Facility incharge) Mob. 9212669513
				PLOT No. 378 FLE
				PATPARGANI. DEHLI -
		Head Office		110092
		30		Ph. No. +91-11-43086501-502,
				22157662-63
				43B, Okhla Industrial Estate,
		Corporate do		New Delhi - 110020. India.
		Head Office	Moser Baer	Tel +91 11 40594444, 91 11
		11000 Office		26911570 - 74
				Fax +91 11 41635211, 26911860
				Chennai
				Moser Baer India Ltd.
		Branch Offices		01, IIIU FIOOr Valluwarkottam High Pood
		Drawn Offices		Nungambakkam
				Chennai - 600 034
				Tel: Ph.+91-44-42664358-59
				M & ES Office
				Moser Baer India Ltd.

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
No.	11000001(0000	Category		
				167-169, IInd Floor, Anna Salai,
				Saidapet, Chennai - 600 015
				Tel: +91-44-45050041-42-43
				Chennai Project Office
				Moser Baer Solar Limited
				UZ-2,0Z-3,0Z-4
				Part-3
				Oragadam Sriperampudur Taluk
				Kancheepuram District
				Tamil Nadu - 602105
				Mumbai
				Moser Baer Entertainment Ltd
				Mukti Foundation Building,
				A Wing, 1st Floor,
				141- A, Model Town, Village
				Ambivali,
				Behind Kokilaben Dhirubhai
				Ambani Hospital,
				Four Bungalows, Andheri-West,
				Mumbai - 400053
				Domestic Marketing & CE
				Moser Baer India Ltd.
				510- Maker Chambers V 5th Floor Nariman Point
				Mumbai-400.021
				Telefax: +91-22-66157930-31
-				Bangalore
				Moser Baer India Ltd.
				Raheja Plaza, Unit No.103
				17 Commissariat Road
				Bangalore - 560025
				Telefax : 080-41649712
				Kolkata
				Moserbaer Entertainment
				Limited
				1st Floor, 13 FLT. LT.
				Tapan Chowdhury Avenue,
				Mudiali,
				Kolkata - 700026
				1cl. Tyl-33-03419943-34
				235 Okhla Industrial Estate
				Phase III
				New Delhi -110 020
				Tel: +91-11-47624100
				Pune
				Moser Baer Photo Voltaic Ltd.

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
		8 /		311, IIIrd Floor
				Connaught Place
				28 Bund Garden Road
				Pune - 411 001
				USA Distributor
				Media Masters LLC
				#440, 2601 S. Minnesota
		Detressentative		Ave., Ste 105 Sioux Falls,
		Representative		SD 57105-4750 USA
		C Distributor		Phone: +1-(888)-243-4465
				Fax: +1-(877) 835-2834
				E-mail: sales@mediamastersdisc
				.com
				BOM & M& ES
		Manufacturing		66, Udyog Vihar,
		Facilities		Greater Noida (U.P.) - 201 306
				Tel: 0120-4386000
				Solid State Media
				A-164, Sector - 80,
				Phase - II, Noida (UP)
				Tel: 0120-4307000
				MBPV & MB Solar
				66B, SEZ Udyog Vihar,
				Greater Noida (U.P.) – 201306
				Tel: 0120-4658000
				BOM & SSM
				A-164, Sector - 80,
				Phase - II, Noida (UP) - 201 305
				Tel: 0120-4307000
				PV Technologies India Ltd.
				Oz-2, Oz-3, Oz-4
				Hi-Techsez, Sipcot Industrial
				Park-3 Oragadam, Sriperampudur
				Taluk
				Kancheepuram District
				Tamilnadu - 602105
				MIRC Electronics Ltd.
				Onida House, G-1, M.I.D.C,
				Mahakali Caves Road, Andheri
		Corporato		(E), Mumbai - 400 093.
		A dames	Onida	Tel: 022 - 28200435 / 66975777.
		<i>iuuress</i>		Email: response@onida.com
				For Institutional Sales:
				corporate.sales@onida.com
				For Service: service@onida.com
			Panasonic	Ph. No. 1800 108 1333 / 1860
				425 1860 / 1800 103 1333
			Samsung	Samsung India Electronics

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
140.		Category		
				6th, 7th & 8th Floors, Ifci Tower,
				61, Nehru Place,
				New Delhi,
				Tel: 011 3030 8282
				Samsung Corporation
				Room No 355, Hotel Taj Palace,
				Chanakyapuri
				New Delhi, DL
				011 2688 9817
				Philips Electronics India
				Limited
			201.00	9th Floor, DLF 9-B,
			Philips	DLF Cyber City,
				Sector 25, DLF Phase - 3,
				Gurgaon - 122002, India
				Tel: +91 - 124 - 4606000
				Philips Electronics India
				/, Justice Chandra Madhab Road,
				Kolkata - 700020 , India
				1el: +91 - 33 - 24/53621 / 2/
				Philips Electronics India
				The Estate, 4th floor (North
				Wing), (Next to Manipal Centre),
				121, Dickenson Road,
				Bangalore - 560042 , India
-				$1e_1: +91 - 80 - 66929898$
				MEAD M T 1 D 1
				MFAR Manyata Tech Park,
				Nagavara, Bangalore - 560045,
				$T_{-1} + 01 = 00 = 41800000$
				161: +91 - 80 - 41890000
				Limited
				Tomolo Towara 5th Elecar
				Old No. 476 New No. 672
				Anne Selei Nendenem
				Changei (00025 Jadia
				$T_{a1} + 01 - 44 - 66501000$
				Dhiling Floatronics India
				Limited
				6 3 1109/1/D/103 3rd Elasa
				U-J-1109/1/1/1/105, 5fd Floor,
				Bai Bhayan Road Someilouda
				Hyderabad 500082 India
				$T_{\rm ol} + 01 + 0 = 66467676$
				Philips Electropics India

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
110.		Category		.
				Limited Technopolis Knowledge Park, Mahakali Caves Road, Chakala, Andheri (E), Mumbai - 400093, India Tel : +91 - 22 - 66912000
			Salora	D-13/4, Okhla Industrial Area, Phase-II New Delhi – 110 020, India Phone: +91-11-49207100 / 101
			Sansui	Adheshwar Arcade, Ist Floor, Andheri Kurla Road, Andheri East, Mumbai: 400 093
				No.62, 3rd floor, 1st main, 3rd cross, 2nd stage, Yeshwantpur Industrial Area, Bangalore – 560022
				Plot No. 296, Udyog Vihar Phase -2, Gurgaon – 122015
			Sharp	Sharp India Limited Gat No. 686/4, Koregaon Bhima, Tal: Shirur, Dist: Pune Pin – 412216 Phone: 02137-252417, 02137- 666520
			Sony	Sony India Registered Office A - 31, Mohan Co-operative Industrial Estate, Mathura Road New Delhi - 110044 Ph No : 66006600 Fax No : 26959141
				Sony India Branch Offices City Center, 3rd Floor, Plot A-5/1, Unit-IX, Sachivalaya Marg, Bhubaneswar Pin – 751022
				3rd Floor, NH Center Point Building, Opposite Bora Service, G S Road, Guwahati Ph No : 0361-2462858, 2462859
				White House, 2nd Floor, Block 2D, 119 Park Street, Kolkata - 700016 Ph No : 033-40071751/52/53/

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
110.		Category		
				54/55
				Fax No : 033 - 400/1/63
				4th Floor, Block-B,
				Sai Corporate Park,
				Rukanpura, Bailey Road,
				Patna - 800014
				Phone No : 0612-3269866
				Srd Floor, Adarsh Mall, Plot No
				50, Industrial and Business Park,
				Phase-2, Chandigarn - 160002
				Pn No : $01/2-66$ 555 55,
				Fax INO: 01/2-00.555.00
				Unit # 405 - 407, 4th Floor,
				Lagola District Control
				Jasola District Centre,
				$C_{optact} : 1800 \ 103 \ 7700 \ (T_{o})$
				E_{ree} Eav No : 011 42458844
				SCO 38-39 G 1st Eloor
				BRS Nagar Ludhiana -141 012
				Ph No \cdot 0161-463 2222
				24 Advocate Chambers
				2nd Floor RDC Rai Nagar
				Ghaziabad Uttar Pradesh
				Ph No : $0120 - 4940150$
				Fax No : 0120 - 4940180
				C-7 Sultan House 1st floor
				Sawai Jai Singh Highway, Bani
				Park. Jaipur - 302016
				Ph No : 0141-4041896, 4041897
				Fax No : 0141-4041894
-				4th Floor, Eldeco Corporate
				Chambers, Vibhuti Khand
				Opposite Kisan Mandi Bhawan,
				Phase 1 Gomti Nagar
				Lucknow Ph No : 0522-
				4041231/32/33/34/35
				U & I : VR 1 Centre, IInd Floor
				Plot No. 83, Sector 29,
				City Centre, Gurgaon,
				Haryana - 122002
				Ph No : 0124 - 4896200,
				Fax: 0124 - 4896220
				No.768, 100 Feet Main Road
				HAL, IInd Stage, 12th Main,
				Indira Nagar, Bangalore - 560038
				Ph No : 080-66605555
				Fax No : 080-25294987

Sr. No.	Product Name	Product Sub	Brand	Address / Contact Details
1.00		Category		
				#2-1-2/6(2), First Floor,
				Hill Groove, Chilimbi Hills, 2nd
				Cross, Mangalore - 575006
				2nd Floor, Hameedia Centre,
				No 14/43, Haddows Road,
				Nungambakkam,
				Chennai - 600006
				Ph No : 044 - 28242571
				Fax No : 044-28234853
				2nd Floor, Muscat Tower
				S.A.Road, Kadavanthara
				Cochin - 682 020
				Ph No : 0484-2318616, 2318618,
				2318619, Fax No : 0484-2318629
				III Floor, 1025/1 Skanda Square,
				Avinashi Road
				Coimbatore - 641018
				Ph No : 0422-4334455
				Fax No : 0422-4334456
				6-3-676/A/2/3/4,
				Punjagutta X Roads, Punjagutta
				Hyderabad - 500082
				Ph No : 040-66115000
				Fax No: 040-23400014
				Door No. 59-10-1/A,
				Matha Towers , 4th Floor,
				Ring Road, Patamatalanka,
				Vijayawada-520 010
				Mohans Arcade, 1st Floor, 47-
				11-5, Dwarka Nagar
				Vishakhapatnam - 530016
				101, Parth Complex, Ground
				floor, Swastik Cross Road
				Navrangpura
				Ahmedabad - 380009
				Ph No : 079-26441040,
				26441041
				Fax No : 26460839
				25/1 Ground Floor,
				Yashwant Niwas Road,
				Shirish Chamber
				Indore - 452003
				Ph No: 0731-4055762, 4042013,
				4042033
				2nd floor, Crimpage
				Corporation,
				Plot No. 57, Street No.17, MIDC,
				Andheri East.

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
110.		Category		
				Mumbai - 400093
				Ph No : 022-6128 8000
				Fax No : 28312935
				Office No.2, 3rd floor
				G.O.Square, Aundh-Hinjewadi
				Road, Near Mankar Square
				Wakad, Pune - 411057
				Ph No : 020-67917200
				Fax No : 020-67917299
				Office - 18 A, 04th Floor,
				Empress Mall,
				Behind Raman Science Centre,
				Sir Bezonji Mehta Marg,
				Nagpur – 440018
				Ph No : 0712-6471533-557
				TCL India Holding Pvt. Ltd.
			TCI	Sco 254, 2nd Floor, Sector 44 C
			ICL	Chandigarh, CH
				Tel: 0172 464 6211
				TCL India Holding Pvt. Ltd.
				B-8/3, Uppal Industrial Area,
				Uppal, Hyderabad, AP
				Tel: 040 2344 9350
				TCL India Holding Pvt. Ltd.
				302, Vidhyapati, 17, Race Course
				Road, Race Course Road
				Indore, MP
				Tel: 0731 400 3365
				TCL India Holding Pvt. Ltd.
				82, Phase 3, Okhla Industrial
				Estate, New Delhi, DL
				011 3082 3011
				Laxbro Manufacturing Company
			T Coming	W-53, MIDC Area, Bhosari Indl.
			1-Series	Estate, PMC – 411026,
				Maharashtra
				TOSHIBA INDIA PVT. LTD.
				3rd Floor, Building No. 10 Tower
				- B, Phase - II
			Toshiba	DLF Cyber City,
				Gurgaon - 122 002,
				Haryana, India
				Board No. + 91-124-4996600
				TOSHIBA INDIA PVT. LTD.
				C&B Square Building , 6th Floor,
				Plot No 601, 127, Andheri Kurla
				Road, Chakla Andheri, (East),
				Mumbai 400059

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
140.		Category		
				Tel: + 91-22-61911500
				TOSHIBA INDIA PVT. LTD.
				284 Hothur Square, 2nd Floor,
				100 Feet Road Indiranagar,
				Bangalore - 560038,
				Karnataka, India $T_{1} + 01.90$ 25100900
				Tel: + 91-80-25190800
				Toshiba India Pvt. Ltd.,
				Chinese Communication Centre
				Road Bayingaran Kashi (82.015
				Koad, Kavipurain, Kocm-062 015 Tol: $\pm 01.484.2357107$
				Ter: + 91-464-235/10/
				Diot No. 1. 4. Vatika Business
				Flot NO 1-4, Valka Dushless
				Pood No 12 Papiers Hills
				Hyderabad 500034
				$T_{el} + 91.40.44311152$
				Toshiba India Pyt I td
				219 Regus Centre 3rd Floor
				Altius Olympia Technology
				Park Sidco Industrial Estate
				Guindy Chennai - 600032 India
				Tel: + 91-44-42994353
				Videocon Industries Ltd.
				14 Kms Stone, Aurangabad-
				Paithan Road.
			Videocon	Chitegaon, Tg. Paithan,
				Dist. Aurangabad - 431 105
				(India)
				Corporate Office
				Fort House, 2nd Floor,
				221,Dr. DN Road, Fort, Mumbai-
				400 001(INDIA)
				Corporate Office (Marketing,
				Service & Support):
				296, Udyog Vihar Phase-II,
				Gurgaon, Haryana. Phone No.:
				0124-3273091
				Westway Electronics Limited
				B-102, Phase – II, Noida –
			Weston	201305 (U.P)
				Phone: 0120 4543114
				Fax: 0120 4543115
				Westway Electronics Limited
				C-189, Naraina Industrial Area
				Phase-I
				New Delhi 110028

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Phone: 011 45035222
				Fax: 011 41411110
		LED	LG	Given Above
			Samsung	Given Above
			Panasonic	Given Above
			Toshiba	Given Above
			Onida	Given Above
			Akai	Corporate office Global Brands Enterprise Solutions Pvt. Ltd. Plot No. 97, Sector-44, Gurgaon - 122 002, INDIA Phone No: 0124-4305000, Fax No.: 0124-4305020
				Global Brands Enterprise Solutions Pvt. Ltd. Flat No. 31, 3rd Floor, Harihar Apartment, Vishnu Dev Path, East Boring Canal Road, Patna - 800 001. Tel No: 0612 2524302
			Haier	Given Above
			Hitachi	Given Above
			Philips	Given Above
			Sonv	Given Above
			T-series	Given Above
			Salora	Given Above
			Videocon	Given Above
		Plasma and HDTV	Hitachi	Given Above
			LG	Given Above
			Panasonic	Given Above
			Samsung	Given Above
			Sansui	Given Above
		Flat	BPL	Given Above
			Daenyx	Given Above
			Haier	Given Above
			LG	Given Above
				Next Retail India Limited,
				3rd Floor, Aadeshwar Arcade
			Ъ.Т.	Above Loop Gallary,
			INext	Opp. Sangam Cinema,
				Andheri Kurla Koad, Mumbai 400 102
				$\frac{1}{2} \frac{1}{2} \frac{1}$
			Opida	Civen Above
			Danasonia	Given Above
			Fallasoliic Someung	Given Above
		1	Jambung	

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
			Philips	Given Above
			Salora	Given Above
			Sansui	Given Above
			Sharp	Given Above
				SANYO India Pvt. Ltd.,
				'Jubilee Building', 2nd Floor,
			Samo	45, Museum Road,
			Sallyo	Bangalore 560025, India,
				Tel: +91-80-43418200,
				Fax: +91-80-43418222
			TCL	Given Above
			T-Series	Given Above
				TEXLA ELETROVISION
				A-72, OKHLA INDUSTRIAL
			Texla	AREA, PHASE-II, New Delhi -
				110020, India
				91-11-26384589/26387153
			Videocon	Given Above
			Weston	Given Above
		CTV	Daenyx	Given Above
			Haier	Given Above
			LG	Given Above
			Markson	Given Above
			Moser Baer	Given Above
			Panasonic	Given Above
				Next Retail India Limited,
				3rd Floor, Aadeshwar Arcade
				Above Loop Gallary,
			Next	Opp. Sangam Cinema,
				Andheri Kurla Road,
				Mumbai 400 102
				Phone: +91-7498218860
			Philips	Given Above
			Salora	Given Above
			TCL	Given Above
			T-Series	Given Above
			Videocon	Given Above
			Weston	Given Above
	Washing Machine	Semi Automatic	BPL	Given Above
				BELTEK INDIA LTD.
			Beltek	B-89 SEC-5 201301
				NOIDA - UTTAR PRADESH
				Phone No.:- 0091 95 1202421676
			Daenyx	Given Above
				PE Electronics Ltd.
			Electrolux	Corporate Centre, 5th Floor, Andheri Kurla Road, Andheri

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				(East), Mumbai – 400059 Phone No. +91-22-61171000
			Gem	Gem Equipments Pvt. Ltd. S.F. No. 103, Avanashi Road, Arasur Coimbatore – 641407 Ph. No. +91 422 2363800
			Godrej	Godrej Industries Limited. Pirojshanagar, Eastern Express Highway, Vikhroli, Mumbai - 400079, INDIA. Tel: +91-22-2518 8010 / 2518 8020 / 2518 8030 Fax: +91-22-2518 8074
				Godrej & Boyce Manufacturing Company Limited. Pirojshanagar, Vikhroli, Mumbai - 400079, INDIA. Tel: +91-22-6796 5656 / 5959
			Haier	Given Above
			Kelvinator	
			Kenstar	
			LG	Given Above
			Onida	Given Above
			Samsung	Given Above
			TCL	Given Above
			T-Series	Given Above
			Videocon	Given Above
			Weston	Given Above
			Whirlpool	Given Above
		Fully Automatic	BPL	Given Above
			Daenyx	Given Above
			Electrolux	
			Godrej	Given Above
			Haier	Given Above
			IFB	Corporate Address: IFB Industries Limited Corporate Off.: Flat No.IND-5, Sector-1,East Kolkata Township, Kolkata – 700 107 Ph: +91 33 39849524/39849475 Fax: +91 33 39849676
				Kolkata Factory: IFB Industries Limited No:14, Taratolla Road, Kolkata -

Sr.		Product		
No.	Product Name	Sub	Brand	Address / Contact Details
		Category		700.088.
				Ph: +91 33 30489299
				Fax: +91 33 30489230
				Bangalore Factory: IFB Industries
				Limited
				16/17, Visveswaraiah Indl.
				Estate,
				Off.Whitefield road, Bangalore -
				560048.
				Ph: + 91 80 30589620
				GM: +91 80 30589604
				MKTG: +91 80 30589641
			17.1	Fax:+91 80 30589611
			Kelvinator	Circus Altarea
			LG	Given Above
			Opida	Civen Above
			Papasonic	Given Above
			Samsung	Given Above
			Toshiba	Given Above
			Videocon	Given Above
			Whirlpool	Given Above
			Winnpoor	Corporate Headquarters
				Kasturi Buildings.
				Mohan T Advani Chowk,
	Air Conditioner	Window	Blue star	Jamshedji Tata Road,
				Mumbai - 400 020
				Tel: (91) (22) 66654000
				Fax: (91) (22) 66654151
				Divisional Headquarters
				Chennai
				9 Bazullah Road
				I Nagar
				Chennai - $600 017$
				Fer: (91) (44) 4344 4000 Fer: (91) (44) 28158015 / 4344
				4072
				Mumbai
				Bandbox House
				4th Flr, 254 D
				Dr Annie Besant Road
				Worli
				Mumbai - 400 030
				Tel: (91) (22) 66544000
				Fax: (91) (22) 66544001
				Regional Headquarters
				Chennai
				No.104, Old No. 46,

Sr.	Product Name	Product	Brand	Address / Contact Details
No.	1 loudet i vanie	Category	Diana	Redress / Contact Details
				Garuda Buildings, Cathedral
				Road,
				Chennai - 600 086
				Tel: (91) (44) 42444000
				Fax: (91) (44) 42444190
				Mumbai
				Blue Star House
				9A, Ghatkopar
				Link Road
				Sakinaka
				Mumbai - 400 072
				Tel: (91) (22) 66684000
				Fax: (91) (22) 66684004
				Kolkata
				7, Hare Street
				Kolkata - 700 001
				Tel: (91) (33) 22134000
				Fax: (91) (33) 22134102
				New Delhi
				Block 2-A, DLF Corporate Park
				DLF Qutab Enclave
				Phase III
				Gurgaon - 122 002 (Haryana)
				Tel: (91) (124) 4094000
				Fax: (91) (124) 4094004
				Manufacturing Facilities
				Ahmedabad
				501/3, 503/2, Tejpur Road
				Sarkhej Baula Highway
				Changodar,
				Ahmedabad- 382213
				Tel : (91) (2717) 294490
				Bharuch
				Plot Nos. 4 and 5
				GIDC Industrial Estate
				Narmada Nagar post
				Bharuch - 392 015
				Tel: (91) (2642) 246116
				Fax: (91) (2642) 246026
				Dadra
				Survey No. 265/2
				Demni Road
				Dadra 396 191
				U.T. Of Dadra & Nagar Haveli
				Tel: (91) (0260) 2668617 /
				2668618
				Fax: (91) (0260) 2668503
				Kala Amb

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Nahan Road
				Ranpur Jattan
				Kala Amb
				District Sirmour
				Himachal Pradesh 173030
				Tel : (91) (01702) 238760
				Fax: (91) (01702) 238461
				Kala Amb
				Nahan Road
				Village Ogli
				Kala Amb
				District Sirmour
				Himachal Pradesh 173030
				Tel : (91) 98160 13443
				Fax: (91) (01702) 238761
				Thane
				IInd Pokhran Road
				Majiwada
				Thane - 400 601
				Tel: (91) (22) 67924000
				Fax: (91) (22) 67924020
				Wada
				Village-Vasuri Khurd,
				Khanivali Road,
				PO - Khupari,
				Taluka - Wada,
				Dist - Thane, 421312
				India
				Sales and Service Offices
				Ahmedabad
				Abhishree Avenue,
				3rd Floor, Near Nehru
				Nagar Cross Roads,
				Ambawadi Road,
				Ahmedabad - 380 006
				Tel: (91) (79) 4022 4000
				Bengaluru
				Ozone Manay Technology Park,
				Sy.No 56/18 & 55/9
				Hongasandra Village
				Begur Hobli
				Garvebhavipalya
				Bangalore - 560 068
				Tel: (91) (80) 41854000
				Bhubaneswar
				3A, Satya Nagar
				2nd Floor,
				Bhubaneswar 751 007
				Tel: (91) (674) 2572403 /

Sr. No	Product Name	Product Sub	Brand	Address / Contact Details
140.		Category		
				2573670 / 2570024
				Fax: (91) (674) 2570544
				Chandigarh
				Adarsh Mall,
				4th Floor, Plot No. 50,
				Industrial & Business Park,
				Phase - II,
				Chandigarh - 160 002
				Tel: (91) (1/2) 5024000
				Fax: (91) (172) 5004007
				Blue Star Limited
				020, Anna Salai, Madare Sebaal Baad
				Chappai 600006
				Tel : (91) (44) 40444000
				Fax: (91) (44) 40444001
				Ghaziabad
				C 53A. Third Floor.
				Raj Nagar District Center
				(RDC), Raj Nagar,
				Ghaziabad - 201001.
				Uttar Pradesh
				Tel: (91) (120) 2821400
				Guwahati
				2nd Floor, New Star Freeze
				Bldg., Opp. Kunjalata Bibah
				Bhawan, G S Road,
				Guwahati - 781005
				Tel: (91) (361) 2340620
				Indore
				1st Floor, Shri Krishna
				Classic, 139 ,
				Fadnis Colony, A B Koad,
				Tal. (01) (721) 4001211 /
				4001311
				Jainur
				A-19 First Floor
				Main Sahakar Path.
				Nr. Sahakar Bhavan,
				Jaipur
				Tel: (91) (141) 4141100/
				2744033/35
				Kochi
				Millenium Plaza
				Alinchuvadu

Sr.	Due 1 of Norma	Product	Dura 1	
No.	Product Name	Sub Category	Brand	Address / Contact Details
				MKK Nair Road
				Near Palarivattom Junction
				Kochi - 682024
				Tel: (91) (484) 4499000
				Fax: (91) (484) 4499190
				Lucknow
				177/4,Faizabad Road
				Lucknow 226 007
				Tel: (91) (522) 4034000
				Fax: (91) (522) 4034004
				Mumbai
				59 Forbes Street
				Mumbai 400 001
				Tel: (91) (22) 22844660
				Mumbai
				Unit G-2
				Shalimar Ind. Estate
				Dharavi Road
				Matunga
				Mumbai - 400.019 T ₋₁ , (01) (22) 24042008
				Tel: (91) (22) 24042098
				Mumbai
				Unit I Prabhadevi
				Drobhedovi
				Mumbai 400025
				Tal : (01) (22) 24227305
				Fax: (91) (22) 24227503 Fax: (91) (22) 24376041
				Nacour
				219 Bajaj Nagar 1st Floor South
				Ambazari Road, Nagnur - 440010
				Tel: (91) (712) 6624000
				Fax: (91) (712) 6624002
				New Delhi
				E-44/12. Okhla Industrial
				Area. Phase II.
				New Delhi - 110 020
				Tel: (91) (11) 41494000
				Fax: (91) (11) 41494001
				Panjim (Goa)
				First Floor, Buddhaseth
				Apts, Tonca, Caranzalem,
				Goa - 403 002.
				Tel: (91) (832) 2462789
				Pune
				201/A, Nityanand Complex
				247/A Bund Garden Road
				Pune - 411011

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Tel: (91) (20) 4104 4000 Fax: (91) (20) 4104 4001
				Raipur
				Alaska Corporates,
				3rd Floor, Opp VIP Road,
				Jivan Vihar Colony,
				G E Road, Raipur,
				Chattisgarh - 492 006
				Tel: (91) (771) 6544000
				Secunderabad
				207 Sikh Road
				Bantia Estate
				Secunderabad - 500 003
				I el: (91) (40) 4400 4000
				Fax: (91) (40) 4400 4001 / 4190
				Inane Und Dokhman Road
				Majiwada
				The -400601
				Tel: (91) (22) 67154500
				Fax:(91)(22)(67924020)
				Thiruvananthapuram
				TC IV/962. Chandrika.
				Sree Chitra Nagar,
				Pipe line Road, Kawdiar,
				Thiruvananthapuram - 695 003
				Tel: (91) (471) 2435025
				Fax: (91) (471) 2434065
				Vadodara
				Ramkrishna Chambers
				Productivity Road
				Alkapuri
				Vadodara
				Tel: (91) (265) 6614000
				Visakhapatnam
				D. No. 49-24-65/1,
				Madhura Nagar Mandal
				Madhura Nagar Mahdal,
				Vishakapatnam 530 016
				T_{al} (91) (891) 274 8405
				Fax: (91) (891) 270 1041
				INDIAN HEADOUARTERS :
				Carrier Airconditioning &
				Refrigeration Limited
			Carrier	Delhi - Jalpur Highway, Narsingpur,
				Gurgaon,
				Haryana, 122 004, India Ph. No. +91-124-4825500

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
140.		Category		
				Fax No. +91- 124- 2373 241
				Carrier Airconditioning &
				Refrigeration Ltd
				U & I Building,Plot No-83,
				Sector-29, Noar Bilanor Sweets
				Gurgeon 122 002 (Hervene)
				Tel - 0124 - 4707333
				Fax:- 0124 - 2565050
				Carrier Airconditioning &
				Refrigeration Ltd
				Carrier Complex
				Vill. Narsinghpur, Kherki Daula
				Post,
				Gurgaon – 122 004
				Tel:- 0124 - 482 5500
				Fax:- 0124 - 237 2230
				Carrier Airconditioning &
				Shop No # 201 E. 2nd Eleor
				Mahagun Metro Mall
				Near Ansal Plaza, Vaishali.
				Ghaziabad (Uttar Pradesh)
				Tel:- 0120-4183260
				Fax:- 0120 - 4183266
				Carrier Airconditioning &
				Refrigeration Ltd
				Unit No.402 B & 403,
				4th floor, Shalimar Square,
				Lucknow 226001
				$T_{el} = 0.522 = 220001$
				Fax:- 0522 - 2230050
				Carrier Airconditioning &
				Refrigeration Ltd
				SCO 301/302, 1st Floor ,
				Sector – 38 D, Chandigarh - 160 036
				Tel:- 0172 - 500 7548/ 50
				Fax:- 0172 - 5007160
				Carrier Airconditioning &
				Act Flager S.S. Tarran Marri Calara
				Behind Ivanti Market
				Jaipur - 302 001
				Tel Nos :- 0141 - 511 3444, 511 3999
				Carrier Airconditioning &
				Refrigeration Ltd
				C/o Bhairav Distributors,
				Shop No:- 5 & 6, Victor Bldg
				Cujira - St Cruz
				Panaji - Margao Highway,
				Panjim, Goa - 403 005
1				1 el:- 0832 - 244 7/028

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
No.	·	Category	· · · · · · · · · · · · · · · · · · ·	
				Fax:- 0832 - 244 7027
				Carrier Airconditioning &
				Refrigeration Ltd
				605A, Lokmat Building,
				Lokmat Square, Vardha Road,
				Ramdas Peth, Nagpur
				Tel:- 0712 - 663 0214, 645 3790
				Fax:- 0712 - 645 3790
				Carrier Airconditioning &
				Refrigeration Ltd
				C/o Suman Enterprises
				Behind ITI, Sham Nagar
				Raipur – 492 006
				Tel:- 0771 - 401 3245
				Carrier Airconditioning &
				Refrigeration Ltd
				1st Floor, Milestone, Drive In Road
				Thaltej, Ahmedabad – 380 052
				Tel:- 079 - 4026 7777
				Fax:- 079 - 4026 7799
				Carrier Airconditioning &
				Refrigeration Ltd
				Shreeprasad, Office No.4, 4th floor
				Plot No.74, Sheela vihar colony
				Opp. Planet ford, Paud Road
				Pune -411 038
				Tel:- 020 - 41051000/ 02025437/41
				Fax:- 020-2543//42
				Carrier Air-conditioning &
				Refrigeration Ltd.,
				Unit No.4, 3rd Floor
				Phoenix Market City,
				15 L.B.S. Marg, Kurla (West)
				MUMBAI – 400 070.
				Telephone: 022-61700700
				Carrier Airconditioning &
				Refrigeration Ltd
				315-316, Shagun tower,
				7 Commercial Sector PU 4, Scheme
				No 54,
				Vijay Nagar Square, A.B. Road,
				Indore – 452010
				Tel:- 0731-4070378
				Fax:- 0731 - 252 6365
				Carrier Airconditioning &
				Refrigeration Ltd
				C/o Om Sai Enterprises,
				Pushpanjali Complex,
				Second Floor, Lake Road,
				Ranchi – 834 001
				Tel:- 0651 -645 2488
				Fax:- 0651 – 246 1818
				Carrier Airconditioning &

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Refrigeration Ltd
				C/o, Candida Enterprises
				R.G. Baruha Raod, Sunderpur
				Guwahati - 781 005
				Tel:- 0361 - 259 5003
				Fax:- 0361 - 220 3508
				Carrier Airconditioning &
				Retrigeration Ltd
				204, Adarshia Complex
				Potpo 800.001
				Tel: $0.612 - 232 - 3517$
				Telefax:- 0612 - 252 5517
				Carrier Airconditioning &
				Refrigeration Ltd
				P-339/1. CIT Road. Scheme VI-M.
				Phulbagan, Kolkatta – 700 054
				Tel:- 033 - 4020 1300
				Fax:- 033 - 2364 9766
				Carrier Airconditioning &
				Refrigeration Ltd
				Flat No:- 201, Shanti Niwas Housing
				Plot No:- 33/1747, Rasulgarh
				Bhuvaneshwar – 751010
				Tel:- 0674 - 258 7178/ 258 5893
				Fax:- 0674 - 258 7178
				Carrier Airconditioning &
				Refrigeration Ltd
				6-2-976, Raj Bhawan Road
				Khairatabad,
				Hyderabad -500004
				$1 \text{ el:- } 040 - 4546 \ 2888$
				Fax:- 040 - 4011 8146
				Carrier Airconditioning &
				3rd Eloor Block III
				Prestige Blue Chip, No 9, Hosur
				Road
				Bangalore -560.029
				Tel :- +91 80 43442000
				Fax:- +91 80 41321222
				Carrier Airconditioning &
				Refrigeration Ltd
				Shivas Complex
				263/5, Mettupalayam Road
				Coimbatore - 641 043.
				Tel:- 0422 - 438 4151, 438 5403
				Fax:- 0422 - 2436485
				Carrier Airconditioning &
				Refrigeration Ltd
				39/6641, Perumanoor,
				M.G. Road, (Opp. Cochin Shipyard)
1				Cochin – 682 015

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
110.		Category		
				Tel:- 0484 - 402 9001/ 0
				Fax:- 0484 - 235 9214
				Carrier Airconditioning &
				CRR Zone
				271/2 Maraimalai Adigal Salai
				Pondicherry – 605 001
				Tel:- 0413 - 222 5853, 2226 676
				Fax:- 0413 - 234 4695
				Carrier Airconditioning &
				Refrigeration Ltd
				Old No. 248, New No.114
				Royapettan High Road,
				Phone : $044 = 42222888$
			Daenvx	Given Above
			Ducinjii	ETA General Pyt Ltd
				ETA House .3rd Floor
				#71/63,Opp.Lovola College
			General (ETA)	Sterling Road, Nungambakkam,
				Chennai.6000034 . Tamilnadu
				044- 43402345
				ETA General Pvt. Ltd.Flat no -
				642 D, Ram AppartmentsOpp.
				Laksmi MillsPapanaicken
				PalayamCoimbatore - 641 037Tel.
				#:0422 - 2554732
				ETA General Pvt Ltd
				ETA House, Behind Green Park
				Hotel
				7-1-27/5, Plot No:9,
				Greenlands, Ameerpet
				HYDERABAD - 500 016
				1el.#:040 - 66103530 / 31
				ETA General Pvt. Ltd.
				D NO.40-1-119, Old DATA
				GodownOpp. Jyouni Manai Benz
				VIIAVAWADA 522.010
				$T_{el} \cdot 0866 - 6460278 / 3074020$
				ETA General Pyt 1 td
				PL of No 153 2nd Floor 9th
				Main Road
				3rd Block Javanagar
				BANGALORE - 560 011
				Tel: 080-40926531 / 40926538
				ETA General Pyt. Ltd.
				Bldng #:30/2001-D. 'Atham'
				1st Floor, Opp.Gold Souk
				Grande

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
140.		Category		
				Ponnurunni Road
				Ponnurunni, Vytilla P.O
				Cochin - 682 019
				Telefax : 0484 - 4011623
				ETA General Pvt. Ltd.
				101-102, 1st Floor, Grotto
				Heritage,
				Opp.Orlem Church, Marve Road,
				Malad – West,
				Mumbai - 400 064
				Tel: 022 - 42455300 / 02
				ETA General Pvt. Ltd.
				203, 2nd Floor, Sankalp Square
				Near Gurukul Temple
				Drive In Road
				AHMEDABAD - 380 054
				Tel: 0/9-2/46/991,40058991
				ETA General Pvt. Ltd.
				SCO 24/5 - /6,
				Sector 22 - C, 2nd Floor
				CHANDIGARH - 160 022
-				$1 \text{ el: } 01/2 - 508/288, 4421121}$
				ETA General Pvt. Ltd.
				C = 19, Sector - J
				Aliganj,
				LUCKNOW - 226 020 (U.P)
				ETA Canaval Driverta Lingita d
				ETA General Private Limited
				Sunrise Mail, 2nd Floor,
				Tel: 0120 4201121
				ETA Conomi Dat Ltd
				221 Jat floor
				Okhla Indl. Area
				New Delbi 110020
				# 011 43127777
				FTA Coporal Put Ltd
				203. 2nd Eloor
				Krishna Enclave Plotno-SB-52
				Opp SMS Stadium Topk Road
				LAIPLIR - 302015(Rajasthan)
				Ph. No: 0141-4012684
				ETA General Pvt 1 td
				1st Floor Unit 1 F
				"Sree Ganesh Centre"
				216 AIC Bose Road
				KOLKATA - 700 017
				Tel: 033 - 40602006

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
			Godrej	Given Above
			Haier	Given Above
			Hitachi	Given Above
			LG	Given Above
			Onida	Given Above
			Samsung	Given Above
			Videocon	Given Above
			TCL	Given Above
				Voltas Limited
				Voltas House
	Corporate			'A' Block
	Headquarters		Voltas	Dr. Babasaheb Ambedkar Road
				Chinchpokli
				Mumbai 400 033
				Tel: 022-66656 666
	Factories			2nd, Pokhran Road,
	1 actorics			Thane - 400 601
				Tel: 022-67920111
				Dadra Plant (EM&RBG)
				Shreenath Industrial Estate, C
				Building
				Survey NO.197, Nr. Dadra Check
				Post Pin -396230
				Tel: 0260-6619999 / 2669648
				Uttarakhand Plant
				(EM&RBG)
				Plot No.1, Sector 8
				Dist U.S. Nagar Industrial Area
				Dist U.S. Nagar, Rudrapur
				$T_{11} = 203143$ $T_{21} = 05044, 250006, 7.8$
				Ittarakhand Plant (UPBC)
				Plot NO 2.5 Sector 8
				LLE Pant Nagar Industrial Area
				Dist U.S. Nagar, Rudrapur
				Pin = 263153
				Tel: 05944-250009
			Whirlpool	Given Above
		Split	Blue star	Given Above
		opili	Carrier	Given Above
			Daenvx	Given Above
<u> </u>			General (ETA)	Given Above
<u> </u>			Godrei	Given Above
			Haier	Given Above
			Hitachi	Given Above
			IG	Given Above
			Onida	Given Above
			Mitsubishi	Gurgaon Head Office

Sr. No.	Product Name	Product Sub	Brand	Address / Contact Details
1.101		Category		
				2nd Floor, Tower A & B, DLF
				Cyber Greens, Dlf Cyber City,
				DLF Phase -III, Gurgaon-122002,
				$\begin{array}{c} \text{India} \\ \text{D} \\ \text{D} \\ \text{D} \\ \text{India} \\ India$
				Phone: $+91(124) 463-0300 +91$ (124) (72,0200 E-m, $+01(124)$
				(124) 6/3-9300 Fax: +91 (124)
				A03-0399 / 398
				M 38/1 Middle Circle
				Coppaught Place New Delhi
				11000 India
				Please contact Gurgaon head
				office for Delhi inquiries
-				Bangalore Sales Office
				Prestige Emerald 6th Floor
				Municipal No. 2. Madras Bank
				Road (Lavelle Road), Bangalore
				560001. India
				Phone: +91 (80) 4020-1600 Fax:
				+91 (80) 4020-1699
				Pune FAID Head Office
				Emerald House, EL-3, J block
				M.I.D.C Bhosari, Pune -411026,
				India
				Phone: +91 (20) 2710-2000 Fax:
				+91 (20) 2710-2100
				Pune Sales Office
				301-302, Lunkad sky Station, near
				HDFC Bank, Viman Nagar,
				Pune-411 014, India
				Phone: +91 (20) 4131-4868 Fax:
				+91 (20) 4131-4851
				Pune Sales Office
				F-2, Gurutej Bahadur, Housing
				Society, Aundh Road, Khadki,
				Pune - 411003, India
				Phone: $+91(20)2582-04477448$
				/ 449 Fax: +91 (20) 2582-0450
				305 306 3rd Eloor "Windfall"
				Sober Diaza Complex Next to
				Kohinoor Hotel Andhori Kurda
				Road I B Nagar Andheri (E)
				Mumbai-400 059 India
				Phone: +91 (22) 6611_6200 Ease
				+91 (22) 6611-6299
				Chennai Sales Office
				Citilights Corporate Centre No.1.

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Vivekananda Road, Srinivasa Nagar, Chepet, Chennai-600 031, Tamilnadu, India Phone: +91 (44) 4923-2222 Fax: +91 (44) 4923-2249
				Hyderabad Sales Office 4th Floor, Unit No.407, Ashok Bhopal Chamber S.P. Road, Secunderabad, A.P-500 003, Andhra Pradesh, India Phone: +91 (40) 4343-8888 Fax: +91 (40) 4343-8899
				Chandigarh Sales Office SCO 176, First Floor, Sector 38 C, Chandigarh – 160036, India Phone: +91 (172) 460-1645
				Jaipur Sales Office 111, Ground Floor, Apex Mall, Tonk Road, Jaipur, India Phone: +91 (141) 401-1109
				Ahmedabad Sales Office 303 / A, 3rd Floor, Primate, Judges Bungalow Cross Road, Bodakdev , Ahmedabad Gujarat – 380054, India
				Coimbatore Sales Office No 551A, West Lokmanya Street, DB Road, RS Puram , Coimbtore - 641002, India Phone: +91 (422) 438-5600
				Vadodara Sales Office A - 1/2, 2nd Floor, Status Plaza, Opp Relish Resort Aksar Square, O.P Road, Vadodara -390020, India Phone: +91 (265) 231-4699/ 235- 8137 Fax: +91 (265) 233-3307
				Kochi Sales Office Room No G9, Building Door No CC: 39/5102-A-6, Netage Arcade Church Landing Road Ernaculum, Kochi-682016, India Phone: +91-9846013451 / +91- 8129445670
				Mitsubishi Elevator ETA India Pvt. Ltd. Chennai Citi Centre, 5th Floor, 10 & 11, Dr.R.K. Salai, Mylapore, Chennai - 600004, India Phone: +91 (44) 2847-7370 Fax:

Sr.		Product	D 1	
No.	Product Name	Sub Category	Brand	Address / Contact Details
				+91 (44) 2847-7374
			Panasonic	Given Above
			Samsung	Given Above
			Sanyo	Given Above
			TCL	Given Above
			Toshiba	Given Above
			Videocon	Given Above
			Voltas	Given Above
			Whirlpool	Given Above
	Refrigerators	Direct Cool	BPL	Given Above
			Electrolux	Given Above
			Gem	Given Above
			Godrej	Given Above
			Haier	Given Above
			Kelvinator	
			LG	Given Above
			Panasonic	Given Above
			Samsung	Given Above
			Videocon	Given Above
			Whirlpool	Given Above
		Frost Free	BPL	Given Above
			Electrolux	
			Godrej	Given Above
			Haier	Given Above
			Hitachi	Given Above
			Kelvinator	
			LG	Given Above
			Panasonic	Given Above
			Samsung	Given Above
			Videocon	Given Above
			Whirlpool	Given Above
			Toshiba	Given Above
			Sharp	Given Above
				Registered & Corporate Office
				130, Pandurang Budhkar Marg,
			Siemens	Worli, Maharashtra,
				Mumbai $400\ 018$.
				Tel: +91 22 3967 7000
				Fax: +91 22 3967 7500
				Ground Floor B 28 Okhla
	Mobile Phones		Acer	Bhase J New Delhi
	MODIC I HOIICS			110020 Delbi India
				Tel: $+(91)-(11)-40568000$
				India Office
			Alcatel	TCT Mobile International
				Limited,

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
110.		Category		
				Elegance Tower, Regus Business
				Centre, 2nd Floor, Room
				No.252B Jasola, New Delhi-
				110025
				Distributors
				Encon Impex Private Limited,
				Super Distributor
				No 45 2nd Floor Vinavaka
				Electronic Plaza 1st Cross S.P.
				Road Bangalore - 560.002
				Kochi Kerala
				Talktime Telesystems Super
				Distributor
				Talktime Telesystems, 48/425B.
				Main road, Elamakkara,Kochi-
				682026.
				Tirunelveli, Tamil Nadu
				KM Enterprises,Super
				Distributor
				KM Enterprises, No 41 E/3,
				Vasanthapuram, South Bye-Pass
				road, Tirunelveli-627005
				Karimnagar,Andhra Pradesh
				SR Technologies,Micro
				Distributor
				SR Technologies, No 1-5-89,
				Aravindh Nagar, Jagtial,
				Karımnagar, Andhra Pradesh.
				Amazon Development Center
				India Pvt Ltd
				Q-city, 2nd Floor-Block A &
				BIOCK B Second Second
			Amazon	Survey Number-109,110,111/2,
				Serlingamplaw Mandal Ranga
				Reddy Dist
				Hyderabad - 500032
				Ph: 040 39921111
				Divvashree Building, Ground
				Floor, Plot No: 6
				Hi-Tech City Layout, Survey No.
				64(Part), Madhapur Village
				Serilingampally Mandal
				Hyderabad - 500081
				Ph: 040 43451000
				9th & 10th Floor,
				Bulding #9, Raheja Mindspace

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Madhapur Hyderabad - 500081 Ph: 040 40005111
				#40,3rd Floor, SP Infocity M G R Salai, Perungudi Kandanchavady Chennai-600096
				Ph: 044 30883088 2nd Floor, Safina Towers
				Opposite J.P. Techno park No.3, Ali Asker Road Bangalore - 560052 Ph- 080 41970000
				Brigade Gateway 6th floor 26/1, Dr. Rajkumar Road Malleshwaram(W) Bangalore-560055 Ph: 080 33273000
			Apple	Apple India Private Limited 19 Floor, Concorde Tower C, UB City No 24 Vittal Mallya Road Bangalore 560-001
			Benefon	Presentec GmbH Große Elbstraße 117 DE-22767 Hamburg Phone: +49 (0)40 300 6683 0 Fax: +49 (0)40 300 6683 29
			BenQ	BenQ India Pvt. Ltd. 3rd Floor, 9B Building, DLF Cyber City, DLF Phase 3, Gurgaon 122002, Haryana.
			Bird	Ningbo Bird Co.,Ltd. No.999, Dacheng East Road, Fenghua City, Zhejiang Province, P.R.China Tel : +86 574 88953465, +86 755 36878286 Fax: +86 574 88951025, +86 755 36878284 Postcode: 315500
				US & Latin Americas Tel: +86 574 88953465 Mobile: +86 13738470409
			BlackBerry	Corporate Head Office BlackBerry B 2200 University Ave. E Waterloo, ON, Canada N2K 0A2

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Tel: (519) 888-7465
				Fax: (519) 888-7884
				BlackBerry United States
				BlackBerry
				5000 Riverside Drive,
				Irving,
				TX 75039
				Tel: (972) 373-1700
				Fax: (9/2) 650-2006
				BlackBerry Europe
				BlackBerry
				200 Bath Road
				Slough, Berkshire
				United Kingdom SLI $3XE$
				For: $\pm 44 (0)1753 669070$
				Mapufacturing Eacility
				BlackBerry
				451 Phillip Street
				Waterloo Ontario
				Canada N2L 3X2
				Tel: (519) 888-7465
				Fax: (519) 888-0021
				Ottawa
				BlackBerry
				4000 Innovation Drive
				Kanata, Ontario
				Canada K2K 3K1
				Tel: (613) 599-7465
				Fax: (613) 599-1922
				Mississauga
				BlackBerry
				4/01 Tahoe Boulevard
				Mississauga, Ontario
				Canada L4W 0B5 Tal. (0.05) 620, 4746
				Ferry (005) (629-4740)
				BLU Product o
				10814 NW 33rd St# 100
			BLU	Doral FL 33172
				(305) 715 - 7171
				Bosch Sicherheitssysteme GmbH
				Robert-Bosch-Ring 5
			Bosch	85630 Grasbrunn
				GERMANY
				Tel: +49 (0) 89 6290-0
				Bosch Security Systems
				130 Perinton Parkway

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
110.		Category		
				Fairport, New York, 14450
				Tel: +1 585 223 4060
				Bosch Security Systems Pte Ltd
				11 Bishan Street 21
				Singapore 5/3943
				$\frac{\text{SINGAPORE}}{\text{Tab} \pm 65.6571.2909}$
				Reach Sequeity Systems B V
				Postfach 80002
				5600 IB Findboven
				THE NETHERLANDS
				Tel: +31 (0) 40 25 77 284
				Casio India Co. Private Ltd.
				210, 1st Floor, Okhla Industrial
				Estate, Phase-III,
			Casio	New Delhi-110020
				Tel: 011-66999200
				Fax: 011-41054330
				601, 6th Floor, Crescent Plaza,
				Telly Gulli, Andheri(E),
				Mumbai-69,
				Ph.: 022-60605005
				No.7, Shah Complex, 2nd Floor,
				9th Main, 5th Block Jayanagar,
				Bangalore- 41,
				Ph.: 080-60605005
				3rd Floor, Heera Panna Complex,
				T Neger Change 17
				1.1 Nagar, Chennai-17,
				2rd Eloor 3.4.630
				Padma Plaza Opposite Ratna
				College
				Naravanguds Hydrabad-29
				Ph.: 040-60605005
				4C, Lansdowne Place,
				2nd Floor, Kolkata-29,
				Ph.: 033-60605005
				CELKON IMPEX PVT LTD.
				3rd floor, 2nd block, MY HOME
			Collicon	HUB,
			Ceikon	Madhapur, Hyderabad - 500081,
				Andhra Pradesh, India.
				Contact : +91 90523 45678
				Spectrum House, Dunstable
			Chea	Road, Redbourn, Hertfordshire,
1	1		1	AL3 7PR

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
10.		Category		
				Tel: 01923 383828 International: +44 (0)1923 383828
			Dell	Dell Computer Corporation One Dell Way Round Rock, Texas 78682 Tel: (888) 560-8324 (800) 915-3355
			Ericsson	ERICSSON INDIA PRIVATE LIMITED Ericsson Forum DLF Cyberciti Sector-25A, Gurgaon Haryana Postal code: 122 002 Phone: +91 124 4080808, +91 124 2701001
			Fujitsu Siemens	Shiodome City Center 1-5-2 Higashi-Shimbashi, Minato- ku Tokyo 105-7123, Japan Tel: +81-3-6252-2220
			Gigabyte	Gigabyte Technology India Private Limited +91-22-40633222
			Haier	Given Above
			НР	Hewlett-Packard India Sales Pvt.Ltd 24, Salarpuria Arena Adugodi Hosur Road Bangalore - 560 030 Phone: (080) 33824000 / 33829000
				Hewlett-Packard India Sales Pvt. Ltd 501, 5th Floor, Satkar Complex Behind Swagath Building Off C.G.Road, Navrangpura Ahmedabad - 380 001
				Hewlett-Packard India Sales Pvt. Ltd. 24, Salarpuria Arena Building Adugodi, Hosur Road Bangalore - 560 030
				HP GR Tech Park Facility 10th & 11th floor, B wing, Akash Block, 6-9 floor, B wing, Akash Block, 0-3rd Floor, B wing, Akash

Sr. No.	Product Name	Product Sub	Brand	Address / Contact Details
		Category		Dla ala
				Block, Salaman CD Track Daula
				Salarpuria GR Tech Park,
				Sy INO.09/ 5, Whitefield Road,
				Next to 11PL,
				Bangalore - 560 066. India.
				Hewlett-Packard GlobalSoft
				Limited
				HP Avenue
				39/40, Electronics City-I
				Hosur Road
				Bangalore - 560 100
				Global e-Business Operations
				Pvt. Ltd.
				Wind Tunnel Road
				Tower 1, GVH, Murugeshpalya
				Murugeshpalya
				Bangalore - 560 017
				Hewlett-Packard India Sales Pvt.
				Ltd.
				No. 66/2, Ward No. 83,
				Bagmane Tech-Park
				4th Floor, Wing A,
				Embassy Prime, CV Raman
				Nagar,
				Bangalore - 560 093
				Survey No. 192,
				Whitefield Road,
				Mahadevpura Road,
				Bangalore - 560 048
				III Floor, Khanija Bhavan,
				49, Race Course Road,
				Bangalore - 560 001
				Surya Park 2,
				No.100, Ring road,
				Bangalore - 560 100
				Surya Wave,Sy # 61(p),
				Electronic City, Hosur Road
				Bangalore - 560 100
				Prathik Tech Park,
				Survey No 93/1, Veerasandra
				village,
				Attibele Hobli, Anekal Taluk,
				Electronic City Extension
				Bangalore - 560 100
				Hewlett-Packard India Sales
				Pvt.Ltd
				No.2, KRM Plaza,
				Harrington Road,
Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
------------	--------------	----------------------------	-------	--
				Cheppai - 600 031
				Plot 1, Olympia Technology park, Citius block, SIDCO industrial
				estate, Guindy, Chennai - 600 032
				Block 1, 4F - 6F Block 1, G - 3F
				First Software Park,
				110 Mount Poonamalle Road, Porur
				Ground floor, Crowne Plaza
				New Friends Colony, New Delhi - 110065 .
				Hewlett-Packard India Sales Pvt.
				No.18, ilabs Centre,
				4th Floor, D- Block,
				5th Floor, C - Block, 5th Floor, D - Block
				Madhapur,
				Hyderabad - 500 081
				Hewlett Packard India Sales Private Limited
				Building No:-02, DLF
				Cybergreen,
				1st to 4th floors, Towers D & E,
				DLF Cyber City, Phase III,
				India
				Phone:(0124) 3886000
				Fax: (0124) 3886941
				Hewlett-Packard India Sales Pvt
				Ltd.
				Plot No. 9-11A & 35-3/A,
				Integrated Industrial Estate
				Pantnagar (SIDCUL),
				Rudrapur, US Nagar - 263 153.
				Uttaranchal State, India
				No 08, Major Arteral Road,
				Block - AF New Iown 1st Floor,
				Kolkata- 700 156
				West Bengal.
				Unit No. 16N & 17, 16th & 17th

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
10.		Category		
				Floor,
				Oberoi Commerz, International
				Business Park,
				Oberoi Garden City, Off.
				Western Express Highway,
				Goregoan,
				Mumbai - 400 063
				Maharastra.
				Hewlett-Packard India Sales
				Pvt.Ltd.
				Level 6, Pentagon P-2,
				Magarpatta City,
				Hadapsar
				Pune - 411 028
			HTC	1800 266 3566
				Huawei Telecommunication
				(INDIA) Co. Pvt Ltd.
				7 th Floor, Tower A,
			L Interne:	Spaze I-Tech Park, Sohna Road,
			riuawei	Sector-49
				Gurgaon, Haryana-122001 India
				Tel: +91-124-4774700
				Fax: +91-124-4774863
				Huawei
				9th Floor, Tower 6, The Gateway,
				No. 9, Canton Road, Tsim Sha
				Tsui,
				Kowloon, Hongkong
				Tel: 00852-21253888
				Fax: 00852-21253889
				Karbonn Mobiles
				#39/13, off 7th main, HAL 2nd
			Karbonn	stage
			Karbolili	Appareddy Palya, Indiranagar,
				Bangalore – 560038
				Tel: 080 40894888
				Karbonn Mobiles
				D-170, Okhla Industrial Area,
				Phase-1
				New Delhi – 110020
				011 46604660
				KYOCERA Corporation
				Cutting Tool Group
				6 Takeda, Tobadono-cho,
			Kyocera	Fushimi-ku, Kyoto 612-8501,
				Japan
				Phone: +81-75-604-3473
				Fax: +81-75-604-3472

St. Product Name Sub Brand Address / Contact	t Details
Category	
KYOCERA Asia Pac	cific India
Pvt. Ltd.	
1001A, 1001B, 1002, 1	10th Floor
JMD Regent Square, N	M.G. Road
Dhanny + 01 124 402 5	yana, India
Findle: $\pm 91-124-402-5$	30000
1'ax. ±91-124-402-500	/1
Eeros Icon Level -2	
Doddenakund Village	
Marathhalli Outer Rin	g Road
Lenovo Marathhalli Post. Kr P	g Road,
Hobli	urani
Bangalore-560037	
Phone No. :080-3053?	3000
Lenovo India Pvt.Ltd	
Vatlka Business Park 1	lst
floor,Badshah Pur Roa	ad,
Sec-49,	,
Sohna Road,	
Gurgaon-122001	
Phone No. : 0124-431	5600
Lenovo India private l	td
MLS Business Centres	s India Pvt.
Ltd.	
6th Floor, Block A, 22	2, Camac
Street	
Kolkata - 700 016.	
MPh no: 033 - 4019-22	234 TO
4019-2239	
FAX - 033 - 40192240)
#1011-12, Solitaire Co	orporate
Park,	A 11 -
Building No.10,1st Flo	oor,Andheri
Chakala Andhari (Fas	,
Unakaia, Andren (Eas	st),
$\frac{1}{2}$	17000/100
Lenovo India Pyt I td	+/000/100
2nd Floor Kuppu Arc	ade 4
Venkatanarayana Road	1.
T.Nagar Chennai 600	,
Phone No. : 044-3915	9273
LG Given Above	
Maxon CIC Europe Ltd	
Maxon House	
Maxon Cleveland Road	
Hemel Hempstead Herts	s

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
No.	11000001100000	Category		
				United Kingdom
				Tel: +44 (0) 1442 267777
				Future Technology Enterprise
				Ltd.
			Meizu	Unit 01-02, 19/F, Hollywood
			WICIZU	Plaza, 610 Nathan Road,
				Mongkok, Kowloon, Hong Kong
				Tel: (852) 2388 8022
				Micromax House,
				90B,Sector-18,Gurgaon
			Micromax	Pin Code - 122015
				Tel: +91-124-4811000
				Fax: +91-124-4009603
				Micromax House,
				90B,Sector-18,Gurgaon
				Pin Code - 122015
				1ei: +91-124-4811000
				Fax: +91-124-4009605
				Nicromax House,
				Pub, Sector-18, Gurgaon
				Tal: 18605008286
				F_{av} : +91 124 4009603
				Micromax Informatics I td. Plot
				No 234 HPSIDC Industrial Area
				Tehsil Nalagarh Distt Solan
				(HO)-173205
				Microsoft Corporation
			Microsoft	One Microsoft Way
				Redmond, WA 98052-6399
				MiTAC products or general
			Mitac	company enquiries
				Tel: 886-2-26525888
			Mitsubishi	Given Above
				Motorola Mobility, Inc.
			Motorola	600 North U.S. Highway 45
				Libertyville, Illinois 60048 USA

SI No	No Name Address		Latitude			Lognitute			
51. 1 (0.	ivanc	nuiress	Dig.	Min.	Sec.	Dig.	Min.	Sec.	
	L	Bastar							
1	Kamal Electronics	Dharampura No-2, Jagdalpur, Bastar	19	5	41.2	1	59	43.9	
2	Sarojni Electronics	Near Anupam Takies, Jagdalpur, Bastar	19	5	12.7	81	0	58.0	
3	Rahul Enterprises	State Bank Road, Chadni Chowk, Jagdalpur, Bastar	19	5	7.8	82	1	30.6	
4	Sajawat (Electronics)	Chadni Chowk, Jagdalpur, Bastar	19	5	9.2	82	1	32.5	
5	Sony	Infront of Maharani Hospital, Chadni Chowk, Jagdalpur, Bastar	19	5	6.8	82	1	25.4	
6	Vimal Electronics	Infront of New Narendra Theater, Chadni Chowk, Jagdalpur, Bastar	19	5	9.2	82	1	21.2	
7	Rajeev Electronics	Sirasar Chowk, Jagdalpur, Bastar	19	5	25.9	82	1	25.7	
8	Golden Marketing	Sirasar Chowk, Jagdalpur, Bastar	19	5	26.8	82	1	24.4	
9	Meru Electronics (Samsung)	Sirasar Chowk, Jagdalpur, Bastar	19	5	28.1	82	1	24.8	
10	Mahaveer Electronics	Gol Bazar, Jagdalpur, Bastar	19	5	25.1	82	1	23.9	
11	K.C. Electronics	Gol Bazar, Jagdalpur, Bastar	19	5	25.2	82	1	23.8	
12	Sai Electronics	Gol Bazar, Jagdalpur, Bastar	19	5	23.2	82	1	23.9	
13	MIB Shopping	Thakur Road, Gol Bazar, Jagdalpur, Bastar	19	5	21.4	82	1	29.9	
14	Tulsi Electronics	Main Road, Gol Bazar, Jagdalpur, Bastar	19	5	19.1	82	1	29.0	
15	Khurana Radio	Main Road, Gol Bazar, Jagdalpur, Bastar	19	5	17.5	82	1	29.8	

Partial List of Distributor, Trader & Retailer in Bilaspur Division – Annexure 2

SI No	Name	Address	Latitude			Lognitute					
51, 140,	Traine	nucless	Dig.	Min.	Sec.	Dig.	Min.	Sec.			
	Agarwal Sale	Main Road, City Kotwali,		_							
16	9	Jagdalpur, Bastar	19	5	16.0	82	1	32.9			
17	Kushal Furniture	Pratap Word, Near Sakal Jain Mandir Jagdalour Bastar	19	5	18.9	82	1	22.3			
		Manun, Jaguaipur, Dastar									
18	Sai Deep Enterprises	Hospital Road, Bastar Tahsil, Bastar	19	12	18.2	81	56	6.9			
19	Siddhi Palace	Jagdalpur Road, Bastar Tahsil, Bastar	19	12	18.6	81	56	11.6			
Kondagaon											
20	Saukin House	Main Road, Kondagaon	19	35	32.0	81	39	46.4			
21	Vijay Electronics	Main Road, Kondagaon	19	35	45.6	81	39	54.2			
22	Ashak Electronica	Gandhi Ward Kondasson	10	36	25.6	Q1	40	50			
22	ASHOK Electronics	Gandini ward, Kondagaon	19	30	23.0	01	40	5.2			
23	Reet Electroics	Jamkot Para Road, Main Market, Kondagaon	19	36	1.2	81	40	4.9			
24	Sandeep Sajawat	Jamkot Para Road, Main Market, Kondagaon	19	35	44.4	81	39	53.8			
25	R.K.Enterprises	Gandhi Ward, Kondagaon	19	35	42.3	81	39	51.6			
26	Solanki Electronics	Shitala Para, Kondagaon	19	35	32.3	81	39	47.0			
27	Sidh Electronics	Main Road, Kondagaon	19	35	27.6	81	39	45.5			
28	Nanak Bhai Electronics	Sargipal Para, Kondagaon	19	35	23.6	81	39	33.6			
29	Navkar Traders	Main Road, Keshkal, Kondagaon	20	5	14.6	81	35	26.7			
30	Rathi Metal & Electronics	Main Road, Keshkal, Kondagaon	20	5	2.8	81	35	20.8			
31	Payal General & Electronics	Pharasgaon Road, Keshkal, Kondagaon	20	4	51.8	81	35	15.5			
32	Muskan General & Electronics	Bargaon, Keshkal, Kondagaon	20	4	44.7	81	35	14.4			
33	Versha Electronics	Main Road, Pharasgaon, Kondagaon	19	51	44.3	81	38	7.7			

SI No	Name	Address	Latitude			Lognitute				
51. 140.	Ivanic	Address	Dig.	Min.	Sec.	Dig.	Min.	Sec.		
34	Lucky Electronics	Main Road, Pharasgaon, Kondagaon	19	51	43.1	81	38	8.9		
Sukma										
35	Niaz Electronics	New Bus Stand, Bajar Rd., Chhindgarh, Sukma	18	31	31.2	81	45	15.1		
36	Maheshwari Electronics	Old Bus Stand, Sukma	18	23	25.0	81	39	32.6		
37	S M Electronics	Opp. State Bank, Sukma	18	23	20.3	81	39	33.5		
38	Prachi Electronics	Ward No13, Sukma	18	23	20.8	81	39	32.7		
Dantewada										
39	Raj Enterpirse	Main Rd., Dantewada	18	53	29.7	81	20	48.4		
40	Mansi Electronics	Main Rd., Dantewada	18	53	21.5	81	20	51.8		
41	Vandna Electronics	Paraspal Chock, Dantewada	18	53	21.5	81	20	52.9		
42	Regal Electronics	Main Rd., Dantewada	18	53	19.0	81	20	53.4		
43	Sai Electronics	Gram Post Nakulnar, Kuwa Konda	18	43	32.0	81	25	4.8		
44	Sri Shakti Electronics	Nakulnar, Kuwa Konda	18	43	44.8	81	24	26.0		
		Bijapur		I		I	I			
45	Baghed Electronics	Purana Petrol Pump, Bijapur	18	48	2.6	80	48	45.5		
46	E-Point	Indra Marekt, Bijapur	18	47	39.9	80	49	0.8		
47	Sanjay Treading Company	Indra Marekt, Bijapur	18	47	41.5	80	48	59.9		
48	Sanjay Treading Company	Main Rd., Bijapur	18	48	3.5	80	48	44.1		
		Narayanpur								
49	Raj Luxary Sofa Mark	Sonpur Rd., Chandni Chock, Narayanpur	19	43	7.0	81	14	38.2		
50	Samrat Furniture	Sonpur Rd., Narayanpur	19	43	6.6	81	14	45.5		

SI No	Name	Address	Latitude			Lognitute				
01. 1 10.	TVallie	nuitss	Dig.	Min.	Sec.	Dig.	Min.	Sec.		
	· · · · · · · · · · · · · · · · · · ·									
51	Jagdish Chand Pawan Kumar Shop	Sonpur Rd., Narayanpur	19	43	6.6	81	14	46.4		
52	Sidharth Traders	Chandni Chock, Narayanpur	19	43	6.3	81	14	48.8		
53	Ariyant Saigel Electronics	Main Rd., Narayanpur	19	43	6.8	81	14	50.4		
Kanker										
54	Lakshmi Electronics	Near Jain Mandir, Main Rd., Anthagarh	20	5	44.5	81	9	26.8		
55	Lakshmi Bartan Bhandar Furniture & Electronics	Near Gramin Bank, Main Rd., Anthagarh	20	5	47.5	81	9	27.4		
56	Patel Enterprises	Ward No8, Shyam Nagar, Anthagarh	20	5	53.2	81	9	26.6		
57	Rahul Electronics	Veer Narayan Chock, Anthagarh	20	5	38.5	81	9	27.6		
58	Ma Parmeshwari Electronics	Awas Para, Naharpur	20	26	49.2	81	37	21.9		
59	Hari Om Furniture & Electronics	Atal Bihari Vajpai Ward, Naharpur	20	26	48.9	81	37	16.5		
60	Kabir Radio	Infront of Janpat Panchayat office, Charama, Kanker	22	29	12.0	81	22	17.8		
61	Navkar Electronics	Makadi Road, Charama, Kanker	20	29	22.9	81	22	12.0		
62	Amar Radio	Makadi Road, Charama, Kanker	20	29	23.7	81	22	12.1		
63	Sri Bhagwati Enterprises	Dhamtari Road, Charama, Kanker	20	29	25.8	81	22	11.1		
64	Shani Electronics	Dhamtari Road, Charama, Kanker	20	29	26.9	81	22	10.2		
65	Devendra Electronics	Main Road, Charama, Kanker	20	29	26.6	81	22	10.2		
66	Jatwani Furniture & Electronics	Din Dayal Chowk, Charama, Kanker	20	29	34.8	81	22	7.1		
67	Gopi Electronics	Sadar Bazar, Charama, Kanker	20	29	29.6	81	22	6.6		

SI No	Name	Address	Latitude			Lognitute		
01. 1 (0.	i vanic	induite 35	Dig.	Min.	Sec.	Dig.	Min.	Sec.
68	Astha Enterprises	Sadar Bazar, Charama, Kanker	20	29	29.8	81	22	6.7
69	Chhaya Enterprises	Anapara, Main Road, Kanker	20	16	19.5	81	29	31.5
70	R.K.Suppliers	Old Kachahari Chowk, Kanker	20	16	12.0	81	29	28.1
71	Gupta Electronics	Cinema Chowk, Kanker	20	16	9.5	81	29	26.9
72	Amit Electronics	Cinema Chowk, Kanker	20	16	8.9	81	29	26.7
73	New Ranjeet Enterprises	Cinema Chowk, Kanker	20	16	8.9	81	29	26.8
74	Hind Radio	Manjha Para, Kanker	20	16	5.2	81	29	26.3
75	Prakash Electronics	Gilli Chowk, Kanker	20	16	7.3	81	29	27.5
76	Ganpati Electronics	Gilli Chowk, Kanker	20	16	3.1	81	29	31.2
77	Sheetal Electronics	Daily Market, Kanker	20	16	5.0	81	29	35.4
78	DeepaK Electronics	Manjha Para, Kanker	20	16	4.1	81	29	32.5
79	Ahuja Radio	Manjha Para, Kanker	20	16	5.4	81	29	33.7
80	Ahuja Electronics	Manjha Para, Kanker	20	16	5.5	81	29	34.4
81	Dhannamal Gullumal Electronics	Manjha Para, Kanker	20	16	8.2	81	29	35.8
82	Agarwal Electronics	New Bus Stand, Kanker	20	15	50.3	81	30	0.0
83	Jeetu Electronics	Near Bus Stand, Durgu Kondal Kanker	20	13	10.5	80	56	42.7
84	Shree Radha Electronics	Sambhalpur Road, Main Chowk, Durgu Kondal Kanker	20	13	9.9	80	56	41.7
85	Akash Electronics	Dalli Road, Bhanu Pratap Pur, Kanker	20	18	40.2	81	4	17.3
86	Shankar Variety	Near Bus Stand, Bhanu Pratap Pur, Kanker	20	18	34.6	81	4	9.2
87	Manokamna Electronics	Shambhalpur Road, Bhanu Pratap Pur, Kanker	20	18	35.0	81	4	11.3

Sl. No.	Name	Address		Latitude			Lognitute		
			Dig.	Min.	Sec.	Dig.	Min.	Sec.	
88	Nirmal Agency	Shambhalpur Road, Bhanu Pratap Pur, Kanker	20	18	35.1	81	4	11.7	
89	Santosh Electronics	Main Market, Bhanu Pratap Pur, Kanker	20	18	35.0	81	4	12.4	
90	Aishwarya Electronics	Main Market, Bhanu Pratap Pur, Kanker	20	18	35.4	81	4	14.5	
91	Radio Corner	Main Market, Bhanu Pratap Pur, Kanker	20	18	35.8	81	4	14.5	
92	Star Radio	Main Road, Bhanu Pratap Pur, Kanker	20	18	35.7	81	4	15.6	
93	Sonu Electronics	New Market, Pakhunja, Kanker	20	1	59.6	80	37	33.3	
94	Ray Electronics	New Market, Main Road, Pakhunja, Kanker	20	1	59.9	80	37	33.1	
95	Rajesh Electronics	New Market, Main Road, Pakhunja, Kanker	20	2	0.3	80	37	33.2	
96	Khusi Traders	Near Post office, Main Road, Pakhunja, Kanker	20	2	14.6	80	37	29.3	

SI No	Nama	Address	I	Latitud	e	Lognitute		
51. 190.	Iname	Address	Dig.	Min.	Sec.	Dig.	Min.	Sec.
		Bastar	<u> </u>	<u> </u>	<u> </u>		<u> </u>	<u> </u>
1	Collectrate office	Jadgalpur	19	4	52.0	82	1	16.9
2	PWD Office	Jadgalpur	19	4	54.5	82	1	23.2
3	Tahsil office	Jadgalpur	19	5	25.4	82	1	14.9
4	Zila Panchayat office	Jadgalpur	19	4	51.5	82	1	2.9
5	Nagar Palika Office	Jadgalpur	19	4	45.9	82	1	0.9
6	Tahsil office	Darbha	18	52	16.4	81	52	10.5
7	Tahsil office	Bastanar	18	59	16.9	81	38	12.1
8	Tahsil office	Tokapal	18	0	43.5	81	52	32.0
9	Nagar Panchayat Office	Bastar	19	12	13.9	81	56	2.0
10	Tahsil office	Bastar	19	12	7.7	81	56	3.5
		Kondagaon		,			,	,
11	Zila Panchayat office	Kondagaon	19	35	17.1	81	39	47.5
12	Tahsil office	Kondagaon	19	35	16.8	81	39	41.9
13	Collectrate office	Kondagaon	19	34	38.2	81	40	4.7
14	Lok Sewa Kendra	Kondagaon	19	34	38.9	81	40	4.6
15	Nagar Palika Office	Kondagaon	19	35	15.0	81	40	9.8
16	Nagar Pachayat Office	Kesh Kal	20	4	57.4	81	35	19.7
17	Vyavhar court	Kesh Kal	20	4	57.9	81	35	18.6
18	Tahsil office	Pharasgaon	19	50	22.4	81	38	35.9
		Sukma						
19	Tehsil Office	Jagdalpur Rd., Tehsil Parisar, Chhindgarh, Sukma	18	32	25.2	81	44	54.6
20	Janpad Office	Main Rd, Chhindgarh, Sukma	18	32	15.5	81	45	0.0

Partial List of Bulk Consumers in Bilaspur Division- Annexure 3

SI No	Name	Address	Latitude			Lognitute						
01. 1 10.	itunic	induite 55	Dig.	Min.	Sec.	Dig.	Min.	Sec.				
21	PWD Office	Near New Bus Stand, Sukma	18	23	30.3	81	39	31.6				
22	Nagar Palika	Nagar Palika Parishad, Sukma	18	23	28.3	81	39	31.9				
23	SDM Office	SDM Karyalya, Sukma	18	23	28.8	81	39	32.4				
24	Tehsil Office	Tehsil Parisar, Sukma	18	23	27.5	81	39	32.1				
	Dantewara											
25	Janpad Office	Barseli, katekalyan	18	48	0.2	81	39	9.9				
26	Tehsil Office	Barseli, katekalyan	18	48	0.9	81	39	11.2				
27	Janpad Office	Janpad Panchayat, Chitalanka, Dantewara	18	54	57.9	81	20	35.5				
28	RTO Office	Main Rd., Chitalanka, Dantewara	18	54	44.0	81	20	38.2				
29	Collectrate Office	Amra Pata, Dantewada	18	54	36.1	81	20	39.5				
30	Tehsil Office	Amra Pata, Dantewada	18	54	36.2	81	20	39.6				
31	Court	Amra Pata, Dantewada	18	54	27.6	81	20	42.3				
32	Nagar Palika	Opp. JAD Colony, Dantewara	18	54	0.1	81	20	48.5				
33	Tehsil Office	Tehsil Parisar, Kuwa Konda	18	43	34.5	81	25	7.3				
34	Janpad Office	Nakulnar, Kuwa Konda	18	43	27.7	81	25	2.5				
		Bijapur										
35	Jila Panchayat	Dantewara Rd., Bijapur	18	48	16.3	80	48	22.8				
36	Collectrate Office	Dantewara Rd., Bijapur	18	48	15.0	80	48	20.8				
37	Janpad Office	Panara Pari Chock, Bijapur	18	48	49.4	80	47	49.3				
38	Nagar Palika	Sanchi Nagar, Bijapur	18	47	59.2	80	48	9.2				
39	Tehsil Office	Purana Bus Stand Para, Bijapur	18	47	33.4	80	49	0.1				
40	RTO Office	Indra Market Rd., Bijapur	18	47	32.5	80	49	2.8				
41	PWD Office	Main Rd., Bijapur	18	47	47.9	80	48	55.2				

SI No	Name	Address	Latitude			Lognitute				
51. 140.	ivanic	nuuress	Dig.	Min.	Sec.	Dig.	Min.	Sec.		
		Narayanpur								
42	PWD Office	Jai Stambh Chock, Narayanpur	19	43	16.8	81	14	41.7		
43	Nagar Palika	Subash Chock, Narayanpur	19	43	8.2	81	14	19.6		
44	Tehsil Office	Main Rd., Narayanpur	19	43	14.0	81	14	47.3		
45	Collectrate Office	Mahaka Gram, Narayanpur	18	43	22.5	81	14	12.7		
Kanker										
46	Nagar Panchayat	Rajiv Gandhi Chock, Anthagarh	20	5	57.0	81	9	30.9		
47	Janpad Office	Bajar Para, Anthagarh	20	5	57.7	81	9	36.3		
48	Tehsil Office	Naya Para, Anthagarh	20	6	4.0	81	9	41.3		
49	Tehsil Office	Dantewara Rd., Narharpur	20	26	59.6	81	37	37.3		
50	Janpad Office	Dantewara Rd., Narharpur	20	27	4.1	81	37	41.8		
51	Nagar Palika	Dantewara Rd., Narharpur	20	27	6.3	81	37	42.1		
52	PWD Office	Dantewara Rd., Narharpur	20	26	87.2	81	37	35.6		
53	Janpad Office	Opp. Staff Colony, Pakhunja	20	2	7.4	80	37	31.1		
54	Nagar Panchayat	Naya Bajar, Pakhunja	20	1	55.3	80	37	36.2		
55	Tehsil Office	Kali Mandir Rd. Pakhunja	20	2	20.7	80	37	34.9		
56	Tahsil office	Charama	20	29	16.0	81	22	14.5		
57	Zanpat Panchayat office	Charama	20	29	14.5	81	22	15.8		
58	Collectrate office	Kanker	20	15	57.8	81	29	55.1		
59	Nagar Palika Office	Kanker	20	15	55.9	81	29	55.4		
60	Tahsil office	Durgu Kondal	20	13	18.1	80	56	48.9		
61	Mahila & Bal Vikas office	Durgu Kondal	20	13	19.2	80	56	47.3		
62	Zanpat Panchayat office	Durgu Kondal	20	13	20.5	80	56	47.6		

Sl. No.	. No. Name Address		Latitude			Lognitute		
			Dig.	Min.	Sec.	Dig.	Min.	Sec.
63	Nagar Panchayat Office	Bhanu Pratap Pur	20	18	38.5	81	4	26.3
64	Tahsil office	Bhanu Pratap Pur	20	18	38.9	81	4	25.0

01 N	NI	A 11	Latitude			Lognitute		
51. INO.	Name of Shops	Address	Dig.	Min.	Sec.	Dig.	Min.	Sec.
		Bastar		<u></u>				
1	Mayak Electronics	Dharampura No-2, Bazar Chowk, Jagdalpur, Bastar	19	5	38.5	81	59	52.6
2	Sarojni Electronics	Near Anupam Takies, Jagdalpur, Bastar	19	5	12.7	81	0	58.0
3	Golden Electronics	Geedam Road, Jagdalpur, Bastar	19	5	5.1	82	1	2.1
4	Khan Electronics	Geedam Road, Jagdalpur, Bastar	19	5	5.0	82	1	2.5
5	Speed Refrigeration	Infront of PWD office, Chadani Chowk, Jagdalpur, Bastar	19	4	54.2	82	1	23.6
6	Vinay Refrigeration	Chadani Chowk, Jagdalpur, Bastar	19	5	1.3	82	1	26.4
7	Baba Electronics	Pratapganj Para, Jagdalpur, Bastar	19	5	11.0	82	1	21.3
8	Vinay Enterprises	Kumar Para Road, Moti Line, Jagdalpur, Bastar	19	5	3.6	82	1	34.4
9	Lalita Electroics	Moti Line, Jagdalpur, Bastar	19	5	2.4	82	1	36.7
10	Barsh Electronics	Shiv Basant Comlex, Sirasar Chowk, Jagdalpur, Bastar	19	5	25.7	82	1	25.9
11	Yadav Electronics	Sirasar Chowk, Jagdalpur, Bastar	19	5	27.6	82	1	24.8
12	Mehra Store	Gol Bazar, Jagdalpur, Bastar	19	5	25.0	82	1	23.7
13	Prakash Radio	Gol Bazar, Jagdalpur, Bastar	19	5	25.7	82	1	24.3
14	R.P. Radio	Gol Bazar, Jagdalpur, Bastar	19	5	23.5	82	1	23.8
15	Kanika Mobile	Main Market, Darbha, Bastar	18	52	6.8	81	52	9.6
16	Verma Electronics	Main Market, Bastaar, Bastar	18	58	29.3	81	34	23.9
17	Bulbul Mobile	Main Road, Bastaar, Bastar	18	58	28.6	81	34	24.8

Partial List of Service centers in BBastar division- Annexure 4

SI No. Name of Shops		Address	Latitude			Lognitute				
01. 1 40.	Traine of Shops	nuitss	Dig.	Min.	Sec.	Dig.	Min.	Sec.		
18	Star Electronics	Main Road, Tokapal, Bastar	19	0	43.6	81	52	35.2		
19	Ekta Mobile	Main Road, Bastar Tahsil, Bastar	19	12	15.9	81	56	4.6		
20	Siddhi Palace	Jagdalpur Road, Bastar Tahsil, Bastar	19	12	18.6	81	56	11.6		
21	Om Electronics	Jagdalpur Road, Bastar Tahsil, Bastar	19	12	11.5	81	56	16.8		
Kondagaon										
22	Ashok Electronics	Gandhi Ward, Kondagaon	19	36	25.5	81	40	4.6		
23	Satendra Electronics	Arkachhepara Para, Kondagaon	19	36	16.0	81	40	5.0		
24	Sharda Electronics	Vikas Nagar, Kondagaon	19	35	22.4	81	39	45.2		
25	Arvind Electronics	Vikas Nagar, Kondagaon	19	35	21.4	81	39	45.4		
26	Guru Nanak Electronics	Congress Bhawan, Kondagaon	19	35	21.2	81	39	45.7		
27	Megha Electronics	Congress Bhawan, Kondagaon	19	35	20.8	81	39	45.8		
28	Sri Ram Refrigeration	DNK Colony, Kondagaon	19	35	20.7	81	40	4.9		
29	Pooja Electronics	Ghati Road, Keshkal Kondagaon	20	5	16.7	81	35	27.1		
30	R.C. Radio	Main Road, Keshkal Kondagaon	20	5	4.2	81	35	20.9		
31	New Naredra Mobile & Electronics	Bargaon, Keshkal Kondagaon	20	4	41.1	81	35	13.2		
32	Ayaan Computer	Bazar Road, Pharasgaon, Kondagaon	19	51	44.0	81	38	14.1		
33	Taj Electronics	Near Bus Stand, Pharasgaon, Kondagaon	19	51	41.7	81	38	10.3		
34	Dewangan Repairing Center	Near Bus Stand, Pharasgaon, Kondagaon	19	51	42.5	81	38	10.3		
		Sukma	L	1	L	1	L	L		

SI No	Name of Shops Address	Latitude			Lognitute					
01. 1 40.	Traine of Shops	nuitss	Dig.	Min.	Sec.	Dig.	Min.	Sec.		
35	Asad Refigration	Bajar Road, Sukma	18	23	19.4	81	39	33.5		
36	Mahavir Electronics	Bajar Road, Sukma	18	23	19.4	81	39	33.3		
Dantewada										
37	Ma Danteshwari Electronics	Main Rd., Dantewada	18	53	26.9	81	20	49.1		
38	Swastik Electronics	Congres Bhawan, Dantewada	18	53	14.8	81	20	54.6		
Bijapur										
39	Mahaesh Electronics	Deepo Para, Bijapur	18	48	0.6	80	48	44.6		
		Narayanpur		<u> </u>						
40	Sinha Electronics & Electrical	Sonpur Rd., Narayanpur	19	43	7.1	81	14	40.3		
41	Ma Danteshwari Electronics	Chandni Chock Market, Narayanpur	19	43	6.6	81	14	47.6		
Kanker										
42	Krishna Electronics	Naya Para, Anthagarh	20	5	50.7	81	9	28.5		
43	Neeraj Electronics	Rajiv Gandhi Chock, Anthagarh	20	5	57.1	81	9	27.8		
44	Lakshmi Electronics	New Bus Stand, Naharpur	20	26	48.4	81	37	22.4		
45	Suman Electronics	Durga Chock, Naharpur	20	26	51.8	81	37	15.2		
46	Neena Fridge Repairing	Near Janpat Panchayat office, Charama, Kanker	20	29	13.2	81	22	15.8		
47	Shani Electronics	Dhamtari Road, Charama, Kanker	20	29	26.9	81	22	10.2		
48	Devendra Electronics	Main Road, Charama, Kanker	20	29	26.6	81	22	10.2		
49	Tanuj TV Repairing	Main Road, Charama, Kanker	20	29	27.4	81	22	10.6		
50	Durga Electronics	Din Dayal Chowk, Charama, Kanker	20	29	33.6	81	22	7.3		
51	Chandra Fridge &	Din Dayal Chowk, Charama,	20	29	31.5	81	22	6.9		

SI No	Name of Shops	Address	I	Latitude		Lognitute		
01. 1 40.	Traine of Shops	nuiress	Dig.	Min.	Sec.	Dig.	Min.	Sec.
	Binding	Kanker						
52	Dewangan Watch & TV Repairing	Sadar Bazar, Charama, Kanker	20	29	23.8	81	22	6.3
53	Pooja Electronics & TV Repairing	Sadar Bazar, Charama, Kanker	20	29	21.3	81	22	6.1
54	DeepaK Electronics	Manjha Para, Kanker	20	16	4.1	81	29	32.5
55	Krishna Electronics	Manjha Para, Kanker	20	16	9.5	81	29	36.4
56	Markam Electronics	Daily Market, Kanker	20	16	7.1	81	29	35.3
57	Deep Electronics	Daily Market, Kanker	20	16	4.2	81	29	36.2
58	Durga Refrigeration	New Bus Stand, Kanker	20	15	50.4	81	29	59.5
59	Jeetu Electronics	Near Bus Stand, Durgu Kondal Kanker	20	13	10.5	80	56	42.7
60	Anjali Electronics	Main Chowk, Durgu Kondal Kanker	20	13	8.0	80	56	41.2
61	Shivam Electronics	Sanjay para, Bhanu Pratap Pur, Kanker	20	18	39.8	81	4	6.8
62	Mandal Electronics	Near Bus Stand, Pakhunja, Kanker	20	2	21.1	80	37	27.7
63	Gautam Electronics	Near Bus Stand, Pakhunja, Kanker	20	2	21.8	80	37	27.6
64	Das Freeze Repairing	Old Market, Pakhunja, Kanker	20	2	25.7	80	37	27.2
65	Vishwas Refrigeration	Old Market, Pakhunja, Kanker	20	2	25.0	80	37	25.4

Inventory of Established Collection centers- Annexure 5

Sl No.	Name	Address			
1.	M/s Navrachna Recycling Pvt. Ltd.	Plot No 1B, Somni Industrial Area, Rajnandgaon			
2.	M/S ADV Metal Combine Private Limited	Borai Industrial Growth Center, Durg			

NameNa	Address	SI No	ıde	Lognitute							
Bastar1SaligramDharampura No1, Jagdalpur, Bastar19539.8815952Aslam KabadiRaut Para, Jagdalpur, Bastar1956.581053Dev Saran Lal SahuGeedam Road, Jagdalpur, Baster19439.782014Sumit JaiswalMoti Talab Para, Raaiya word, Jagdalpur, Baster19526.482105Suresh JaiswalMoti Talab Para, Kondagaon19526.482105Suresh JaiswalJamkote Para, Kondagaon19368.8814026Sanjeet SinghBazar Para, Kondagaon193541.6814057Shiv NarayanBazar Para, Kondagaon193512.3813929HakimNear Petrol Pump, Keshkal, Kondagaon20520.681352	Dig. Min. Sec.	01.140.	1. Sec.	Dig. Min. Se	ec.						
1SaligramDharampura No1, Jagdalpur, Bastar19539.8815952Aslam KabadiRaut Para, Jagdalpur, Bastar1956.581053Dev Saran Lal SahuGeedam Road, Jagdalpur, Baster19439.782014Sumit JaiswalMoti Talab Para, Raaiya word, Jagdalpur, Baster19526.4821055Suresh JaiswalJamkote Para, Kondagaon19368.8814026Sanjeet SinghBazar Para, Kondagaon193541.6814058Salim MemanAlbeda, Kondagaon193512.3813929HakimNear Petrol Pump, Keshkal, Kondagaon20520.681352	Bastar										
2Aslam KabadiRaut Para, Jagdalpur, Bastar1956.581053Dev Saran Lal SahuGeedam Road, Jagdalpur, Baster19439.782014Sumit JaiswalMoti Talab Para, Raaiya word, Jagdalpur, Baster19526.4821055Suresh JaiswalMoti Talab Para, Kondagaon19526.4821055Suresh JaiswalJamkote Para, Kondagaon19368.8814056Sanjeet SinghBazar Para, Kondagaon193541.6814057Shiv NarayanBazar Para, Kondagaon193541.1814058Salim MemanAlbeda, Kondagaon193512.3813929HakimNear Petrol Pump, Keshkal, Kondagaon20520.681352	Dharampura No1, Jagdalpur, 19 5 39.8 Bastar	1	39.8	81 59 50	0.3						
3Dev Saran Lal SahuGeedam Road, Jagdalpur, Baster19439.782014Sumit JaiswalMoti Talab Para, Raaiya word, Jagdalpur, Baster19526.482105Suresh JaiswalJamkote Para, Kondagaon19368.8814046Sanjeet SinghBazar Para, Kondagaon193541.6814057Shiv NarayanBazar Para, Kondagaon193541.1814058Salim MemanAlbeda, Kondagaon193512.3813929HakimNear Petrol Pump, Keshkal, Kondagaon20520.681352	Raut Para, Jagdalpur, Bastar 19 5 6.5	2 /	6.5	81 0 59	9.9						
4Sumit JaiswalMoti Talab Para, Raaiya word, Jagdalpur, Baster19526.48216Kondagaon5Suresh JaiswalJamkote Para, Kondagaon19368.8814046Sanjeet SinghBazar Para, Kondagaon193541.6814047Shiv NarayanBazar Para, Kondagaon193541.1814058Salim MemanAlbeda, Kondagaon193512.3813929HakimNear Petrol Pump, Keshkal, Kondagaon20520.681352	Geedam Road, Jagdalpur, 19 4 39.7 Baster	3	39.7	82 0 17	7.8						
Kondagaon5Suresh JaiswalJamkote Para, Kondagaon19368.88140406Sanjeet SinghBazar Para, Kondagaon193541.6814057Shiv NarayanBazar Para, Kondagaon193541.1814058Salim MemanAlbeda, Kondagaon193512.3813929HakimNear Petrol Pump, Keshkal, Kondagaon20520.681352	Moti Talab Para, Raaiya word, 19 5 26.4 Jagdalpur, Baster	4	26.4	82 1 6.	5.0						
5Suresh JaiswalJamkote Para, Kondagaon19368.88140406Sanjeet SinghBazar Para, Kondagaon193541.6814057Shiv NarayanBazar Para, Kondagaon193541.1814058Salim MemanAlbeda, Kondagaon193512.3813929HakimNear Petrol Pump, Keshkal, Kondagaon20520.681352	Kondagaon										
6Sanjeet SinghBazar Para, Kondagaon193541.681407Shiv NarayanBazar Para, Kondagaon193541.1814058Salim MemanAlbeda, Kondagaon193512.3813929HakimNear Petrol Pump, Keshkal, Kondagaon20520.681352	Jamkote Para, Kondagaon 19 36 8.8	5 \$	8.8	81 40 4.	.6						
7Shiv NarayanBazar Para, Kondagaon193541.1814018Salim MemanAlbeda, Kondagaon193512.3813929HakimNear Petrol Pump, Keshkal, Kondagaon20520.681352	Bazar Para, Kondagaon 19 35 41.6	6 5	41.6	81 40 7.	.2						
8Salim MemanAlbeda, Kondagaon193512.3813929HakimNear Petrol Pump, Keshkal, Kondagaon20520.681352	Bazar Para, Kondagaon 19 35 41.1	7	41.1	81 40 5.	.7						
9 Hakim Near Petrol Pump, Keshkal, 20 5 20.6 81 35 2 Kondagaon	Albeda, Kondagaon 19 35 12.3	8 5	12.3	81 39 28	8.4						
	Near Petrol Pump, Keshkal, 20 5 20.6 Kondagaon	9	20.6	81 35 28	8.7						
10Narendra BhardwajSingh NearPetrol Pump, Pharasgaon, Kondagaon195149.3813874	Singh Near Petrol Pump, 19 51 49.3 Pharasgaon, Kondagaon	10	49.3	81 38 7.	'.8						
Sukma	Sukma		_	• • • •							
11 Mohd. Amir Basti, Sukma 18 23 38.1 81 39 2	Basti, Sukma 18 23 38.1	11 1	38.1	81 39 29	9.3						
12 Mohd. Basir Patna Para, Sukma 18 23 39.5 81 39 3	Patna Para, Sukma 18 23 39.5	12 1	39.5	81 39 30	0.5						
Dantewada											
13 Mahabir Mandabi Aura Bhata, Dantewada 18 54 23.6 81 20 4	Aura Bhata, Dantewada 18 54 23.6	13 1	23.6	81 20 48	8.3						
14 Thakur Ram Ward No6, Dantewada 18 54 22.6 81 20 4	Ward No6, Dantewada 18 54 22.6	14	22.6	81 20 49	9.1						
15 Navrang Devraj Ward No15, Dantewada 18 53 17.2 81 20 5	Ward No15, Dantewada 18 53 17.2	15 I	17.2	81 20 55	5.4						
Bijapur	Bijapur		, ,	· · · · ·							
16 G. Subba Raw Ward No8, Rajender Prasad 18 47 39.0 80 48 4	Ward No8, Rajender Prasad 18 47 39.0	16	39.0	80 48 42	2.1						

Partial Inventory of Scrap vendor/ Dismantler in Bastar Division – Annexure 6

SL No	Name	Address	Latitude			Lognitute				
01.140.	T valie	Address	Dig.	Min.	Sec.	Dig.	Min.	Sec.		
		Ward, Bijapur								
Narayanpur										
17	Tapan Manjhi	Ward No5, Bangla Para, Narayanpur	19	43	48.8	81	14	47.6		
18	Abdul Habib Faruqui	Masjid Para, Narayanpur	19	43	14.8	81	14	40.1		
19	Ashok Karmkar	DNK Colony, Narayanpur	19	43	13.7	81	41	26.1		
20	Arun Karmkar	DNK Colony, Narayanpur	19	43	13.2	81	14	25.9		
Kanker										
21	Mohd. Azahar	Durga Chock, Naharpur	20	26	52.9	81	37	14.3		
22	Mohd Aaya Khan	Ward No14, Naharpur	20	26	45.5	81	37	12.3		
23	Abhijeet	Dabra Para, Charama, Kanker	20	29	31.2	81	22	4.3		
24	Hansa Sinha	Near old Bus Stand , Charama, Kanker	20	29	25.6	81	22	9.7		
25	Khuba Bai	Marketing Society , Charama, Kanker	20	29	17.6	81	22	5.6		
26	Mohd. Arif	Mahadev ward, Back side of maszid, Kanker	20	16	4.0	81	29	24.7		
27	Mohd Israk	Manjha Para, Kanker	20	16	4.7	81	29	27.9		
28	Meman	Kesh Kal Road, Kanker	20	15	49.8	81	30	14.5		
29	Vinod Sharma	Kesh Kal Road, Kanker	20	15	48.7	81	30	17.2		
30	Vinay	Sanjay para, Bhanu Pratap Pur, Kanker	20	18	40.1	81	4	7.9		
31	Ramesh	Sanjay para, Bhanu Pratap Pur, Kanker	20	18	43.3	81	4	5.7		
32	Virendra Kumar	Sanjay para, Bhanu Pratap Pur, Kanker	20	18	43.0	81	4	3.5		
33	Ankur	Sanjay para, Bhanu Pratap Pur, Kanker	20	18	43.6	81	4	5.1		









Sample Photo Documentation – Annexure 8









Annexure – 9

Methods for Inventory Assessment

The Time Step Method

The calculation of WEEE/E-waste is made on the basis of private and industrial stock and sales data. Mathematically, the time step method is given below.

WEEE generation (t) =Stock (t1) – Stock (t)] private + [Stock (t1) - Stock (t)] industry + • Sales (n) - • WEEE (n) n=t1+1 to t-1 n=t1+1 to t with t1 < t

Stock private = Number of households * (saturation level of households / 100)

= Population / average size of household * (saturation level of households / 100)

Stock industry = number of work places * (saturation level in the industry / 100)

= number of employees / number of users per appliance *saturation level in the industry/100

The Market Supply Method

The calculation of WEEE/ E-waste is made from sales data, together with typical lifespan. The waste potential during collection phase at time t is calculated from sales figures and information about consumption patterns. Mathematically, the market supply method is given below.

WEEE generation (t) = sales $(t - d_N)$ + reuse $(t - d_S)$ Where,

- d_N Average lifetime of new items
- dS Average lifetime of second-hand items

The Carnegie Mellon Method

This method is a variation of "market supply method", where the calculation of WEEE/E-waste is made from sales data, assumptions about typical lifetimes, recycling and storage. The model considers consumer behaviour when disposing of end-of-life EEE. This method defines the pathways of electrical and electronic equipment from purchase to end-of-life. At the point of obsolescence, there are four options of reuse, storage, recycling & landfill available to the owner.

Approximation 1

The calculation of WEEE is estimated on the basis of stock and average lifetime data. This method has also been referred to as the 'Consumption and Use' method. This method was used to calculate WEEE/ E-waste in the Netherlands. Mathematically, the method is represented by the following equation.

WEEE generation (t) = [Stock private (t) + Stock industry (t)] / average lifetime

Stock private = Number of households *saturation level of the households / 100

= Population / average size of household *saturation level of the households / 100

Stock industry = number of work places *saturation level in the industry / 100

= number of employees/number of users per appliance *saturation level in the industry /

100

Approximation 2

This method is based on the assumption, that with the sale of a new appliance, an old appliance has to be disposed of. Mathematically, it can be represented as given below.

WEEE generation (t) = sales (t)

Methodology/Features	Requirements	Constraints	Advantages
The Time Step Method	 Information about domestic sales. Appliance stock levels for household. Industrial stock levels. 	 Household saturation levels are based on predetermined stock levels Industrial stock levels are assumed in the calculations because they are difficult to obtain and require assumptions. Assumption that all the WEEE/E-waste generated is collected and transferred to treatment and disposal facility. 	 Calculations can be carried out very easily. Method gives good results in a saturated market.
The market Supply Method	 Information about domestic sales. Average life of new and second hand items. 	 The average life is to a large extent is subjective because in most of the developed countries electrical and electronic equipment is often replaced and disposed of before it reaches its technical end-of-life. WEEE/ E-waste are often stored for years. Assumed that all appliances produced in the same year will be in line for disposal after exactly the average life. Assumption that the average variance in life of items of EEE does not change very much, whereas, in reality, lifetimes may become shorter in the future. Therefore, this method is not 	 Necessary data need not be very wide- ranging Calculations can be carried out very easily using a simple formula Sales data is derived from official statistics from market research institutes or trade organisations and are of good quality and available for a large number of products.

Features of the five inventory assessment methods

Methodology/Features	Requirements	Constraints	Advantages
		especially useful in the calculation of WEEE for a dynamic market where technology and life are changing rapidly.	
The Carnegie Mellon Method	Sales data, date for typical life times, recycling & storage.	 Assumptions are made regarding the pathways or "material flow" during reuse, storage, recycling and landfilling. These assumptions are both product and country specific and therefore demand a good knowledge of consumer behaviour and the disposal position. This model also requires a full coverage of sales data as early as possible in the WEEE/E-waste trade value chain. 	 The model allows for an electrical and electronic equipment to be purchased, reused, stored and finally recycled or landfilled representing "material flow" more precisely. This method is ideal for more extensive examination of individual products. Because of the larger amount of input data, the calculation of WEEE is clearly more extensively structured.
Approximation 1	The required input data for application of this method is stock data and assumptions about average lifetime of appliance.	 A product's constant mean lifespan is assumed in this method. This method is suitable for estimating WEEE in widely saturated markets with no major deviations from the mean lifespan, which is a subjective variable. 	This method is particularly useful when reliable stock data for an appliance is available
Approximation 2	Sales statistics is used to calculate	1. This method is only suitable in a fully	1. This method is suitable for carrying out

Methodology/Features	Requirements	Constraints	Advantages
	WEEE/E-waste generation in a particular year assuming a saturated market.	 saturated market where the purchase of a product leads to the same quantity of waste from the old product. Therefore, this method has limited application in dynamic and developing markets because in these markets a larger part of the sales serves to increase stock and does not initially contribute to waste. 2. This method is unsuitable if the temporary storage or second use of old appliances plays a significant role in consumer behaviour. 	an initial assessment.2. Very limited range of input data required for application of this method.3. No historical data is required, only sales figures for a particular period of time are required.

Methodology/	Saturation Level		Number of	Calculated Sales			Stock Data		Average	Storage			
Requirement	Household	Industry	Household	Export Data	Import Data	Manufacturing /Production	Private	Industry	Lifetime	data	Reuse	Recycle	Landfill
Time Step Method	V		\checkmark	V	V		\checkmark	V					
Market Supply Method				\checkmark	\checkmark	V			V				
Carnegie Mellon Method				\checkmark	\checkmark	\checkmark			\checkmark	\checkmark	\checkmark	\checkmark	
Approximation 1	V	\checkmark	\checkmark				\checkmark	V	1				
Approximation 2				V	V	V							

Data Requirements for E-waste Inventory Assessment

Note: √ means 'Yes'



Generic E-waste material flow chain

Methodology

A two-prolonged approach was adopted for the collection of relevant data and arriving at the results. Firstly, a primary survey was undertaken for data collection from the end users side. The information was then projected to the all-India level using robust projection techniques. Secondly, All-India estimates were validated by the feedback obtained from the vendors and the trade channel members.



End User Survey

Two broad user segments were covered in this phase of data collection viz. business establishments (having at least a telephone connection) and households (SEC A, B, C and D/E households). The following paragraphs explain the method of arriving at the final estimates from the end users route.

Business Establishments

A representative sample of establishments was contacted personally by our trained field personnel and relevant information on the IT products installed in the establishment during April 2012 to March 2013 and the number of units of each installed etc. was obtained. This information was then projected to the universe of establishment stratified by the Principal activity carried out at the respective establishment and the number of employees working in the respective establishment.

The detailed sampling process is as explained below:

Stratification of the Universe of Establishment

The universe of establishment was stratified on the basis of "Principal Activity carried out at the respective establishment" Classified by "Employee size" (ACE), which has been ascertained through an extensive telephonic survey conducted as a part of ITOPS' 97 – the baseline study in the ITOPS series. During the

survey, 32000 telephonic contacts ware made in the Top 22 cities to determine the distribution of telephone owning establishments among different (nature of) Activity X Employee size (ACE) cells. This provided the ACE grid distribution for each of the 22 cities.

The universe of establishment as well as the ACE grid obtained from ITOPS' 97 is continuously updated and used for this study.

On the basis of the ACE grid composition thus obtained for each of the 22 centres covered, sample quota were set for the number of establishments that had to be contacted for each cell formed by the intersection of the nature of activity and numbers of employees as in the ACE grid.

Random starting addresses were selected from the telephone directory and at each starting address, 5 interviews were conducted with telephone owning establishments.

The variables used in ACE grid are robust indicator, which explains consumption of IT and Office automation products.

The market size for establishments has been obtained by applying product acquisition rate in each employee band to the respective size of universe of establishments in each city.



Households

With the growing awareness of the benefits of using IT at home, this segment has grown well in the last 3-4 years and offers a huge potential for such products. A representative sample of affluent households (SEC A, B and C & D/E) was personally contacted and relevant information was obtained. The universe of households for projection purpose has been taken from National Readership Survey 2006.

The steps involved in the household sampling and the purpose of these steps have been explained in the following table:

Step	Purpose
Random Listing	 To identify the target group household (SEC A/B/C/D/E) To determine the penetration of PC and other IT products in the households To stratify the household universe into 2 broad categories Pure households Home offices
Detailed interview with the Target	• To determine the market size and profile of the owners and non- owners

Step	Purpose
Group Household	 To determine the brand share To determine the usage of IT products among the owners To determine the intention to own IT products among the non-owners And to obtain there relevant information as needed for the study.

For the market size estimation for home offices and households, the acquisition rate in each SEC class in home offices and households were applied to their respective universe strata.

Validation from Vendors and Trade Channel

Major IT manufacturers of each of these products were contacted and their views and facts & figures on the sales during April 2012 to March 2013 and their likely share of the market were collected. This information was used to validate the findings of the End User Survey.
National/ Local Government Agencies	Industry/ Trade/ Recyclers/ Waste Disposal Operator's Association (Reports/ Published Data/ Field Work)	Market Research Agencies (Reports/ Published Data)
National Census Data, (1991, 2001 & 2011)	Major Trading Agencies, (Retailers)	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
National Census Data, (1991, 2001 & 2011)		
NSSO (1994 – 2010)	Industry Association, Scrap Dealers, Recyclers, EEE Retailers	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
TRAI, MOCIT, Govt of India.	Industry Association, Scrap Dealers, Recyclers, EEE Retailers	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
TRAI, MOCIT, Govt of India.	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications, Annual Reports of Major Brands
	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications, Newspapers
	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications
	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	
City Municipalities	Scrap Dealers, Recyclers, EEE Retailers	

FINAL REPORT

E-Waste Inventorization of Bilaspur Division





2016

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Executive Summary

E-waste is one of the fastest growing waste streams in the world. In developed countries, it equals 1% of total solid waste generation on an average. In this context, Ministry of Environment & Forest, Government of India at first notified E-waste guidelines followed by Hazardous Waste (Management, Handling & Transboundary) Rules in 2008. This was followed by formulation of E-waste (Management & Handling) Rules 2011, which came into effect from 1st May 2012. In order to implement these regulations, each state mandated to prepare their E-waste inventory which can assist State Pollution Control Boards (SPCB) to monitor & regulate E-waste Management as per E-waste rules. Each of the State Pollution Control Board's have been assigned the responsibility for inventorization of E-waste in their State, grant and renewal of authorization, registration of recyclers, monitoring of compliances of authorization and registration conditions and action against violation of these rules. In view of the dues and responsibility defined under the E-waste rule, 2011, Chhattisgarh Environment Conservation Board (CECB) has planned for inventorization of E-waste in the five divisions of this State. IRG Systems South Asia Pvt. Ltd. has been assigned the task to carry out the inventorization in the five districts of Bilaspur Division. The current effort will assist to prepare an inventory of E-waste generated in the state so that an action plan can be formulated for future interventions.

The objective of the E-waste Assessment is to identify and quantify the E-waste generation for reuse, recycle and final disposal in the study area by adopting uniform approach and methodology. SoW as per ToR includes assessment of E-waste generation, present handling practices, storage, and channelization for its recycling or disposal, by producers, consumer, or bulk consumers. The report shall also include the detail list of producers, consumer or bulk consumers, collection centers, dismantlers and recyclers with the name, address contact no. and their practices for E-waste handling & management. Finally, the inventorization of E-waste shall be done for different categories (Information Technology and Telecommunication and consumer / household appliances) listed in schedule – 1 of E-waste Rules 2012. The study area includes Bilaspur, Mungeli, Korba, Jangir Champa and Raighar districts of Bilaspur Division.

This **Final Inventory Assessment Report** has been compiled in six chapters. This report is being compiled giving inventory of various stakeholders and present handling practices, storages & channelization for recycling.

Some of the major features of E-waste regulation having implication on E-waste inventory assessment indicate that no target has been fixed to collect E-waste from the time of enforcement. Producer is not bound by any collection target. There are no mandatory provisions for producers in the rules to declare quantity of EEE placed in the market since 2012. No mechanism for tracking purchase of EEE by bulk consumers exists.

Therefore, monitoring of E-waste inventory through evaluation of Form 2 or Form 3 in accordance with Rule 4(9) of E-waste Rule by CECB in the state is possible only through the producers data obtained from centralized agency e.g. CPCB or the state where these producers are registered after 2012. CPCB data shows that as of September 2013. Therefore, CECB can track & monitor E-waste inventory in the state through the dismantler's / recycler's data obtained from centralized agency e.g. CPCB or the state where dismantler's / recycler's are registered. This also indicates that E-waste is either dismantled or recycled in informal sector in the state. Producers are majorly responsible for all the activities including financing of E-waste management. It indicates that producers may be fulfilling their responsibility through collection system catering to dismantlers & recycler within and outside the state. Therefore, collection centres registered in the state may offer a limited opportunity of E-waste inventory tracking & monitoring mechanism in the state. Assessment on the upstream side of the E-waste chain especially of both types of consumers (bulk & individual consumer), also indicate that only bulk consumer offer opportunity of E-waste inventory tracking & monitoring. Though, bulk consumers are required to maintain records of E-waste, they are not required to file the returns. Since no mechanism exist for tracking purchase of EEE by bulk consumers and producers are not required to declare quantity of EEE placed in the market since 2012, E-waste inventory assessment has to rely on available historical market research data. Therefore, there is need to identify different

producers, profile of consumers & bulk consumers, collection centre, dismantlers & recyclers who are catering to E-waste in the state.

Tracer technique, which was pilot tested in Chhattisgarh has been used in major urban centers/towns in Chhattisgarh to fix E-waste trade value chain. A tentative E-waste trade value chain for study area which has emerged out of field work from tracer techniques indicates the following profile of stakeholders & their inventory.

<u>Producers</u>: EEE producers / manufacturers do not exist in the study area. However, their products are being sold in the division. Secondary data confirms that EEE producers do not have manufacturing facilities in the division and therefore they are not registered with CECB. Since these producers are responsible for their products under EPR, their detailed **inventory** as per schedule 1 of E-waste (Management & Handling) rules are given in Annexure 1.

<u>Distributors / Traders / Retailers</u>: EEE from these producers are sold in the study area through Distributor / Trader / Retail network as well as directly through the company. Items like Centralized Data Processing, Mainframes, Mini-computers of Schedule 1 are used by large corporate, State and Central Government agencies falling under the category of bulk consumers whose profile is given below. **Inventory** of Distributors / Traders / Retailers selling items other than mentioned above in the study area are given in Annexure 2. However, retailers / dealers do not fall under the purview of E-waste (Management & Handling) Rules 2011, unless they serve as collection centre or drop off point.

<u>Consumers</u>: There are two types of consumers, which are found in the five districts of study area, Individual Consumers & Bulk Consumers. **Inventory** of bulk consumers in the five districts is given in Annexure 3.

<u>Collection Centres / Channel</u>: Tracer analysis indicates that EEE, which becomes E-waste in the study area partly gets collected & transported in the informal sector and partly in formal sector. Primary survey carried out through Tracer technique indicates that bulk of E-waste generated in the study area goes to informal sector. Majority of the producer / manufacturer have established collection channel in the study area. These collection channels work through following mechanism.

- 1. Single point call centre
- 2. Distributors / Retailers
- 3. Service Centres
- 4. Physically established collection centre / drop off point

The producers use a combination of these mechanisms. Inventory of Service centres in the study area are given in Annexure 4. Inventory of Physically established collection centres are given in Annexure 5. Majority of producers use call centre as well as dealer's network for collection of E-waste. There are two possibilities of onward transportation & disposal of E-waste. The first possibility is the disposal through informal sector & the second is through registered recycler. An inventory location of major scrap vendor / dismantler, temporary stockpile site / informal collection centre & landfill site is given in Annexure 6.

Small scrap dealer purchase waste from Household / Commercial Area / Institution, etc. At first stage, they segregate the waste than break the item and collect valuable items like Aluminum, Copper, Iron & Steel, Compressor, motor, etc. from E-waste. They sell their collected item to the large scrap dealer. They visit nearby area on daily/weekly basis and purchase the waste. These scrap dealers are not licensed by the municipalities but are part of the networks of large scrap dealers. Dismantling and segregation of E-waste occurs in a major way at large scrap dealers. Inventory of hotspots, identified in the study area have been geographically shown & also mapped in Annexure 7. Photo documentation captured district-wise of Bilaspur division of Chhattisgarh in given in Annexure 8. Some of the major findings of the disposal mechanism are:

- Electronic items go to mechanic shops from households for repairing, and mechanic replace damaged / defunct parts/components from it and then they sold it to scrap dealers.
- Mechanics sell E-waste to scrap dealer by weight / Pcs. mainly of ICT items (IT as per Schedule 1); TV circuit Rs. 15-45/kg; Compressor Rs. 300-400/Pcs.; Washing Machine Motor Rs. 200/Pcs.;

Copper Rs. 200-350/kg; DVD Circuit Rs. 20-25/kg; Mobile kit Rs. 1000-2000/kg; SMPS Rs. 50/Pcs, Mother Board Rs. 90/Pcs.; Hard disk Rs. 120/Pcs.; CD Writer Rs. 35-40/Pcs.

- Scrap vendors sold E-waste to scrap dealer by weight at Rs. 150-250 per kg
- Scrap vendors sold damage mobile phone to scrap dealer as individual piece at Rs. 30-50 per piece
- Scrap dealer comes from Delhi yearly twice/thrice for collecting of E-waste
- There is no organized mechanism for collection, transportation and disposal of E-Waste in Bilaspur division.
- No mechanism exists in the state to monitor and track its inventory, collection, transportation and disposal.

<u>Repair Shops (AC/WM/REF)</u>: One person repairs one of these items every day. E-waste fractions/ waste Parts, like plastic body of these items, etc. is dumped into community bin and valuable item sold to nearby scrap dealer. Some of the respondent informed that Item which is not in repairable condition is returned to the owner of the product who in turn sells to the scrap dealer. Majority of the product are in repairable condition.

<u>Repair Shops (TV / PC / Mobile Phone)</u>: Majority of mobile phones, TV & computers repair shop owners are local citizens. Waste Parts, like plastic body of these items, etc. are dumped into community bin and valuable item sold to nearby scrap dealer. They also store valuable item and use it to repair other EEE. In case of mobile phone, they utilize maximum parts while waste parts are dumped in municipal bin. Majority of the product are in repairable condition.

Data matrix versus methodology used for E-waste inventory assessment indicates "Market Supply" method and "Carnegie Mellon" method can be applied for WEEE / E-waste inventory assessment in five districts of Bilaspur division. However, a combination of Carnegie Mellon method & tracer tracking has been selected for inventory assessment since it covers all the aspects of material flow chain. Assessment of data from these stakeholders through tracer tracking has resulted in assessment of obsolescence rate or average life of equipment described in chapter 5. Major sources of secondary data included Saturation Level – National census data was obtained from office of the Registrar General & Census Operation, Govt. of India, National Sample Survey Organization (NSSO), Department of Statistics, Government of India, State Statistics from Department of Statistics, Government of Chhattisgarh, Telecom Regulatory Authority of India (TRAI), Ministry of Communications & Information Technology (MOCIT), Government of India, Industry Association like Manufacturers Association for Information Technology (MAIT), Electronic Industries Association of India (ELCINA), Telecom Equipment Manufacturers Association of India (TEMA) & Research Institutions e.g. National Council for Applied Economic Research (NCAER). Data related to average life time, storage data, reuse, recycling & disposal at landfill site was obtained through "tracer tracking" technique & primary survey.

The description of each of this method also describes constraints and advantages of each of these methods. The data requirements for each methodology based on mathematical expressions are given in Annexure 9. The extent of data required depends on the extent of geographical boundary, which could be national, regional or city boundary. Conceptually, the source of data can be identified by understanding the "material flow chain" within the given geographical boundary. A list of sources of data in study area, which was required for application of inventory assessment methodology, is given in Annexure 10.

Analysis shows that Computers have the highest installed base followed by Cellphone, TV, printers, fixed line telephone, refrigerators, washing machines and Air Conditioners. In Bilaspur cellular phone, fixed line phone, TV, washing machine and refrigerator has the highest installed base followed by Bilaspur, Korba, Raigarh, Jangir Champa and Mungeli districts of Bilaspur division.

Inventory estimates in Bilaspur division indicate that E-waste generation ranges from **7761.99** tons in 2011 to **22324.03** tons in 2020. In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 88% of the total inventory followed by Computer (6%), Washing machine (1%), Air conditioner (1%), Cellular phone (1%), Refrigeratorr (1%), Fixed Line Phone (1%) & Printer (1%). In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (59%), computer will constitute about 36% of the total inventory followed by Printer (2%), Air conditioner (1%), Washing machine (1%), Cellular phone (0%), Refrigerator (1%) & Fixed Line Phone (0%).

Some major observations are that Operating margin for Television waste per kilogram is Rs. 0.44. Operating margin for waste refrigerator is Rs. 11.46 per kilogram. For that of Washing Machine is Rs. 13.03 per kilogram. For that of Air Conditioners is Rs. 18.40 per kilogram. For scrap old Personal Computer is Rs. 6.98 per kg. For waste cellular phones is Rs. 24.20 per kg. The operating margin ranges from Rs. 0.44 to Rs. 24.20 per kilogram. Scrap of Mobile / cellular phones gives the maximum operating margin of Rs. 24.20 while scrap from television gives the minimum profit of Rs. 0.44 per kilogram. This indicates that informal sector if brought into formal sector considering taxation involved will only dismantle / recycle cellular phones followed by ACs and WMs to some extent. Therefore, there is a need to formulate financial instrument for making dismantling / recycling of white goods viable.

Market risks matrix highlight the availability of raw material, its collection and transportation as risks of high & medium intensities. Collection mechanism directly impacts the availability of raw material. Therefore, there is a need for both strict implementations of regulations as well as financial instrument for diverting E-waste inventory in to the formal sector.

Chapter 1: Introduction & Background

1.0 Introduction & Background

E-waste is one of the fastest growing waste streams in the world. In developed countries, it equals 1% of total solid waste generation on an average. As the fastest growing component of municipal waste across the world, it is estimated that more than 50 MT of E-waste is generated globally every year. The rapid change in technology, low initial cost, and planned obsolescence has resulted in its fast growth. These rapidly increasing numbers of electronic equipment and appliances have the potential to create serious environmental and health impacts at the "end of life" if not treated and disposed in an environmentally sound manner. E-waste is also a source of resource as some of these materials and valuable parts used in manufacture of electrical and electronic (EEE) items can be recycled and re-used. The harnessing of E-waste as a "resource" provides potential economic opportunities through the development of collection, recovery and recycling facilities. As per CPCB / MoEF 2006 estimates, India generated 1, 46,000 metric tones of E-waste from six items, which were projected to exceed 7, 00,000 metric tones by 2012. A report of the United Nations predicted that by 2020, E-waste from old computers would jump by 500 percent on 2007 levels in India 2. In this context, Ministry of Environment & Forest, Government of India at first notified E-waste guidelines followed by Hazardous Waste (Management, Handling & Transboundary) Rules in 2008. This was followed by formulation of E-waste (Management & Handling) Rules 2011, which came into effect from 1st May 2012. In order to implement these regulations, each state is mandated to prepare their E-waste inventory which can assist State Pollution Control Boards (SPCB) to monitor & regulate E-waste Management as per E-waste rules.

In this context, Chhattisgarh Environment Conservation Board invited Proposals for Inventorization of Ewaste in Raipur, Bilaspur, Durg, Bastar and Sarguja divisions of the State of Chhattisgarh. IRGSSA submitted its technical & financial proposal to CECB to carry out E-waste inventorization in Raipur, Bilaspur, Durg, Bastar and Sarguja divisions of the State of Chhattisgarh.

1.1 Need for Study

Despite of enactment of law for handling E-waste in India, this particular waste is being disposed off unaudited, in absence of appropriate inventory of E-waste in most of the states / cities. As per National Ewaste inventory estimates carried out by CPCB in 2006, Chhattisgarh state ranks among top twenty states generating E-waste in India. Therefore, in Chhattisgarh an effective inventory comprising the details of Ewaste and related components is yet to be created to manage & handle E-waste in eco-friendly manner and to combat the problem associated this waste. In this context, it is proposed to prepare an Inventory of Ewaste & related components in five divisions of Chhattisgarh viz. Raipur, Bilaspur, Durg, Bastar and Sarguja. The overall aim of this initiative is to assess the generators, quantity and present practices for handling of Ewaste in these divisions.

The current effort is aimed to prepare an action plan for E-waste for implementation of the legislations framed. The items to be covered in this assessment include personal computers, mobile phones, televisions, washing machines and refrigerators etc. as mentioned in E-waste (Management & Handling) Rules, 2011. A list of these items as per ToR is given in **Table 1.1**.

	Table 1.1: Categories of Electrical and Electronic Equipment
Sr. No.	Categories of Electrical and Electronic Equipment
i.	Information Technology and Telecommunication Equipment
	Centralized Data Processing
	Mainframes, Minicomputers
	Personal Computers (Central Processing Unit with input and output devices)
	Laptop Computers (Central Processing Unit with input and output devices)
	Notebook computers
	Notepad Computers

Sr. No.	Categories of Electrical and Electronic Equipment
	Printers including cartridges
	Copying equipment
	Electrical and Electronic typewriters
	User terminals and systems
	Facsimile
	Telex
	Telephones
	Pay telephones
	Cordless telephones
	Cellular telephones
	Answering systems
 11.	Consumer Electrical and Electronics
	Television sets (including sets based on liquid Crystal Display and Light Emitting Diode technology),
	Refrigerator, Washing Machine, Air conditioners excluding centralized air conditioning plants.

1.2 **Objective**

The objective of the Rapid E-waste assessment is to identify and quantify the E-waste generation for reuse, recycle and final disposal in the study area by adopting uniform approach and methodology. The main objectives of this study are as follows:

- ➤ To assess identify and quantify the WEEE generation.
- ➤ To examine the existing WEEE recycling system
- > To study the problems / risks posed by the recycling system at present/ future
- > To estimate the existing and future quantity of WEEE in the study area
- To evaluate the capacities / capabilities of existing stakeholders and infrastructure for reuse, recycle and disposal of E-wastes
- > To analyze the environmental and social sustainability of present system.
- ➢ To determine E-trade economics for WEEE
- Preparation of directory of the stakeholders
- Conduct 01 sensitizing workshops in the each study area

1.3 Scope of Work (SoW)

In order to achieve the above objectives identified by CECB, IRGSSA has developed a comprehensive Methodology addressing the need to develop and implement an effective E-waste management based on the need to quantify and characterize this waste stream, identify major waste generators, assess risks involved and develop and implement a scientific, safe and environmentally sound management system, including policies and technologies.

The project aims to promote identification and implementation of environmentally sound and commercially viable technologies for the various elements of waste management *viz* collection, segregation, transportation, treatment, recovery and/ or recycle and disposal. The fundamental approach can be summarized in the following three phases.

Phase 1: Mobilization and work plan

Team will be mobilized & work plan will be prepared & presented to CECB.

Phase 2: Data Collection / Field Work

IRGSSA would be following the approach suggested by CECB. In order to execute this assignment, it is essential to establish the E-waste business chain linking different stakeholders to understand the trade economics and associated environmental impacts. An example of this chain is given in **Figure 1.1**.



Figure 1.1: Conceptual WEEE business chain

This chain will be mapped geographically in the study area to describe the following:

- > The stakeholders
- > Their respective geographical distribution in the study area and
- ➢ WEEE generation cycle
- Material flow across stakeholders

Study Area: As per ToR, the study area is Raipur, Bilaspur, Durg, Bastar and Sarguja Division. However, the current report is being submitted for Bilaspur Division. In this division Bilaspur, Mungeli, Korba, Jangir Champa and Raighar five districts are covered.

This study would lead to the identification of stakeholders, classification of organization as organized / unorganized sector. Further their geographical location would be determined in the terms of their operating base coverage. Conceptually, some of the major stakeholders would include:

Ist Group

- The Importers, Manufacturers
- > The distributors, traders and retailers
- The consumers Individual households, Business sector, IT sector, BPO, teaching institutions, Railways, Airlines, Defence establishments, Transport Corporations, PUCs etc.

2nd Group

- > The Collectors Scrap dealers, Big Bazaars or malls who are buying the e-waste
- > The Recyclers dissemblers, dismantlers, material recoveries,
- The Road side vendors
- The authorized / unauthorized Auctioneers, the sellers of the used electronic goods on the footpaths.

The study would also aim at establishing E-waste trade chain using conceptual input output analysis. This idea has been developed based on "E-waste material flows" through region and on its way its disintegration and processing in numerous steps until it rejoins the raw streams or ends in a final disposal. This will be done through "tracer techniques", which includes identification of tracer for each item and its tracking through the chain from the start of dismantling process till its final disposal.

Inventorization

Inventorization of E-waste would be done as follows:

- Inventory of obsolescence rate of each electronic product (viz. Personal computer / TV / Mobile phones as mentioned in the e-waste rules and guidelines issued by CPCB) using scenario analysis from secondary / market research data.
- Confirm obsolescence rate from data of primary survey using "tracer technique".
- Identify a tracer for each product and follow it from the start of dismantling process till its final disposal.
- The inventorization other than households (on sample basis) would also be on actual basis.

The Inventorization other than households (whereas sample basis at least 500 nos in rural and urban area of each district) should be on actual basis.

Analysis of existing E-waste recycling system & quantification of E-waste

This will include description & documentation of each process used in dismantling of an EEE and the location details. Carry out photo documentation and geographical setting of each step. Estimate the quantity of material dismantled at each step. Estimate the quantity of E-waste for a particular year based on market projections & obsolescence rate.

Phase 3: Report findings

A Final Inventory Assessment Report will be prepared for each division & findings will be presented in one workshop, one each for five divisions.

1.4 Approach & Methodology

IRGSSA will follow a very comprehensive approach and methodology as described below. This is based on UNEP's manuals 1 and 2 and its application in a number of countries globally including India. The consortium will carry out the following activities and will follow the following step wise approach and methodology for each of these activities.

Activity 1: Development of Policy & Regulatory Framework

Step 1: Carry out due diligence on E-waste policy / laws / regulations eg. EPR.

- Step 2: Identify the gaps with respect to existing environmental regulations and recommend tentative content, extent and coverage of E-waste policy/ laws/ regulatory framework.
- Step 3: Carry out due diligence on expected E-waste institutional mechanism like collection and transportation system and registry e.g. Collective and clearing house system, B2C and B2B model. Identify the gaps with respect to existing collection and transportation system and recommend tentative collection and transport framework.

Activity 2: Assessment of E-waste Market

- Step 1: Determine E-waste item of interest as per Schedule 1 of E-waste (Management & Handling) Rules 2011. This will assist in studying the items of interest ex. PCs, TVs, cellular telephones, and refrigerators etc. Determine the brands, local, national and international, which are available in the market for each item and the year of their introduction in the market. Determine brands which existed earlier. This can be determined through review of secondary data from industry association or by interacting with local dealers. If the product is manufactured under a brand name, the broad feature of technology used to manufacture item is generally disclosed. This will also assist in identifying its dealer's network, existing facilities for item's manufacture and repair and its membership with local industry association.
- Step 2: Determine average weight and size of local, national and international E-waste item from each brand ex. capacity of refrigerator (liters) / washing machine, size of monitor / TV / cellular phone. The variation in size of each item should be documented under each brand. Average weight and size along with percentage composition should be estimated. This can be further confirmed while carrying out field survey for documenting dismantling operation.
- Step 3: Determine broad components out of the 26 components of E- waste items. Determine composition of E-waste item from available source like industry association / manufacturer. Determine technology of E-waste item e.g. ODS based refrigerator / 386 / 486 / Pentium series of PCs and laptops / CRT / front loading / top loading washing machines etc. Determine approximate quantity of recoverable elements from each item based on outputs of step 2. Determine possible hazardous substance in E-waste item.



Figure 1.2: Geographical mapping of different attributes

- Step 4: Establish geographical boundary / system boundary of study area. Procure maps of the area and prepare base map of the area with physical features marked on it. If the detailed map is not available easily then procure city map and fix up the municipal boundaries. Alternately, maps of the study area can be prepared based on standard map search engines available on the internet. The base map will be used for generation of different thematic layers as shown in **Figure 1.2**. This mapping will give an insight into the possible sources of E-waste and assist in carrying out the primary survey.
- Step 5: Identify different stakeholders from Group 1 & Group 2 who could be E-waste generators and mark them as layer two on the base map. Physically verify by carrying out preliminary reconnaissance survey of the identified locations of the stakeholders. Mark the tentative locations by taking latitudes and longitudes of the identified locations through GPS instrument. Identify the stakeholders, which are in the formal / organized sector and which are in the informal sector.
- *Step 6:* Prepare a tentative E-waste trade value chain as per conceptual life cycle; four phase model and E-waste trade value chain. These figures should be customized as per preliminary survey, which will be confirmed and established during field survey.
- Step 7: Identify E-waste dismantling sites, recycling sites and landfill / dump sites. Physically verify these sites by preliminary reconnaissance survey and marking the tentative locations by recording their latitudes and longitudes through GPS instrument.
- Step 8: Identify data needs from these stakeholders based on identified stakeholders in step 5 and trade value chain identified in step 6.
- Activity 3: Selection of Methodology for E-waste Inventory
- Step 1: Identify data requirements. This is carried out by classifying data needs under the heads of saturation level, households, calculated sales, stock data, average life, storage data, reuse, recycle and landfill for each electronic item ex. PC, TV, refrigerator, cellular phone, etc.
- Step 2: Identify tentative sources of data for each electrical and electronic item. This will be based on preparing preliminary or detailed interview guide / checklist / questionnaires for data collection for each time.
- Step 3: Document secondary sources of data for each electrical and electronic equipment and visit the respective agency to procure data i.e. published / unpublished / historical.
- Step 4: Check the availability, reliability, amount and range and completeness of data against following decision criteria.

<u>Availability of data</u>

- 1. Number of sources of data, which can provide data for study area. Generally, more than one source of data is preferred for item of interest.
- 2. In what format, data is available i.e. yearly, half yearly, cumulative or distributed.
- 3. Whether the data is published/ unpublished, confidential/ public.
- 4. Mode of procurement of data.

Reliability of data

- 1. Data of at least two sources should match.
- 2. If there is any variation in sources of data, check the methodology of calculating and compiling the data from each source. If there is a difference in the calculation and compilation of data, then check the factor responsible for the difference.
- 3. Check the trends from the data obtained from different sources and correlations with other data.

Amount and Range of data

- 1. Check the availability of historical data for each E-waste item.
- 2. Historical data should be available for more than anticipated average life time of the E-waste item.

Completeness of data

- 1. Historical data should be complete without any gap.
- 2. If gap exists then source, which provide data with minimum gap should be selected so that the gaps can be supplemented.
- 3. Incomplete data can be supplemented by trend analysis or by national / regional / city level assumptions.

Step 5: Prepare the constraint matrix by mapping outputs of steps 4 and step 5. Decide the most suitable and applicable methodology for E-waste inventory assessment

Activity 4: E-waste Inventory Assessment:

Sub Activity1: Establishment of the study area and its geographical limit

This activity will include the establishment of geographical limits of study area i.e. geographically defining the area. This will include assessment of landuse maps of the study area, fixing of rural and urban boundaries and mapping of tentative locations of stakeholders. The investigation team will geographically verify the tentative locations where generation, stockpiling, collection, handling and brokering, processing and production of other items from E-waste are taking place by using transect walk.

Sub Activity 2: Identification of E-waste and establishment of E-waste trade value chain

This activity will include identification of specific E-waste item and its tracer (CRT / Compressor / LCD screen / any other) followed by tracking of tracer's geographical movement within the identified geographical limits of the area to its final end of life, e.g. places where items are unloaded, traded, transported, dismantled, recycled, reused, repaired and disposed, using output of activity 1. The following steps are involved in field investigations.

- Step 1: Identify the E-waste streams of specific E-waste item
- Step 2: Identify the E-waste processes i.e. unloaded, treated, transported, dismantled, recycled, reused, repaired, and disposed.
- Step 3: Follow the E-waste tracer through the process in the E- waste stream by using tracer/ hazardous process walk.

A typical, E-waste trade chain will be established in a geographical context after verification of the tentative trade value chain obtained as an output of activity 1 and activity 2. This superimposition of E-waste trade value chain on a map will facilitate spatial analysis.

Sub Activity 3: Estimate the E-waste and obsolescence rate/ average life through secondary data by

following "approach and methodology upstream of demarcation" mentioned. By using secondary data e.g. market research data like market supply and imports data, installed base of the E-waste item. The key to estimate E-waste is fixing of obsolescence rate based on market research data, industry data or on consumer behaviour. Since obsolescence rate is dynamic in nature, therefore, a range is fixed with upper and lower limits. Carry out sensitivity analysis for E-waste inventory using upper and lower limits of obsolescence rate.

Sub Activity 4: Verification of obsolescence rate / average lifespan through primary data. The obsolescence rate / average life can be verified through identification of E- waste stream and E-waste processes and tracking of tracer item. The following steps are involved in tracer verification.

- Step 1: Identify the tracer item
- Step 2: Follow the tracer item through the process in the E-waste stream
- Step 3: Identify all the organized and unorganized market of a tracer in the geographical area.
- Step 4: Establish the extent of dismantling / recycling happening in a geographical boundary.

The primary survey methodologies used for tracer technique and outputs are described in Table 1.2.

Table 1.2: Methodology for estimation of E-waste quantity					
Objective	Detail	Primary Survey Methodologies Output			
WEEE / E- waste stream	Material flow	 Follow tracer materials: semi- structured interviews about quantities, quality, economics, and labor. Key-players are known (dealers, disassembly workers, recycler) Material flow (quantities / Labor in E-waste streams are identified 			
	Input quantities / Import	 Interviews with E- waste producers (manufacturers / retailers, auctions) to find out E-waste quantities Survey of key-players for import: structured questionnaires / interviews E-waste quantity input is estimated Percentage of imported / household E-waste is known 			
	Reuse	 Surveys of scrap dealers, retailers, ocomputer repair shops: structured interviews (using questionnaires) Quantities of reused entire equipment are estimated Quantities of reused equipment parts are estimated 			
	Disposal	 Sampling on different landfills Existence of E-waste fractions in landfills is known 			
Recycling technologies	Recycling technology	 Transect walks in different districts (semi-structured interviews) Applied recycling technologies are known Labor needed for different recycling processes is known 			
	Hazardous processes	 Semi-structured interviews in Hazards in different recycling processes are identified 			

....

The structured and semi structured interviews can be conducted using questionnaires. The questionnaire has been developed to quantify and photo document each step in the E-waste value chain.

Sub Activity 5: Identify the products, by products and waste products and back calculate E-waste dismantled.

Identify products, by products and waste products. This can be carried out by using a combination of qualitative and quantitative estimations with the identified stakeholders across the value chain using photo documentation of sampled E-waste tracer. Using this data, back calculate to check the best fit scenario of Ewaste inventory obtained as an output from activity 3. The output from back calculation should confirm the obsolescence rate / average life of E-Waste within the range used in activity 3. This obsolescence rate is used for calculating E-waste projections based on historical data.

Sub Activity 6: Establish E-waste trade economics

Each stakeholder in the dismantling processes is linked to the other and the trade between the two takes

place based on profit. Therefore, the basic parameters driving this trade, which should be estimated, are as follows.

- 1. Input cost
- 2. Selling Price
- 3. Operating margin

Estimate input cost in terms of raw material cost / energy cost and labour cost. Estimate raw material cost / energy cost and labour cost using data collected from questionnaire add the two costs to arrive at input cost. Estimate selling price of the product by using data from questionnaire. Establish operating margin as the difference between selling price and input cost.

Sub Activity 7: Identify and assess the impacts

Identify the effluents / solid waste / emissions from each of the process. Establish their quantity if possible. Establish the geographical location of their discharge and history of the site. Classify impacts into environment, health and business impacts. Use relative ranking technique to quantify impacts. Relative ranking technique is based on scores where each sector i.e. health, environment and business are assigned with individual score subject to identified negative and positives impacts on the workers, surroundings and economy.

Activity 5: Compilation of draft & final reports.

Activity 6: Workshops in each division.

1.5 Format of the Report

This **Final Inventory Assessment Report** has been compiled in six chapters. The table of contents of each chapter is given below.

Chapter 1 Introduction and Background: Introduction; Objective of the Study as per ToR; Scope of Work (SoW) as per ToR; Approach and Methodology; Format of the Report.

Chapter 2 Policy & Regulatory Framework: Overview of Regulatory Framework; Policy, Regulations, their Scope and Institutional Responsibility; Reforms in Waste Management; E-waste and Environmental Legislation in India and Chhattisgarh.

Chapter 3 Assessment of E-waste Market: Introduction; E-waste Composition; Mechanism of E-waste Trade; Conclusions.

Chapter 4 Methodology for E-waste Inventory: Introduction; Methods for Inventory Assessment; Material Flow Chain, Data Sources and Data Gaps in Chhattisgarh; Constraints / Limitations and Selection of Methodology; Methodology / Approach & Instruments Used; Conclusion.

Chapter 5 E-waste Inventory Assessment: Introduction; Market Size Assessment of Electrical and Electronic Equipment (EEE) in Chhattisgarh; Obsolescence Rate / Average Life; E-waste Inventory; E-waste Processing in Chhattisgarh; Environmental Pollution; Market Risks; Conclusions.

Chapter 6 Conclusions & Recommendations: Regulations; E-waste Market; Methodology for Inventory Assessment; E-waste Inventory.

Chapter 2: Policy & Regulatory Framework

2.0 Overview of Regulatory Framework

E-waste management comes under the broad regulatory framework related to environment, foreign trade and local rules & regulations. A number of policy & regulatory initiatives have come into effect since 2006. The following sections describe the policy framework, relevant rules and regulations, which regulates E-waste management and emerging framework under extended producer responsibility (EPR). Further, their implications in the context of current situation in the study area have been described.

2.1 Policy, Regulations and their Scope

During the 1990s, Ministry of Environment & Forests (MoEF) adopted pollution control policy by formulating multi-pronged strategies in the form of regulations, legislations, agreements, fiscal incentives and other measures to abate pollution. National Environmental Policy, which was declared in 2006, identified pollution abatement as an important issue affecting human health and poverty. The policy focuses on optimizing resource efficiency and minimizing pollution loads. An analysis of policy statements reveals that there has been a gradual shift from simple pollution control to the pollution abatement leading to reduction, recovery and recycling. Policy states about strengthening informal sector through technological upgradation & incentivization. It states about promotion of segregation, reuse & recycling & benign disposal of waste. The policy further states involvement of private sector for hazardous waste management. The policy also focuses on optimizing resource efficiency and minimizing pollution loads. National Environment Policy clearly states about the need for preparation of guidelines & regulations for E-waste management in India.

2.1.1 E-Waste and Environmental Legislation in India

The Environment (Protection) Act 1986, an umbrella act also covers industrial waste and provides broad guidelines to address it. Under the umbrella act, a number of rules have been formulated to address hazardous waste like Hazardous Waste (Management Handling & Transboundary) Rules, Battery (Management & Handling) Rules & Bio Medical (Management & Handling) Rules. Specific laws for electronic waste have been notified in May 2011, effective from 1st May 2012 in the country. Further, India is also a signatory to international conventions like Basel Convention, whose provisions are applicable for export and import of E-waste. These provisions find expression in terms of Rules 13, 14, 15 & 16 of the HW (Management, Handling and Transboundary Movement) Rules, 2008. Therefore, there are two regulatory scenarios related to E-waste management as shown in **Table 2.1**. At first, E-waste (Management & Handling) Rules 2011 & Hazardous Waste (Management, Handling & Transboundary) Movement Rules 2008 have been described. This is followed by description of guidelines for implementation of regulations.

Table 2.1: E-waste Regulatory Scenario					
Regulations / Guidelines	E-waste M Pre 1 st May 2012	anagement Post 1st May 2012	Export & Imp Pre 1 st May 2012	port of E-waste Post 1 st May 2012	
E-waste (Management & Handling) Rules 2011		\checkmark			
Hazardous Waste (Management, Handling & Transboundary) Rules 2008	\checkmark		\checkmark	\checkmark	
Guidelines for Environmentally Sound Management of E-waste 2008	\checkmark	\checkmark			
Guidelines for Implementation of E-waste Regulations 2012	\checkmark	\checkmark			
Source: IRGSSA					

Table 2.1 clearly indicates that pre 1st May 2012 Hazardous Waste (Management Handling) Rules were used to regulate E-waste management. It is specifically relevant in case of E-waste recyclers, who got registered prior to 1st May 2012 & whose registration extends beyond this date.

CPCB data shows that as of September 2013, Chhattisgarh has M/s Navrachna Recycling Pvt. Ltd. & M/s ADV Metal Combine Private Limited has two E-waste dismantler / recycler, located at Rajnandgaon & Durg districts having a licensed. Therefore, this indicates that E-waste is either dismantled or recycled in both formal and informal sector in state because of their limited capacity.

2.1.2 E-Waste (Management and Handling) Rules, 2011

Salient features of the E-waste rules are given below.

- These rules are applicable to every producer(s), collection centre(s), dismantler(s), recycler(s), consumer(s) or bulk consumer(s) involved in the manufacture, sale, purchase and processing of electrical and electronic equipment or components as specified in Schedule-I. However, micro, small and medium enterprises are not covered under this regulation.
- The rules clearly define electrical and electronic equipment (EEE) and E-waste. Definition of E-waste categorizes them into two broad categories, i.e., IT and Telecommunication Equipment and Consumer Electrical and Electronics. As per Schedule-I of the rules, seventeen items have been specified under the IT and Telecommunication Equipment category and four items have been specified under the Consumer Electrical and Electronics category. The categories of E-waste covered under the rules are provided in Section 1.4 of Chapter 1.
- The rules also clearly define producers, bulk consumer, consumer, collection centre, transporter, dismantler and recycler. These form an integral part of material flow chain. The physical, financial & compliance responsibilities of each of the above stakeholders, as specified in the rules have been summarised in **Table 2.2** is given below.
- The rules provide direction to domestic EEE manufacturers/ producers to be RoHS (reduction in the use of hazardous substance) compliant within three years. It also allows imports of only RoHS compliant EEE.

Responsibilities		Producer	Consumer	Bulk Consumer	Collection Centre	Dismantler	Recycler / Reprocessor
Collection	Manufacturing	\checkmark					
	End of Life	\checkmark					
Take-back	Individual	\checkmark					
	Collectively	\checkmark					
Transportation to	Producer		\checkmark	\checkmark			
	Collection Centre	\checkmark	\checkmark	\checkmark			
	Dismantlers/ Recyclers	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	
	TSDF* Facility	\checkmark				\checkmark	\checkmark
Storage					\checkmark	\checkmark	\checkmark
Financing		\checkmark					
Registration					\checkmark	\checkmark	
Filing of Annual Returns					\checkmark	\checkmark	\checkmark
Return of Annual Inventory Handled		\checkmark		\checkmark	\checkmark	\checkmark	\checkmark

Table 2.2: Responsibilities of Stakeholders for Collection, Transportation, Storage and Disposal of E-waste

Note: \sqrt{means} "Yes", TSDF means Treatment Storage and Disposal Source: IRGSSA

Table 2.2 indicates that producers' major responsibility for all the activities including financing of E-waste management. Since, the state has two registered dismantler & recycler with limited capacity, it indicates that producers may be fulfilling their responsibility through collection system catering to dismantlers & recycler outside the state.

Therefore, there is need to identify different producers, profile of consumers & bulk consumers & collection centre in the study area and dismantlers & recyclers who are catering to E-waste.

2.1.3 The Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008

The Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008, defines hazardous waste as "any waste" which by reason of any of its physical, chemical, reactive, toxic, flammable, explosive or corrosive characteristics causes danger or likely to cause danger to health or environment, whether alone or when on contact with other wastes or substances, and shall include:

- Waste substances that are generated in the 36 processes indicated in column 2 of Schedule I and consist of wholly or partly of the waste substances referred to in column 3 of same schedule.
- Waste substances that consist wholly or partly of substances indicated in Schedule II, unless the concentration of substances is less than the limit indicated in the same Schedule.
- Waste substances that are indicated in Part A or Part B of Schedule III in respect of import or export of such wastes in accordance with rules 12,13, 14, 15 and 16 or the wastes other than those specified in Part A or Part B if they possess any of the hazardous characteristics in Part C of that schedule.
- Schedule IV includes E-waste as item 18 in its list of hazardous wastes requiring registration for recycling/ reprocessing. This item covers components of waste electrical and electronic assemblies comprising accumulators and other batteries included on list A, mercury switches, activated glass cullets from cathode ray tubes and other activated glass and PCB-capacitors, or any other component contaminated with Schedule 2 constituents (e.g. cadmium, mercury, lead, polychlorinated biphenyl) to an extent that they exhibited hazard characteristics indicated in part C of this schedule.
- Rule 9 of Chapter III on procedures for recycling, reprocessing or reuse of hazardous waste states that the occupier generating hazardous waste specified in schedule IV may sell it only to recycler having a valid registration from the CPCB for recycling or recovery.

2.1.4 Basel Convention and its Application to E-waste

The Basel Convention defines waste by disposal destination or recovery processes. These various processes are listed in Anne IV of the Convention. For example, virtually any material that will be recycled or processed in order to reclaim a metal, or to reclaim an organic or inorganic substance for further use, is deemed a waste. Electronic components that are used without further processing are likely to not be defined as a waste. The convention has provided for two lists. List A found in Annex VII is presumed to be hazardous and thus covered by the Basel convention; and list B, found in Annex IX, is presumed to be non-hazardous and thus not subject to Basel convention. The waste listed in list A is waste that poses serious threats to environment and human health. As a result of their adverse effects these substances require special handling and disposal processes.

The Basel Annex-VII hazardous waste lists the following applicable entries to e-waste:

A1010 Metal wastes and waste consisting of alloys of any of the following: antimony, arsenic, beryllium, cadmium, mercury, selenium, tellurium, thallium.

A1020 Waste having as constituents or contaminants, excluding metal waste in massive form, any of the following: antimony compounds, beryllium, beryllium compounds, cadmium, cadmium compound, lead, lead compounds, selenium, selenium compounds, tellurium, tellurium compound.

A1030 Wastes having as constituents or contaminants any of the following: arsenic, Arsenic compounds, mercury, mercury compound, thallium, thallium compounds.

A1160 Waste lead-acid batteries, whole or crushed.

A1170 Unsorted waste batteries excluding mixtures of only list B batteries. Waste batteries not specified on list B containing Annex I constituents to an extent to render them hazardous. [Note: List B batteries include: waste batteries conforming to a specification, excluding those made with lead, cadmium or mercury]

A1180 Waste electrical and electronic assemblies or scraps containing components such as accumulators and other batteries included on list A, mercury- switches, glass from cathode ray tubes and other activated glass and PCB- capacitors, or contaminated with Annex 1 constituents (e.g. cadmium, mercury, lead, polychlorinated biphenyl) to an extent that they exhibit hazard characteristics contain in Annex III.

A2010 Glass waste from cathode ray tubes and other activated glass destined for direct reuse and not for recycling or final disposal.

It is also important to note that the Basel convention's list B includes:

B1110 Electrical and electronic assemblies (including printed circuit board, electronic components and wires) destined for direct reuse and not for recycling or final disposal.

From the above we can conclude that at the very least, circuit board, CRTs, and other electronic boards or components and assemblies containing lead based solders and copper beryllium alloys (which include most computer circuit boards and much other electronic equipment), are hazardous wastes according to Basel convention. Likewise, whole, used, discarded computers, printers, and monitors that contain such circuit boards or CRTs that are not to be reused directly are to be considered as hazardous waste and subject to the Basel convention.

The provisions of Basel Convention & its provisions under Hazardous Waste Rules are not applicable currently in Chhattisgarh unless export and import of E-waste is carried out by any registered dismantler / recycler. Therefore, they have been described considering E-waste management intervention in future.

2.1.5 Guidelines for environmentally sound management of E-waste, 2008

Guidelines for environmentally sound management of E-waste have been formulated by CPCB in 2008, which provide broad framework to recyclers and regulators on the technologies as well as issues related to compliance.

The objective of these Guidelines is to provide guidance for identification of various sources of waste electrical and electronic equipments (E-waste) and prescribed procedures for handling E-waste in an environmentally sound manner.

These Guidelines are reference document for the management, handling and disposal of E-wastes. These are intended to provide guidance and broad outline, however, the specific methods of treatment and disposal for specific wastes needs to be worked out according to the hazardous / risk potential of the waste under question. These Guidelines provide the minimum practice required to be followed in the management of E-wastes and the State Department of Environment or State Pollution Control Board may prescribe more stringent norms as deemed necessary.

These Guidelines shall apply to all those who handle e-waste which includes the generators, collectors, transporters, dismantlers, recycler and stakeholders of E-wastes irrespective of their scale of operation

These guidelines under classification of E-waste, describe Composition of E-waste; Components of E-waste; possible hazardous substances present in E-waste; E-waste scenario; Basis of Defining E-waste; proposed definition of E-waste; Reduction of the Hazardous Substances (RoHS) in the Electronic & Electrical Equipments and Extended Producer Responsibility (EPR). It gives guidelines for environmentally sound

management for E-waste. Under this head, it describes E-waste Composition and Recycle Potential; Assessment of Hazardousness of E-waste; Recycling, Reuse and Recovery Options; Treatment & Disposal Options and E-waste Recycling / Treatment technologies in India.

Further, it describes environmentally sound treatment technology for E-waste, consisting of description of environmentally sound E-waste treatment technologies; Environmental Impacts of the 1st, 2nd and 3rd level E-waste treatment system; Technology Currently used in India; Best available technology and Available operating facilities. Lastly it describes guidelines for establishment of integrated E-waste recycling & treatment facility consisting of Facility operation requirements; Procedures for setting up & management of integrated E-waste facility and Procedures for compliance with the existing regulations and guidelines.

In the context of current study, these guidelines provide guidance related to assessment of current handling practices, storages & channelization of E-waste in the study area as per SoW.

2.1.6 Guidelines for Implementation of E-waste Rules, 2011

MoEF/CPCB after consulting various stake holders felt the need for preparing a guidance document for implementation of the provisions of the E-Waste (Management & Handling) Rules, 2011 that may help the Producers, Consumer & Bulk Consumer, Collection Center, Dismantler, Recycler and Regulatory agencies (SPCBs/PCCs) for effective compliance / implementation of these rules. This document also provides guidance on setting up collection mechanism, dismantling and recycling operations. Further, guidelines also clarifies issues related to RoHS e.g. the rules call for the reduction in the use of hazardous substances in electrical and electronic equipment. Every producer of equipment listed in Schedule 1 of the Rule shall ensure that the covered products do not contain lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls or poly-brominated di-phenyl ethers above a specified threshold. The threshold for cadmium is 0.01% by weight in homogeneous material, for all other substances, the threshold is 0.1% by weight in homogeneous material. Various clarifications offered by the guidelines are given below.

1. Clarification regarding definitions

- **Producer** is any person who, irrespective of the selling technique used, "manufactures and offers to sell electrical and electronic equipment under his own brand; or offers to sell under his own brand, assembled electrical and electronic equipment produced by other manufacturers or suppliers; or offers to sell imported electrical and electronic equipment" and has to take authorization under these Rules for implementation of EPR.
- **Bulk Consumers** are bulk users of electrical and electronic equipment such as central government or state government departments, public sector undertakings, banks, educational institutions, multinational organizations, international agencies and private companies that are registered under the Factories Act, 1948 and Companies Act, 1956; they have to maintain records on E-waste generated and channelized to registered/authorized collection centres / recycler / dismantler.
- **Extended Producer Responsibility** is a responsibility of any producer of electrical or electronic equipment, for their products beyond manufacturing until environmentally sound management of their end of life products.
- Collection Centre is a centre established individually or jointly or a registered society or a designated agency or a company or an association to collect E-waste which has to obtain authorization under E-Waste Rules, 2011.
- **Dismantler** is any person or registered society or a designated agency or a company or an association engaged in dismantling of used electrical and electronic equipment into their components who has to obtain authorization and registration E-Waste Rules, 2011. The association may include a consortium as well.
- Recycler is any person who is engaged in recycling or reprocessing of used electrical and electronic

equipment or assemblies or their component. Recycling facility may be set up by an individual or a company or a joint venture or a consortium.

• **SPCBs / PCCs** have been given the responsibility as regulatory agencies for ensuring implementation of the E-waste Rules in their respective States.

2. Clarification regarding scope and requirements for compliance to EPR:

- Producers intending to sell their EEEs listed in Schedule-I are required to take authorization only in the place where their manufacturing facilities and corporate head offices are located. In case, of producers importing EEEs listed in Schedule-I, authorization may be taken from SPCB of the State where the port of landing is located.
- Since these products are sold across the country, SPCB/PCC concerned granting the authorization would inform the CPCB of the details of the authorization granted. CPCB would maintain a centralized database on their website, which will be available to all stakeholders. Producers will also place this information on their website and provide details of products sold to the SPCB from whom they have obtained authorization. SPCBs will provide consolidated information to CPCB on an annual basis which CPCB will maintain on the centralized database.
- In the application for authorization, it should be clearly mentioned, how the producer would ensure channelization of the E-waste at the end of its life; details of his own collection centres or take-back systems or the collection centres authorized by him, shall be specified.
- As per the EPR under the Rules, the producers are required to achieve 100% collection and channelization of the end of the life equipment. However, for the purpose of monitoring, targets need to be fixed. Such targets should be based on the life of the product, type of the product, usage and consumption patterns and other relevant factors. CPCB will, therefore, set up a Committee, which will examine the issue of fixing targets, based on the aforesaid factors and also taking into consideration the level of compliance achieved during the first two years.
- Producer who has manufacturing facility shall comply with prevailing environmental regulations under Water (P&C) Act, 1974, Air (P&C) Act, 1981, Hazardous Waste (M, H&TM) Rules, 2008 and other relevant regulations. In the case of a manufacturer, who has obtained authorization under the Hazardous Waste (Management, Handling & Transboundary Movement) Rules, 2008 need not take separate authorization under the e-waste rules till the validity/expiry of that authorization. Subsequent authorization has to be taken under the E- waste rules, 2011 to ensure that electronic scraps, rejects etc. generated during the manufacturing shall be sent or channelized to registered E-waste recycling facilities. Such producer shall obtain authorization only from SPCB/PCC of the State where the manufacturing facility is located.
- The producer is required to maintain records in form 2 along with the details of the e-waste handled/generated and has to submit the annual returns in form 3 in accordance with Rule 4(9) of these Rules.
- Producer shall finance the EPR system either by setting up individual collection system or by joining a common collection system by authorizing them.

Scope of EPR for the Producer:

- i. Producer may assess their individual requirements and design a collection or product take back system as they deem appropriate as long as it facilitates channelization of E-waste for environmentally sound management.
- ii. Producer may arrange for collection from both, individual and bulk consumers and channelize the waste to collection centres or recyclers/dismantlers.
- iii. The producer may opt to implement EPR on his own individually or collectively. There can be

two distinct models; (i.) individual producer responsibility where producer implements EPR managed on his own by setting up his own authorized collection centres or (ii.) collective producers responsibility, where producers may authorize common collection centres (CCC) independently or by joining a consortium as a member. Producers importing EEE listed in schedule – I, may take authorization from the State where the landing port is located

iv. In the E-waste rules, the logo has been printed without a bar below the symbol, whereas the present practice commonly followed by the producer, the Logo has a bar below the symbol. Logo without the bar below the symbol and the logo with bar below the symbol as shown below are acceptable. Symbol may be placed on the products or printed in the accompanying product documentation.



- v. As per Rule 4(6) of the E-waste Rules, 2011 the producer is responsible for creating awareness for the consumer about the product that has been placed on the market. The information should essentially convey the message for the compliance under the rules and the responsibility undertaken by the producer on safe handling and disposal of the end-of-life product. Various modes for creation of awareness such as publications, advertisements, posters, information booklets, use of Television, radio, newspaper etc., could be adopted for communicating the information. The details of awareness programs under taken shall be provided to SPCBs/PCCs while submitting annual returns as per Form 3.
- vi. Under Rule 4(5) it is mandatory for the producer to publicize the contact details of the authorized collection centres and collection points or their collection mechanism to the consumers and such information should be periodically updated. The detailed information should comprise of the full address, telephone number, fax number e-mail etc for each State. The helpline number (like call centre) may also be publicized so that the consumer can reach the nearest collection centre from where he/she is located.
- vii. Awareness is essential regarding the hazardous constituents present in the equipment as well as the safe handling and disposal of the product after its use. In case of the products complying with the provisions of rule 13(1), the same should be indicated in the product information booklet.
- viii. Producer may manage a system directly or with a help of any professional agency on his behalf for collection and channelization system of E-waste by involving relevant stakeholders such as consumer, bulk consumer, NGOs, informal sector, resident associations, retailers, dealers, etc.
- ix. The scope of implementing the EPR by the producers is also explained in the schematic diagram given in **Figure 2.1**.



Figure 2.1: Scope of implementing EPR for Producers Source: E-waste Regulation Guidelines 2012

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3. Clarifications regarding Collection Centres

A collection centre is a store/warehouse where the E-waste collected from consumers, bulk consumers, urban local bodies and retail outlets/collection-points/collection-bins/mobile-units etc. established by producers or collection centres, can be received and stored safely for necessary channelization for dismantling/recycling. These guidelines suggest the following options and requirements for setting up Collection Centres;

- i. Collection centres can be established by various ways. If a collection centre is set up for a particular producer, it may be called individual collection centre. If a collection centre caters the EPR requirements of multiple producers it may be called common collection centre. All collection centres require authorization from SPCBs / PCCs of respective States.
- ii. In case a producer himself sets up a collection centre, he shall take separate authorization from SPCBs / PCCs for setting up such individual collection centre.
- iii. Producer may organize take-back system through their retailers or through service centres and set up collection points or bins or drop-off points and link them to their authorized individual collection centres. Such collection points can also be set-up by authorized common collection centres.
- iv. Producer may organize take-back system through their retailers or service centres and set up collection points or bins and channelize the E-waste directly to registered dismantlers or recyclers.
- v. The collection points can be designated places where E-waste can be collected through residential areas, office complexes, commercial complexes, retail outlets, customer care stores, educational and research institutions, resident welfare associations (RWAs), NGOs working with rag pickers, etc. These collection points can be financed by producers or common collection centres (on behalf of producers) to channelize the E-waste to registered dismantler or recyclers. The E-waste collected through these points should be transported to collection centres or registered dismantling or recycling plants within a stipulated time period as per rule 12. These collection points do not require taking authorization from SPCBs/PCCs.
- vi. Collection Bins could be installed in public places such as kerbsides, restaurants, malls, offices etc. which can be owned by the authorized collection centres or the producer. The contact details of authorized collection agencies should be printed on these bins for reference purposes of the general public. The E-waste collected in these bins should be transported to collection centres or

channelized to registered dismantler or recyclers by the producers. These collection Bins do not require authorization.

- vii. Mobile collection vans can also act as collection systems for door to door collection of E-waste or from institutions / individuals / small enterprises and such vans shall be linked to collection centre or provided by producer to channelize the E-waste to collection centres or registered dismantler or recyclers. A mobile collection van does not require authorization but their detail has to be provided to SPCBs / PCCs while seeking authorization by the producers or collection centres.
- viii. SPCBs shall ensure that authorized collection centres comply with the provisions of the Rules and ensure that the E-waste collected by them is stored in a secured manner and no damage is caused to the environment during storage and transportation till the e-waste reaches registered dismantler (s) or recycler (s) by undertaking periodic inspections and verifications
- ix. The Rules specify that Collection Centres are allowed to store E-waste for a maximum period of 180 days. However, this period may be extended up to one year in the exceptional cases with genuine reasons when the Collection Centres are located in the States, which do not have any registered dismantling or recycling facility and are unable to send the e-waste for recycling within the stipulated time period.

The criteria for setting up collection centres are

- i. The collection, transportation, storage and handling of E-Waste in the collection centres has to be done carefully without breaking the end of life equipments.
- ii. Collection centers, established under these Rules, need not seek Consent to Establish and Consent to Operate under the Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981.
- iii. Producers who has pan India presence having large number of distributors/dealers in each of the State and has large warehouses already in place can use the space if available in these ware house for establishing collection centre. However, the space used for collection centre has to be clearly demarcated (by enclosure or partition) from the space meant for new goods.
- iv. The storage capacity of any collection centre should be commensurate with available area, volume of operations (in weight) and type of E-waste.
- v. The collection centre where Refrigerator and Air conditioners are also stored should have adequate facilities for handling / arresting leakage of compressor oils, CFCs/HCFCs if any.
- vi. Covered shed/spaces may be used for storage of E-Waste generated from IT and Telecommunication equipments while open spaces can be used for storage of refrigerators / washing machines /air conditioners. In case of storage of E-waste, generated from IT and Telecommunication equipment, in open spaces, containers with lids/covers may be used. E-waste comprising of IT & TE waste preferably be segregated and stored at collection centre in suitable racks/containers/bins.
- vii. Containers of appropriate size and shape may be used for segregation of E-waste items generated from IT and Telecommunication equipments to facilitate effective collection and handling operations. Containers can be made either of wood or plastic or mild steel or any appropriate material with sufficient strength and shapes (top open containers, caged boxes, rakes etc.) for holding the E-waste. These containers/racks may be placed in such a way that there should be adequate space for movement of workers and material.







viii. Producer can assess their individual requirements and design a collection or product take back systems as they deem appropriate as long as it facilitates channelization of WEEE for environmentally sound management.

4. Clarification regarding E-waste Dismantler

As per these rules any person or registered society or a designated agency or a company or an association can engage in dismantling of end of life electrical and electronic equipments into their components by obtaining registration and authorization from the respective SPCB/PCC.

- Dismantling operation can be manual, semi manual and automatic involving physical segregation operations for plastics, glass, steel, non-ferrous material, wires, gases, liquids and printed circuit boards. Dismantlers may perform the following operations.
 - 1. Decontamination
 - 2. Manual dismantling using appropriate tools, PPEs and dust control equipment.
 - 3. Hammering
 - 4. Shredding
 - 5. Segregation and
 - 6. Specialized separation processes
 - a) CRT cutting into funnel and panel including removal of phosphor coating from the panel as well as lead paste binding the panel with the funnel.
 - The first step is to decontaminate E-waste and render it non-hazardous by separating hazardous components and materials. Hazardous electronic components such Hg switches, Poly Chlorinated Biphenyl (PCBs) etc. can be recovered and sent to TSDFs for treatment and disposal. In case of refrigerators and air conditioner, the refrigerant gases such as chlorofluorocarbon (CFCs), hydrochlorofluorocarbons (HCFCs) etc. can be collected by using gas recovery equipment for their recovery and storage. The refrigerant gases may be re-used or may be diposed by thermal destruction adopting any of the following options:
 - i. By incineration in existing common HW incinerators
 - ii. By co-processing in cement kiln
 - iii. By plasma destruction
- Dismantling operations shall not include Fine grinding / wet shredding / wet grinding operations. Dismantling operations shall not be permitted for chemical leaching or heating process or melting the material. Dismantlers shall not shred segregated LCDs.
- Dismantler shall have adequate facilities for disposal of bag filter residue and floor cleaning dust in secure manner or shall obtain membership with TSDF for safe disposal.
- Dismantlers can be permitted shredding or cutting of printed circuit boards not below the size of 20mm which have to be handled by employing minimal manual handling and with adequate air pollution control systems.

5. Clarification regarding E-waste Recyclers

As per these rules any person who is engaged in recycling or reprocessing of used electrical and electronic equipment or assemblies or their component is a recycler. Recyclers may also set up their own authorized collection centres and may establish linkages with producers/bulk generators/other collection agencies. They may also establish a scheme for household collection of e-waste or may establish tie–ups with other agencies involved in collection of E-waste from individual consumers.

The functions of the recycling facilities are similar to the dismantlers but implements high degree technologies for recycling or recovery operations. There shall be no restriction on degree of operations that can be permitted for recyclers. The following processes can be employed by recyclers;

- 1. Manual / semi-manual / automatic dismantling operations
- 2. Shredding / crushing / grinding / enrichment operations
- 3. Pyro-metallurgical operations Smelting furnace
- 4. Hydro metallurgical operations

- 5. Electro-weaning
- 6. CRT cutting
- 7. Toner cartridge recycling
- 8. Melting, casting, molding operations (for metals and plastics)
- A recycling facility can be permitted to receive any kind of E-waste covered under E-waste Rules.
- The recycling facilities shall comply with the requirements as specified for dismantlers in the above section for the operations specified therein.
- A recycling facility shall install adequate waste water treatment facilities for process wastewater and air pollution control equipment depending on type of operations undertaken.
- Suitable space de dusting equipment shall be installed where manual dismantling, shredding operations are carried out.
- Suitable fume hoods connected with bag dust collectors followed by wet (chemical) scrubbers shall be installed for control of fugitive emissions from furnaces or chemical reactor fumes.
- In additions to dismantling operations, recyclers may adopt suitable technologies for shredding, wet grinding, gravity / magnetic/density/eddy current / electromagnetic separators with adequate air pollution control equipment. It shall be ensured that dust control equipment comprises of mechanical dust collectors followed by fabric filters or two stage fabric filters or fabric filter followed by wet (chemical) scrubbers.
- Adequate facilities for onsite collection and storage of bag filter residues, floor cleaning dust and other hazardous material shall be provided and sent to secure land fill facility by obtaining membership with TSDF operator.
- The degree of refining and % recovery of resource or precious material present in the E-waste shall be given due importance.

6. Clarification regarding Recycling of CRT Monitor and TVs

- Large volumes of CRTs are expected to be generated in coming years. Care should be taken for recycling of CRTs as it contains harmful substances.
- CRT monitors and TVs can be manually removed from plastic/ wooden casing. The CRT is split into leaded funnel and unleaded panel glass using different splitting technology in a closed chamber under low vacuum environment and the funnel section is then lifted off from the panel glass section and the internal metal gasket is removed for facilitating the removal of internal phosphor coating.
- The CRT can be split manually adopting Ni-Chrome hot wire cutting, Diamond wire method or Diamond saw separation
- Manual shredding, cutting, and segregation operations for CRTs should be carried out in vacuum chambers where the dust is extracted through cyclones, bag filters, ID fan and a suitable chimney. The operators should use gloves fixed to the walls of the vacuum chamber while handling CRTs as shown in the figure below.





- The internal phosphor coating from the inner side of panel glass is removed by using an abrasive wire brush and collected separately. The extracted air is cleaned through high efficiency bag-filter system to collect the phosphor dust. The phosphor dust so collected in the filter bags should be sent to TSDF.
- Segregated CRTs can also be shredded in automatic shredding machines connected with dust

control systems. The mixed shredded glass is separated into leaded glass and glass cullet using electro-magnetic field or by density separation.

7. Clarification Regarding Bulk Consumers

- As per these rules a bulk consumer has to ensure that the e-waste generated by them have to be channelized to authorized collection centres or registered dismantler or recycler or is returned to the producer through its pick up or take back services or through its collection points.
- The bulk consumer has to maintain records of e-waste generated by them in Form 2 and make such records available for scrutiny to SPCBs / PCCs whenever demanded.

8. Clarification regarding reduction in the use of Hazardous Substances (RoHS) in the manufacture of electrical and electronic equipments:

The e-waste rules specifies limit for hazardous substance in the components of electrical and electronic equipments. The limits are detailed below

- i. Every producer of electrical and electronic equipments as per Schedule I shall ensure that new electrical and electronic equipments should not have concentration value more than 0.1% by weight in homogenous materials for Lead, Mercury, Cadmium, Hexavalent Chromium, Polybrominated biphenyls or polybrominated diphenyl ethers and for Cadmium more than 0.01% by weight in homogenous materials. The above maximum concentration limit should be achieved before 01-05-2014. The above limits will not apply to components of electrical and electronic equipment manufactured or placed in the market six years before the date of commencement of these rules. The above limits will also not apply to applications listed in Schedule II of the e-waste rules and electrical and electronic equipments used for defense purpose.
- ii. Import or placement in the market for new electrical and electronic equipment shall be permitted only for those equipment which are RoHS compliant.
- iii. Components of electrical and electronic equipment manufactured or placed in the market before the date of 01-05-2014 are exempted from above provisions.
- iv. The reductions have to be achieved before 1 May 2014 i.e. within two years from the dates of commencement of these rules. Certain applications listed in Schedule II are exempted from the above requirement and there is also an exemption for components of electrical and electronic equipment manufactured or placed in the market six years before the date of commencement of the reduction.

9. Clarification regarding interstate transportation or E-waste

- Transportation of e-waste, being sent for dismantling or recycling to a facility in a State other than the State, where it is generated or collected, does not require 'No objection certificate' from the SPCBs/PCCs concerned.
- However, Transporter of the E-waste is required to give prior intimation to the SPCBs/PCCs concerned i.e. the States in which the E-waste is generated, transited and being sent for the purpose of recycling or dismantling.

10. Clarification Over-all Compliance Mechanism

A compliance mechanism has been set out in E-waste Rules for producers, collection centers, consumer, bulk consumers, dismantler, recyclers and the regulatory authorities (SPCB's, PCCs, CPCB and MoEF). It also sets out the responsibilities for producers to finance and organize the take back and recycling system. However, while ensuring that the given compliance mechanism is followed the same be can be visualized in the following schematic flow sheet given in **Figure 2.2**.





2.2 Institutional Structure

The Ministry of Environment and Forests, Government of India, is the nodal agency at the central level for policy, planning, promoting and coordinating the environmental programs. A number of enforcement agencies assist the Ministry of Environment and Forests at the state level in executing the assigned responsibilities. The Central Pollution Control Board (CPCB) advises on the policy and enforcement. State Pollution Control Boards (SPCB) carry out the enforcement at the state level. The roles & responsibilities of different agencies under E-waste rules are provided in **Table 2.3**.

Sr. No.	Authority/(ies)	Duties
1.	Central Pollution Control Board, Delhi	 i. Coordination with State Pollution Control Boards/ Committees of UT ii. Preparation of Guidelines for Environmentally Sound Management of e-waste iii. Conduct assessment of e-waste generation and processing iv. Recommend standards and specifications for processing and recycling e-waste v. Documentation, compilation of data on e-waste and uploading on websites of CPCB vi. Conducting training & awareness programmes. vii. Submit Annual Report to the Ministry. viii. Any other function delegated by the Ministry under these rules. ix. Enforcement of provisions regarding reduction in use of hazardous substances (RoHS) in manufacture of electrical & electronic equipment. x. Initiatives for IT industry for reducing hazardous substances. xii Set targets for RoHS compliance in manufacture of electrical & electronic equipment. xii Incentives and certification for green design/products
2.	State Pollution Control Boards/ Committees of Union Territories	 i. Inventorization of e-waste. ii. Grant & renewal of Authorization iii. Registration of recyclers of e-waste iv. Monitoring compliance of authorization and registration conditions v. Maintain information on the conditions imposed for authorization etc. vi. Implementation of programmes to encourage environmentally sound recycling vii. Action against violations of these rules

Table 2.3: List of Authorities and Corresponding Duties as per E-waste (Management and Handling) Rules, 2011

Sr. No.	Authority/(ies)	Duties
		viii. Any other function delegated by the Ministry under these rules
3.	Urban Local Bodies (Municipal Committee/Council/C orporation)	(i) To ensure that e-waste if found to be mixed with Municipal Solid Waste is properly segregated, collected and is channelized to either authorized collection centre or dismantler or recycler.(ii) To ensure that e-waste pertaining to orphan products is collected and
		channelized to either authorized collection centre or dismantler or recycler.

Source: E-waste Rules 2012

The roles and responsibilities of different agencies related to hazardous waste and its export and import is given below in Table 2.4.

Sr. No.	Authority/(ies)	Duties and Corresponding Rule
1.	Ministry of Environment and forests, under the Environment (protection) Act, 1986	 i. Identification of hazardous wastes ii. Permission to exporters of hazardous wastes iii. Permission to importers of hazardous wastes. iv. Permission for transit of hazardous wastes through India. v. Sponsoring of training and awareness program on Hazardous Waste and Management related activities.
2.	Central Pollution Control Board constituted under the Water (Prevention and Control of Pollution) Act, 1974	 i. Coordination of activities of the State Pollution Control Boards/ committees. ii. Conduct training courses for authorities dealing with management of hazardous substances. iii. Recommend standards for treatment, disposal of waste and leachates. Recommend procedures for characterisation of hazardous wastes. iv. Sector specific documentation to identify waste for inclusion in Hazardous Wastes (Management, Handling and transboundary Movement) Rules 2008. v. Prepare guidelines to prevent/ reduce/ minimize the generation and handling of hazardous wastes. vi Any other function under rules delegated by MoEE
3.	State Government/ Union Territory Government and Administration	 i. Identification of site (s) for common hazardous waste treatment, storage and disposal facility (TSDF). ii. Assess EIA reports and convey the decision of approval of site or otherwise. iii. Acquire the site or inform operator of facility or occupier or association of occupiers to acquire site. iv. Notification of sites v. Publish periodically an inventory of all disposal sites in the state/union territory
4.	State Pollution Control Boards constituted under the Water (Prevention and Control of Pollution) Act, 1974	 i. Inventorization of hazardous waste ii. Grant and renew authorization iii. Monitor the compliance of the various provisions and conditions of authorization including conditions of permission for issued by MoEF exports and imports. iv. Examining the applications for imports submitted by the importers and forwarding the same to MoEF. v. Implementation of programs to prevent/ reduce/ minimize the generation of hazardous wastes. vi. Registration and renewal of registration of Recyclers/ Re-Processors. vii. Action against violations of Hazardous Wastes (Management, Handling and Transboundary Movement) Rules 2008. viii. Any other function under these rules assigned by MoEF from time to time.
4.	Directorate General of Foreign Trade constituted under the Foreign Trade (Development & regulation) Act 1992	 Grant licence for import of hazardous wastes Refuse licence for hazardous wastes prohibited for imports and exports.

Table 2.4: The authority, duties and corresponding rule as per Schedule VII of the HW Rules, 2008

Sr. No.	Authority/(ies)	es and Corresponding Rule							
5.	Port Authorities under	i. Verify the documents							
	Indian Port Act 1908 and	ii. Inform the ministry of Environment and Forests, Govt. of India of							
	Customs Authorities under	any illegal traffic							
	the customs Act, 1962	iii. Analyze wastes permitted for imports and exports.							
		iv. Train officials on the provisions of the Hazardous Wastes Rules and							
		in analysis of hazardous wastes.							
		v. Take action against export/import Acts, 1908/ Customs Act 1962.							
-									

Source: Hazardous Waste (Management, Handling & Transboundary) Rules 2008

Applicability of E-waste Rules is given in Table 2.5.

Table 2.5: E-Waste (M&H) Rules - 2011 applicability												
Sr. No.	Type of Applicant	To To Maintain Maintain Record in Records Form -2		Filling Annual Return in Form - 3	Authorization Form-I	Registration Form-IV	RoHS Compliance					
1. (Consumer	X	X	X	Х	Х	Х					
2. I	Bulk Consumer	V	\checkmark	Х	Х	Х	Х					
3. U	Jrban Local Bodies		X	X	X	X	Х					
4. Collection Centre						X	X					
F 5. s	Producer –offer to ell					Х						
6. I	roducer - importer			\checkmark		Х						
7. Producer - Manufacturing EEE		\checkmark	\checkmark	\checkmark		Х	\checkmark					
8. I	Dismantler						Х					
9. F	lecycler					Х						
Source: E-waste Rules guidelines												
	X = Not applicab	ole		V = Applicable								

Clarification of the role of State Pollution Control Boards as per E-waste Guideline 2012.

- SPCB/PCC shall also ensure that Producer having manufacturing facility or corporate head office in their State shall obtain authorization. SPCB/PCC shall also ensure that a Producer having their port of landing of imported equipments in their State obtains authorization.
- Shall ensure that manufacturer has set-up adequate collection mechanism to cater the collection needs from entire State.
- The number of collection centres or take-back systems may depend on quantum of sales, number of urban centres in that State.
- The authorization granted to each producer shall be evaluated on case to case basis depending on their proposed EPR implementation scheme. The details of EPR with respect to authorized collection centres, collection points, take-back systems, authorized recyclers, authorized dismantlers and details of agreement between producers, authorized collection centre, dismantler and recycler are required for evaluation.
- Shall ensure that the collection centres, who have applied for authorization, should have adequate space for storing the quantity of e-waste for which application has been made.
- Shall ensure that adequate numbers of containers proportionate to the applied capacity are available for storing e-waste.
- Shall ensure that collection centre should not store e-waste for a period exceeding one hundred and eighty days. The storage period may be extended to one year in those States which do not have any registered dismantling and recycling facility or in such cases where the e-waste needs to be stored for development of a process for its recycling or reuse.
- Shall ensure that collection centre should have arrangement in place for transferring the e-waste to the registered dismantler or recycler.
- Shall ensure that dismantlers and recyclers who have applied for authorization and registration, possess appropriate facilities, technical capabilities and equipment to handle e-waste safely. The land may be owned by the dismantlers/recyclers or could be on lease.

- SPCBs/PCCs shall ensure that no one starts dismantling or recycling of e-waste without having prior permission (registration and authorization) to do so from SPCBs/PCCs.
- Shall ensure that dismantler and recyclers should have appropriate equipments for dismantling and recycling of e-waste.
- Grant of registration for dismantling and or recycling has to be evaluated on case to case basis depending on their capacity and level of operation. The SPCBs/PCCs should ensure that dismantler should not exceed their mandate for processing any e-waste for recovery or refining of materials.
- SPCBs/PCCs shall ensure that dismantlers have well set mechanism for providing dismantled material to recyclers. Action Plan for channelizing the disposal of dismantled component in an environmentally sound manner has to be provided by dismantler.
- SPCBs/PCCs shall ensure that dismantlers/recyclers should be members of TSDF.
- SPCBs/PCCs shall ensure that dismantlers/recyclers should file their annual returns within the stipulated time period.
- SPCBs/PCCs shall place on their web site the conditions imposed on the collection centre, dismantler and recycler while granting authorization and registration and ensure that these conditions are strictly met with by the facility concerned.
- SPCBs/PCCs should regularly monitor the compliance of authorization and registration.

Role of Municipal Authorities

- There is possibility of mixing of e-waste with municipal solid waste. In such cases, the Urban Local bodies (Municipal Committees/ Councils/ Corporations) are required to ensure that E-waste if found to be mixed with MSW is properly segregated, collected and is channelized to either authorized collection centre or dismantler or recycler.
- The Urban Local bodies (Municipal Committees/Councils/ Corporations) are also required to ensure that e-waste generated from non branded or assembled electrical and electronic equipment as specified in Schedule I is collected and channelized to either authorized collection centre or dismantler or recycler. The ULBs are also required to collect E-waste generated from those EEEs which are covered under the rules and produced by a company, which has closed its operation or has stopped product support.
- ULBs may also set up their own collection points at MSW disposal site, public places; residential locality etc to collect the E-waste and such collection points shall be connected to authorized collection centres/dismantlers/recyclers.

2.3 Overall Assessment with respect to Emerging Regulatory Scenario

Major conclusions drawn from regulatory assessment having implications an E-waste management in the state are given below.

National Environment Policy 2006

National Environment Policy 2006 provided overall guidelines on waste management including E-waste. These provided road map for preparation of guidelines and regulation policy. At first guidelines came into effect in 2008, which provided a minimum practice required for environmentally sound management of E-waste.

Guidelines Environment sound Management of E waste

These guidelines also provided the basis for amendment of Hazardous Waste (Management, Handling & Transboundary Movement) Rules 2008 & E-waste was included as part of Schedule IV. This development brought E-waste recycling into the ambit of hazardous waste regulations and facilitated control of export & import of E-waste. A number of E-waste recyclers got registered under these rules indicating the part formalization of the E-waste trade value chain but diversion less than 5% of the E-waste generation to these recyclers paved the way for separate E-waste regulation based on EPR.

E-waste (Management & Handling) Rule 2011

In 2011, new E-waste (Management & Handling) Rules were notified, which came into effect in 2012. These rules were formulated in close consultation with producers & their associations and other stakeholder. Some of the major features of this regulation having implication on E-waste inventory assessment are given below.

- No target has been fixed to collect E-waste from the time of enforcement. Producer is not bound by any collection target.
- There are no mandatory provisions for producers in the rules to declare quantity of EEE placed in the market since 2012.
- No mechanism for tracking purchase of EEE by bulk consumers exists.

Draft E-waste (Management & Handling) Rules 2016

Draft E-waste (Management & Handling) Rules have been disclosed and are expected to be notified any day. These rules have been formulated in close consultation with major stakeholders in E-waste trade value chain. Some of the major features of this regulation having implication on E-waste inventory assessment are given below.

- All the above three points (1, 2 & 3) have been addressed in the draft rules.
- Draft rules recommend financial mechanism to address financial implications for E-waste management.
- Responsibilities of Consumers especially bulk consumers have been increased.

2.4 Conclusions

None of the major brands manufacturing / importing items mentioned in Schedule 1 of the E-waste rules have manufacturing facilities or corporate head offices located in Chhattisgarh Therefore, monitoring of E-waste inventory through evaluation of Form 2 or Form 3 in accordance with Rule 4(9) of E-waste Rule by CECB in the state is possible only through the producers data obtained from centralized agency e.g. CPCB or the state where these producers are registered after 2012.

CPCB data shows that as of September 2013, Chhattisgarh has two E-waste dismantler / recycler M/s Navrachna Recycling Pvt. Ltd. & M/s ADV Metal Combine Private Limited. Therefore, CECB can track & monitor E-waste inventory in the state through the dismantler's / recycler's data obtained from centralized agency e.g. CPCB or the state where dismantler's / recycler's are registered. This also indicates that E-waste is either dismantled or recycled in both formal & informal sector in the state.

Table 2.2 indicates that producers are majorly responsible for all the activities including financing of E-waste management. Since, the state has two registered dismantler & recycler, it indicates that producers may be fulfilling their responsibility through collection system catering to dismantlers & recycler both inside & outside the state.

Assessment on the upstream side of the E-waste chain especially of both types of consumers (bulk & individual consumer), also indicate that only bulk consumer offer opportunity of E-waste inventory tracking & monitoring. Though, bulk consumers are required to maintain records of E-waste, they are not required to file the returns.

Since no mechanism exist for tracking purchase of EEE by bulk consumers and also producers are not required to declare quantity of EEE placed in the market since 2012, E-waste inventory assessment has to rely on available historical market research data.

Therefore, there is a need to identify different producers, profile of consumers & bulk consumers, collection centre, dismantlers & recyclers who are catering to E-waste in the five districts in the study area.

Chapter 3: Assessment of E-waste Market

3.0 Introduction

The increasing market penetration of the consumer electronics will lead to reduced life of electronics items and greater generation of E-waste in Chhattisgarh. Therefore, an assessment of E-waste market structure requires an understanding of E-waste as a "tradable commodity" and its "mechanism of trading". In Chhattisgarh E-waste as a "tradable commodity" can be described in terms of its composition and its potential for material recovery. "Mechanism of Trading" can be described in terms of E-waste trade value chain. This chain will identify different stakeholders consisting of producers, consumer or bulk consumers, collection centers, dismantlers and recyclers, while mechanism of trading will determine E-waste generation, present handling practices, storage and channelization for its recycling or disposal. The following sections describe each of these items to facilitate an understanding of E-waste market in five divisions of Chhattisgarh.

3.1 E-Waste Composition

E-waste Composition has been described in terms of components, which contain items of economic value. At first E-waste has been classified into 19 components forming "building blocks", which are easily "identifiable" and "removable", followed by their respective hazardousness.

3.1.1 E-waste Components

A number of components, which are assembled to produce "Electrical and Electronic Equipment" are metal, motor / compressor, cooling, plastic, insulation, glass, LCD, rubber, wiring / electrical, concrete, transformer, circuit board, fluorescent lamp, incandescent lamp, heating element, thermostat, FR / BFR – containing plastic, batteries, CFC / HCFC / HFC / HC & external electric cables. Specific component, which are found in Air Conditioners, refrigerator, washing machine, personal computers, cellular telephones, TVs and other items as per schedule 1 are described in **Table 3.1**.

Large household appliance like Air Conditioners / refrigerator may consist of electric motor, a circuit board, a transformer, capacitor, thermal insulation, switches, wiring, plastic casing (containing flame retardants) etc. A typical washing machine may consist of the metal casing, inner and outer drums, a motor, a pump, washing cycle controller unit, switches and other components. IT and telecom equipments sector is observing a trend of "micro miniaturization", while CRTs in monitor are being replaced by LCD screens. Further, there is an increasing trend of reduction in weights of these items.

Table 3.1 indicates that the range of different items found in E-waste is diverse classifying it a waste of complex nature. However, it shows that E-waste can be dismantled or disassembled into relatively small number of common components for further treatment. This disassembly results in segregation and treatment of E-waste.

3.1.2 E-waste Composition, Recyclability and Hazardousness

During market survey of major stakeholders in Bilaspur division, it was revealed that broadly E-waste consists of ferrous and non-ferrous metals, plastics, glass, wood, printed circuit boards, rubber and other items. Iron and steel constitutes about 50% of the E-waste followed by plastics, non - ferrous metals and other constituents. Non-ferrous metals consist of metals like copper, aluminum and precious metals ex. silver, gold, platinum, palladium etc. Therefore, these items are dismantled in informal sector. However, the presence of elements like lead, mercury, arsenic, cadmium, selenium, hexavalent chromium and flame retardants in E-waste and their components beyond threshold quantities render them hazardous in nature.

Sr. No.	Items of Electrical & Electronic Equipment's	Metal	Motor / Cooling	Plastic	Insulation	Glass	CRT	ICD	Rubber	Wiring / Electrical	Transformer	Magnetron	Circuit Board	Fluorescent lamp (in ballast)	Incandescent lamp	Heating element	Thermostat	FR / BFR – containing plastic	Batteries	CFC, HCFC, HFC, HC	External electric cables
I.	. Information Technology and Telecommunication Equipment																				
1.	Centralized Data Processing		\checkmark	\checkmark				\checkmark											\checkmark		\checkmark
2.	Mainframes	\checkmark	\checkmark										\checkmark						\checkmark		\checkmark
3.	Mini Computers																				
4.	Personal Computing																				
5.	Personal Computers (Central processing unit with input and output devices)			V	V		V	V	V	V	V	V							V		V
6.	Laptop Computers (Central processing unit with input and output devices)		V	V	V	V		V	V	V	V		V	\checkmark				\checkmark	V		\checkmark
7.	Notebook Computers	\checkmark	\checkmark		\checkmark				\checkmark	\checkmark			\checkmark	\checkmark				N			
8.	Notepad Computers								\checkmark	\checkmark				\checkmark				\checkmark			
9.	Printers including cartridges	\checkmark	\checkmark	\checkmark		\checkmark				\checkmark	\checkmark		\checkmark								\checkmark
10.	Copying Equipment	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark			\checkmark	\checkmark	\checkmark		\checkmark								\checkmark
11.	User Terminals and Systems	\checkmark		\checkmark			\checkmark			\checkmark	\checkmark		\checkmark								
12.	Facsimile	\checkmark	\checkmark	\checkmark						\checkmark	\checkmark		\checkmark								
13.	Telephones	\checkmark		\checkmark					\checkmark	\checkmark			\checkmark								
14.	Pay Telephones	\checkmark		\checkmark						\checkmark			\checkmark						\checkmark		
15.	Cordless Telephones	\checkmark		\checkmark	\checkmark			\checkmark		\checkmark			\checkmark						\checkmark		\checkmark
16.	Cellular Telephones	\checkmark	\checkmark	\checkmark		\checkmark							\checkmark					\checkmark	\checkmark		\checkmark
17.	Answering Systems	\checkmark	\checkmark	\checkmark						\checkmark			\checkmark						\checkmark		\checkmark
II.	Consumer Electrical and Electro	nics																			
18.	Cathode Ray Tube (CRT) TV	\checkmark		\checkmark									\checkmark								
19.	Liquid Crystal Display (LCD) TV																				
20.	Light Emitting Diode (LED) TV																				
21.	Refrigerator		\checkmark						\checkmark									\checkmark			\checkmark
22.	Washing Machine		\checkmark						\checkmark												\checkmark
23.	Air Conditioners excluding centralized air conditioning plants	V	V	V	V				V	V			V				V	\checkmark			V
24.	Compact Fluorescent Lamp CFL																				

Table 3.1: Components in E-waste

 $\sqrt{\text{Present}}$ as a component

• Possible presence as a component Source: Prepared from WEEE & Hazardous Waste, A report produced for DEFRA, UK Government, March 2004, AEA Technology
The possible substances of concern, which may be released during recovery of secondary raw material from E-waste, are given in **Table 3.2**.

Component	Possible Hazardous Content
Metal	
Motor \setminus Compressor	
Cooling	ODS
Plastic	Phthalate plasticize, BFR
Insulation	Insulation ODS in foam, asbestos, refractory ceramic fiber
Glass	
CRT	Lead, Antimony, Mercury, Phosphors
LCD	Mercury
Rubber	Phthalate plasticizer, BFR
Wiring / Electrical	Phthalate plasticizer, Lead, BFR
Concrete	-
Transformer	
Circuit Board	Lead, Beryllium, Antimony, BFR
Fluorescent Lamp	Mercury, Phosphorus, Flame Retardants
Incandescent Lamp	
Heating Element	
Thermostat	Mercury
BFR – containing plastic	BFRs
Batteries	Lead, Lithium, Cadmium, Mercury
CFC, HCFC, HFC, HC	Ozone depleting substances
External electric cables	BFRs, plasticizers

Table 3.2: Possible Hazardous Substances in E-waste Components Possible Hazardous Content

Source: Compiled from WEEE & Hazardous Waste, A report produced for DEFRA, March 2004, AEA Technology

Major components, which cause most concern, include lead, mercury, cadmium and chromium (VI), halogenated substances (e.g. CFCs), polychlorinated biphenyls, plastics and circuit boards that contain brominated flame retardants (BFRs). BFR can give rise to dioxins and furans during incineration and open burning of E-waste fractions at dump site can lead to other toxic release. Other materials and substances that can be present in E-waste are arsenic, asbestos, nickel and copper. These substances may act as a catalyst to increase the formation of dioxins during incineration.

3.2 Mechanism of E-Waste Trade

"Material Flow" along the "Life Cycle" of electrical and electronic equipment within a "Geographical Boundary" of Bilaspur division of Chhattisgarh forms the basis of E- waste generation. The following sections describe a conceptual understanding of material flow, along the life of electrical and electronic equipment, its conversion into an "obsolete" item followed by its transformation into new material. A conceptual E-waste trade value chain showing material flow along the E-waste trade value chain is shown in **Figure 3.1**. This is followed by customization of the conceptual E-waste trade value chain for Bilaspur division.

Raw Material Input





Source: UNEP Manual Vol. I; Inventory Assessment Manual

The establishment of material flow within a geographical boundary assists in identifying, networks / chain connecting different phases of life cycle of electrical and electronic equipment and associated stakeholders. The material flow, when applied to "life cycle" of electrical and electronic equipment leads to evolution of the 'Four-Phase-Model', where each phase describes respective unit operations and different stakeholders. Each of these phases and associated stakeholders is described in **Table 3.3** and depicted in **Figure 3.2**. The dotted vertical line in the **Figure 3.2** indicates the stage of "obsolescence" in between the second and third phase of life cycle.

Table 3.3: Phases of material flow model

S.No.	Phase	Stakeholders
1.	<u>Phase I:</u> Unit Operations / Processes / Activities: Production and sales of electrical and electronic equipment including import, export, and input of equipment for re-use from repair of WEEE / E-waste.	Stakeholders: Manufacturers, importers, exporters, and retailers (brand new / second hand)
2.	<u>Phase II:</u> Unit Operations / Processes / Activities: Consumption of electrical and electronic equipment, use of electrical and electronic equipment in households, offices and industry.	Stakeholders: Consumers like households, commercial places like offices and industry
3.	<u>Phase III:</u> Unit Operations / Processes / Activities: Consumption of electrical and electronic equipment, use of electrical and electronic equipment in households, offices and industry.	Stakeholders: Consumers, importers, exporters, collectors, traders, dismantlers, waste treatment operators
4.	<u>Phase IV:</u> Unit Operations / Processes / Activities: Treatment / disposal alternatives for WEEE/E-waste ex. repair, decontaminating, dismantling, shredding, landfill and incineration.	Stakeholders: Dismantlers, Recycling, Hazards landfill site operators.
Courses De	at and from Waste from electrical and electronic equitment (WEEE)	an antition damageness substances and

Source: Prepared from Waste from electrical and electronic equipment (WEEE) – quantities, dangerous substances and treatment methods, EEA Copenhagen, 2003

In developed countries, where E-waste management system is in operation, the entire trade value chain occurs in organized / formal sector. The blue line indicates the starting point of informal sector involvement in E-waste management in a developing country. An example of generic E-waste trade value chain in a developing country is shown in **Figure 3.3**. In majority of developing countries, the informal sector engagement starts from the point of collection and continues till the last stage in some capacity. However, other steps / unit operations like E-waste processing, production / end products may be present or absent in a country. Therefore, this chain can be further modified or customized with inter or intra linkages depending on the E-waste processing or end production in Bilaspur division.



Figure 3.2: Generic E-waste trade value chain in a developing country Source: UNEP Manual Vol. II; Inventory Assessment Manual



Figure 3.3: The 'Four-Phase-Model'

Source: Prepared from Waste from electrical and electronic equipment (WEEE) – quantities, dangerous substances and treatment methods, EEA Copenhagen, 2003

3.3 E-waste trade value chain in Bilaspur Division (5 districts)

A tentative E-waste trade value chain for study area which has emerged out of field work is shown in **Figure 3.4**. Tracer technique, which was pilot tested in Bilaspur division has been used in major five districts in the division to fix E-waste trade value chain. A brief description of the identified stakeholders is given below.



Figure 3.4: Tentative E-waste trade value chain in Study Area

<u>Producers</u>

Figure 3.4 indicates that EEE producers / manufacturers do not exist in the study area. However, their products are being sold in the division. Secondary data confirms that EEE producers do not have manufacturing facilities in the division and therefore they are not registered with Chhattisgarh Pollution Control Board. Since these producers are responsible for their products under EPR, their detailed **inventory** as per schedule 1 of E-waste (Management & Handling) rules are given in Annexure 1.

Distributors / Traders / Retailers

EEE from these producers are sold in the study area through Distributor / Trader / Retail network as well as directly through the company. Items like Centralized Data Processing, Mainframes, Mini computers of Schedule 1 are used by large corporates, State and Central Government agencies falling under the category of bulk consumers whose profile is given below. **Inventory** of Distributors / Traders / Retailers selling items other than mentioned above in the study area is given in Annexure 2. However, retailers / dealers do not fall under the purview of E-waste (Management & Handling) Rules 2011, unless they serve as collection centre or drop off point.

<u>Consumers</u>

There are two types of consumers, which are found in the five districts of study area; Individual Consumers & Bulk Consumers. **Inventory** of bulk consumers in the five districts are given in Annexure 3.

Collection Centres / Channel

Tracer analysis indicates that EEE, which becomes E-waste in the study area partly gets collected & transported in the informal sector and partly in formal sector. Primary survey carried out through Tracer technique indicates that bulk of E-waste generated in the study area goes to informal sector. Majority of the producer / manufacturer have established collection channel in the study area. These collection channels work through following mechanism.

- 1. Single point call centre
- 2. Distributors / Retailers
- 3. Service Centres
- 4. Physically established collection centre / drop off point

The producers use a combination of these mechanisms as given in Table 3.4.

Brands	Collection through Call Centre	Collection through Dealers / Retailer	Collection through Service Centre	Collection through Collection Centre / establishment	Remarks
LG				\checkmark	
Panasonic					
Samsung	V			V	Technician come to the site of E- waste discarded item, check the item and collect. (No compensate) provides certificate. (All the E-waste discarded item go to Haridwar, Rorkee) Attero Recycling Company.
Toshiba					Collection is carried out by a logistic service provider "M/s Kintetsu World Express Pvt. Ltd.", earlier "Gati"
Haier					
Kelvinator	\checkmark	\checkmark			Exchange your electronic item to your nearest dealer or where you buy the product
Electrolux	\checkmark	\checkmark			Exchange your electronic item to your nearest dealer or where you buy the product
Godrej					
Hitachi	\checkmark				Exchange offer contact to your dealer no collection center
BPL	\checkmark	\checkmark			Contact to your dealer where you buy the product
Akai	\checkmark	\checkmark			To the dealer he gives the cost of the product.
Sansui	\checkmark	\checkmark			E-waste Regarding no information Contact to nearest dealer
Philips	\checkmark			\checkmark	Call on customer care door to door collection of E-waste / discarded items of Philips
Whirlpool					To dealer he exchange your

Table 3.4: Manufacturer's E-waste Collection Centre System in Bilaspur

Brands	Collection through Call Centre	Collection through Dealers / Retailer	Collection through Service Centre	Collection through Collection Centre / establishment	Remarks
					electronic item
			Printe	rs	
HP	\checkmark	\checkmark			Drop your items as dealer's drop off locations.
Canon					
Brother					
TVSE					

Inventory of Service centres in the study area is given in Annexure 4. Inventory of Physically established collection centres is given in Annexure 5 **Table 3.4** indicates that majority of producers use call centre as well as dealer's network for collection of E-waste. There are two possibilities of onward transportation & disposal of E-waste. The first possibility is the disposal through informal sector & the second is through registered recycler. Since dealers are not covered under E-waste Rules, they are not legally bound to report.

<u>Informal Sector</u>

Tracer technique has been used in the Bilaspur division to fix E-waste trade value chain in the informal sector.

E-waste is collected & dismantled in informal sector in the study area. Further, its major fractions are transported outside the state mainly to Ghaziabad, Gwalior, Etawah & Delhi through informal sector traders. An inventory location of major scrap vendor / dismantler, temporary stockpile site / informal collection centre & landfill site is given in Annexure 6.

It has been found that Jarha bhata, Gaura Path road, Masanganj Imali Para, Old Bustand area in Bilaspur District, Bustand Area, Raja Bada, Mungeli road, Hira laa road, Phokat para in Mungeli District, Indira Nagar, Sunday Market, Mudapur Bypass, Machali Markent etc in Korba District, Station Road, Kera road, Birghani Chowk, Idgah Complex etc of janjgir Champa District and Chakradhar Nagar, Chhata Mura,kedwabadi Bustand, Guru Ghasi Das Chow etc In Raigarh District has a strong metal and electronic scrap market. Items from these areas are and then transported to Ghaziabad, Gwalior, Etawah & Delhi. They used to come twice/thrice in a year. The motherboards and floppy drives are removed from the machines by scrap vendors and sold by weight and mobile phone sold as individual pieces to scrap dealers. None of these scrap vendors have the ability to identify the condition of these components. They are then typically sold - TV Circuit Rs. 20-50/kg & TV 250-300/Pcs.; Compressor Rs. 400-450/Pcs.; Copper Rs. 350-450/kg; Refrigerator Rs. 500-1200/Pcs.; Washing Machine Rs. 700-800/Pcs; CFL Rs. 300/kg and Mobile kit Rs. 30-50/Pcs.

- Electronic items go to mechanic shops from households for repairing, and mechanic replaces damaged / defunct parts / components from it and then they sell it to scrap dealers.
- Mechanics sell E-waste to scrap dealer by weight / Pcs. mainly of ICT items (IT as per Schedule 1); TV circuit Rs. 15-45/kg; Compressor Rs. 300-400/Pcs.; Washing Machine Motor Rs. 200/Pcs.; Copper Rs. 200-350/kg; DVD Circuit Rs. 20-25/kg; Mobile kit Rs. 1000-2000/kg; SMPS Rs. 50/Pcs, Mother Board Rs. 90/Pcs.; Hard disk Rs. 120/Pcs.; CD Writer Rs. 35-40/Pcs.

- Small scrap vendors sell E-waste to big scrap dealer by weight / Pcs. TV Circuit Rs. 20-50/kg & TV 250-300/Pcs.; Compressor Rs. 400-450/Pcs.; Copper Rs. 350-450/kg; Refrigerator Rs. 500-1200/Pcs.; Washing Machine Rs. 700-800/Pcs; CFL Rs. 300/kg and Mobile kit Rs. 30-50/Pcs.
- Scrap dealers comes from Ghaziabad, Gwalior, Etawah & Delhi yearly twice / thrice for collection of E-waste.
- There is no organized mechanism for collection, transportation and disposal of E-Waste in Bilaspur division.
- No mechanism exists in the state to monitor and track its inventory, collection, transportation and disposal.

<u>Market Features</u>

E-waste Market concentration is mainly in Bilaspur district. This is due to higher penetration of EEE because of population concentration in this area. The EEE markets have been found to be small and price sensitive. Major brands, which have been observed, are Nokia, LG, Sony, Samsung, Panasonic, Philips, Videocon, Godrej, Onida, Whirlpool, Kelvinator, Haier, Hitachi, Voltas, Blue Star, Dell, HP, HCL and Lenovo. The new items after active life gets repaired and reused by the owner of the item. In case it becomes useless, it is left at repair centre, where it is cannibalized & finally its fractions are thrown in the dust bin.

Majority of material/ E-waste is transported to Ghaziabad, Gwalior, Etawah & Delhi with scattered temporary storage at different places of different towns.

Dump Sites (E-waste tracers)

Only Plastic and Glass parts of E-waste were found in Dump Site. Mixed waste was found in all dump sites. A summary of the process observed is shown in **Figure 3.5**.



Figure 3.5: Processes observed at dumpsite

Collection, Transportation & Processing (scrap dealers)

Small scrap dealer purchase waste from Household / Commercial Area / Institution, etc. At first stage, they segregate the waste than break the item and collect valuable items like Aluminum, Copper, Iron & Steel, Compressor, motor, etc. from E-waste. They sell their collected item to the large scrap dealer. They visit nearby area on daily/weekly basis and purchase the waste. These scrap dealers are

not licensed by the municipalities but are part of the networks of large scrap dealers. Dismantling and segregation of E-waste occurs in a major way at large scrap dealers.



Figure 3.6: Processes observed at scrap dealers / junkyards

<u>Repair Shops (AC/WM/REF)</u>

One person repairs one of these items every day. E-waste fractions/ waste Parts, like plastic body of these items, etc. is dumped into community bin and valuable item sold to nearby scrap dealer. Some of the respondent informed that Item which is not in repairable condition is returned to the owner of the product who in turn sells to the scrap dealer. Majority of the product are in repairable condition. A summary of the process observed is shown in **Figure 3.6** and illustrated in **Figure 3.7**.



Figure 3.7: Processes observed at AC, Washing Machine, and Refrigerator Repair Shop

Repair Shops (TV / PC / Mobile Phone)

Majority of mobile phones, TV & computers repair shop owners are local citizens. Waste Parts, like plastic body of these items, etc. are dumped into community bin and valuable item sold to nearby scrap dealer. They also store valuable item and use it to repair other EEE. Majority of the product are in repairable condition. A summary of the process observed is shown in **Figure 3.9**



Figure 3.9: Processes observed at TV, Computer, and Mobile Phone Repair Shop

Summary E-Waste Process Study

There are various processes involved for recycling / reusing of electronic waste. The major process for different types of electronic items in Bilaspur, Mungeli, Korba, Janjgir Champa and Raigarh are mentioned in **Table 3.5**.

6		Process Status						
Sr. No.	Process name	Bilaspur	Mungeli	Korba	Janjgir Champa	Raigarh		
1	IC's Extraction from PCB	No	No	No	No	No		
2	Surface Heating of PCB and Extraction of components	No	No	No	No	No		
3	Dissembling of Monitor & TV and extraction of components	Yes	Yes	Yes	Yes	Yes		
4	Yoke core and Copper	No	No	No	No	No		
5	Metallic Core of Transformer and Copper	Yes	Yes	Yes	Yes	Yes		
6	Rare Earth Core of Transformer and Copper	No	No	No	No	No		
7	Rare Earth Core of Static Transformer	No	No	No	No	No		
8	Wire PVC and Copper	Yes	Yes	Yes	Yes	Yes		
9	Plastic Shredder	No	No	No	No	No		
10	Dismantling of Refrigerator and Compressor	Yes	Yes	Yes	Yes	Yes		
11	Gold Extractions from Pins and Comb	No	No	No	No	No		
12	Acid Bath for PCB	No	No	No	No	No		
13	Regunning CRT's	No	No	No	No	No		
14	Glass Recovery from CRT	No	No	No	No	No		
15	Gold Recovery	No	No	No	No	No		

Tabla	3 5.	Drocosoo	involved	for	E waste	roovaling	in	different towns
I able	3.5:	Processes	involvea	101	L -waste	recyching	ш	different towns

The process details of fifteen processes are given in **Table 3.5**. The analysis of this table shows that there is dismantling activity occurring in, Bilaspur, Mungeli, Korba, Janjgir Champa and Raigarh. The entire amount of E-waste from these towns is transported to Ghaziabad, Gwalior, Etawah and Delhi for dismantling and further supply to Delhi market. Photo documentation captured in different towns of Bilaspur division is given in Annexure 8.

3.4 Conclusions

Major conclusions, which can be derived, include growing market of EEE in Bilaspur division. This growth may lead to increasing E-waste generation, which may further lead to higher pollution loads, health impacts and loss of recoverable items.

Chapter 4: Methodology for E-waste Inventory

4.0 Introduction

E-waste inventory forms the backbone of its E-waste management in a geographical area. There are, five methods, which have been used to determine E-waste inventory in both developed and developing countries. Each of these methods use "Material Flow" model. Therefore, the selection of E-waste inventory assessment methodology in five districts of Chhattisgarh in Bilaspur division is based on the availability, reliability and analysis of data along the material flow chain within their geographical boundary. The following sections describe each of these methods, their application, constraints, advantages, data requirements and sources of data in the context of Chhattisgarh.

4.1 Methods for Inventory Assessment

Different methods of E-waste inventory assessment as per UNEP's Manual 1 on E-waste Inventory Assessment are given below.

- 1. The Time Step Method.
- 2. The Market Supply Method.
- 3. The Carnegie Mellon Method.
- 4. Approximation Method 1.
- 5. Approximation Method 2.

The data requirement for each methodology based on mathematical expressions is given in Annexure 9. The extent of data required depends on the extent of geographical boundary, which could be national, regional or city boundary. Conceptually, the source of data can be identified by understanding the "material flow chain" within the given geographical boundary.

The E-waste material flow chain in Chhattisgarh as described in **Figure 3.4** of Chapter 3 is again shown in **Figure 4.1** in the context of inventory assessment. **Figure 4.1** shows that in all the five districts of the study area, the material flows from an organized / formal sector starting from production / manufacture till consumption phase, where major percentage of material enters into unorganized / informal sector. Therefore, the major constraints are related to availability, reliability, amount and range and completeness of the data along the chain.

Analysis of transfer of E-waste flow chain from formal to informal sector shows that the data for EEE in Chhattisgarh needs to be collected from secondary sources & primary survey. Therefore, E-waste inventory assessment in Chhattisgarh requires collection of available secondary data from the formal sector & its strengthening by primary survey in the informal sector followed by trend analysis.

4.2 Material Flow Chain, Data Sources and Data Gaps in Study Area

Figure 4.1 indicates that stakeholders existing in the study area are EEE retailers, consumers, service centres, E-waste collectors (to a limited extent) and two dismantlers in formal sector & other E-waste collectors (majority), & dismantlers in the informal sector in the study area. Therefore, secondary data related to stakeholders in the flow chain in the formal sector at temporal level was identified, collected and collated for quantification, while primary survey was carried out covering stakeholders in the informal sector in the study area. The detailed findings of the primary survey are given in Chapter 3.



Figure 4.1: E-waste material flow chain in Study Area

Major observations related to data availability are given below.

- Saturation Level National census data was obtained from office of the Registrar General & Census Operation, Govt. of India, National Sample Survey Organization (NSSO), Department of Statistics, Government of India, State Statistics from Department of Statistics, Government of Chhattisgarh, Telecom Regulatory Authority of India (TRAI), Ministry of Communications & Information Technology (MOCIT), Government of India, Industry Association like Manufacturers Association for Information Technology (MAIT), Electronic Industries Association of India (ELCINA), Telecom Equipment Manufacturers Association of India (TEMA) & Research Institutions e.g. National Council for Applied Economic Research (NCAER).
- 2. Number of Households Available with national census data (1991, 2001 & 2011).
- 3. Stock Data Stock levels at private/households, industry, commercial & sectors with Industry Association.
- 4. Data related to average life time, storage data, reuse, recycling & disposal at landfill site is not available from secondary sources & so primary survey was carried out in the study area.

Data Source/ Item	National/Local	Industry/ Trade/ Recyclers/ Waste Disposal Operator's Association	Market Research Agencies (Reports/		
	Government Agencies	(Reports/ Published Data/ Field Work)	Published Data)		
Saturation Level (Household & Industry)	National Census Data, (1991, 2001 & 2011)	Major Trading Agencies, (Retailers)	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands		
Number of Household	National Census Data, (1991, 2001 & 2011)				

Table 4.1: Tentative sources of data in Study Area

Data Source/ Item	National/ Local Government Agencies	Industry/ Trade/ Recyclers/ Waste Disposal Operator's Association (Reports/ Published Data/ Field Work)	Market Research Agencies (Reports/ Published Data)
Export Data	Not required		
Import Data	Not required		
Stock Data Private (Rural & Urban)	NSSO (1994 – 2010)	Industry Association, Scrap Dealers, Recyclers, EEE Retailers	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
Stock Data Industry	TRAI, MOCIT, Govt of India.	Industry Association, Scrap Dealers, Recyclers, EEE Retailers	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
Average Life Time, Technology Change	TRAI, MOCIT, Govt of India.	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications, Annual Reports of Major Brands
Storage Data		Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications, Newspapers
Reuse		Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications
Recycle		Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	
Disposal in Landfill	City Municipalities	Scrap Dealers, Recyclers, EEE Retailers	

A matrix describing inventory methodology versus data availability has been prepared after assessing the data obtained as per **Table 4.1** (based on data requirement methodology) and summarized in **Table 4.2**. The major inferences, which can be drawn from **Table 4.2** are given below.

Method Saturation Level		Numbe Calculated Sales		ales	Stock Data		Avera			Recvcl			
ology/ Data Require ment	House hold	Industr y	r of Househ old	Export Data	Import Data	Manufac turing / Product ion	Priv ate	Indus try	ge Lifeti me	ge data	Reu se	e / disma ntling	Land fill
Time Step Method	Х			Х	Х		Х	Х					
Market Supply Method				Х	Х				\checkmark				
Carnegie Mellon Method				Х	Х				\checkmark		\checkmark	\checkmark	\checkmark
Approxim ation 1	Х	Х	\checkmark				Х	Х	\checkmark				
Approxim ation 2				Х	Х	\checkmark							

Table 4.2: Data Matrix Vs Methodology

Note: √ means 'Available'/"Can be Derived"; X means 'Not Available'; NV means 'No value'

Since E-waste market in Chhattisgarh is a continuously growing market, which has not reached saturation levels, therefore Time Step Method, Approximation 1 & Approximation 2 Method have not been used. Further, market supply method can be applied since it requires at least one set of data related to EEE penetration & one set of data after E-waste generation. Carnegie Mellon method appears to give better estimates than Market Supply Method since data related to reuse and storage can be estimated while assessing, average life time based on primary & secondary data analysis. Further, only E-waste fractions of no economic value have been found in landfill sites in the study area.

Some of the findings of the secondary & primary data survey, which have been observed, are given below. These findings have been used for carrying out inventory assessment of E-waste from items mentioned in Schedule 1 of E-waste rules 2011.

- 1. The office automation industry has undergone radical shift around 2006-07. The differentiation or gap between "Copier" and "Printer" segment of the Office Automation Industry had been bridged around the year 2006-07. The multi Functions Products (MFPs), which is Printer / Scanner / Fax / Copier, (including color MFPs) are the key drivers of this industry. Therefore, for E-waste inventory assessment, items Printers including cartridges, Copying Equipment, & Facsimile mentioned in Schedule 1 of E-waste rules, have been clubbed under one head of **"Printers including Cartridges"** for inventory assessment.
- 2. It is pertinent to state that Bharat Sanchar Nigam Limited is the only Telecom. Service Provider providing Telegraph Services to the citizens of the country across the length and breadth of the nation. As per BSNL there has been steep decline in the usage of Telegraph Services due to large scale penetration of Fixed Line Telephony, Mobile Services and Internet Services. SMS and E-mails have gained greater importance in Message Transmission over the years. Realizing the declining usage of Telegraph Services, the Establishment branch of BSNL Corporate Office defined Telegraph Services as diminishing services vide circular No. 19 1/2009/TE-II dated 19-02-2010. BSNL in order to keep pace with technological developments introduced Web Based Telegraph Messaging System in all circles by 31-03-2010. Further no Telex machines had been encountered at any of the scrap dealer in the study area.
- 3. Typewriter production stopped in India in 2010. Godrej & Boyce was the only typewriter producing company in the world. Although primary survey in the five districts of the study

area, indicated presence of mechanical typewriters in courts premises & few government offices. Further, primary survey at the scrap dealer also did not indicate any presence of electric or electronic typewriter coming into the dismantling or recycling chain.

- 4. NSSO data, Census data & data from research institution indicate temporal data compilation at national, state & district level for all types of TV (CRT, LCD & LED) clubbed together. Therefore, all the three items under consumer Electrical & Electronics under schedule 1 of E-waste rules have been clubbed under the head TV for E-waste inventory assessment.
- 5. Temporal data from Census, NSSO, MOCIT, TRAI, TEMA market research institutions & telecom operators is classified under fixed line and cellular subscribers at national, state & district level. Further, cellular subscribers consist of GSM & WLL categories. Therefore, Pay telephones, Cordless telephones and Answering systems have been considered as subsegments under fixed line subscriber segment since the consumers choice of instrument cannot be accomplished without subscription to a telephone connection. Therefore, E-waste inventory assessment has been carried out based on temporal fixed line and cellular telephone subscription at district level consisting of both rural & urban consumers.
- 6. Temporal data from Census, NSSO, MOCIT, MAIT market research institutions & telecom operators is classified under Desktop, PC, Notebooks & servers at national, state & district level. Further, Notebook consumers consist of netbooks & notepad computers, servers have also been considered consisting of mainframes & minicomputers subscribers consist of GSM & WLL categories. Therefore, E-waste inventory assessment has been carried out under the head of "computers".
- 7. Among the white goods both households and commercial segments drive the air conditioner market, while households drive the refrigerator, washing machine and TV market.

4.3 Methodology / Approach & Instruments Used

Carnegie Mellon method has been identified for E-waste inventory assessment in study area. Major data requirements in order to use this method are given below.

- 1. Information about stakeholders i.e. recycler / dismantler, scrap dealer, consumer etc.
- 2. Stock and generation of E-waste
- 3. Origin of new electrical and electronic equipment i.e. mode of procurement
- 4. Life time of electrical and electronic equipment
- 5. End of life management of electrical and electronic equipment
- 6. Process involved during dismantling
- 7. Final destination of E-waste fractions

In order to get the required data, two approaches have been adopted. These approaches are depicted in **Figure 4.2** and cover all the identified stakeholders in study area. Salient features of these approaches are given below.

Approach 1: Combination of primary and secondary data collection

Different types of data required has been identified collected, Collated & analyzed from the sources given in **Table 4.1**.

Approach 2: E-waste tracer tracking

In this approach, E-waste tracers are identified at dumpsites, which lead to identification of stakeholders further up on the upstream side of the material flow chain as given in **Figure 4.2**. These stakeholders include dismantlers, junkyard owners, repair shops and retail shops. Different processes carried out by stakeholders are identified, photo-documented and quantified. A list of dismantlers /

recyclers, scrap dealers, trading agents, landfill sites and other agencies surveyed is given in chapter 3 and related annexure.



in Bilaspur Division

4.4 Conclusion

Data matrix versus methodology used for E-waste inventory assessment indicates "Market Supply" method and "Carnegie Mellon" method can be applied for E-waste inventory assessment in five districts of Chhattisgarh in Bilaspur division. However, a combination of Carnegie Mellon method & tracer tracking has been selected for inventory assessment since it covers all the aspects of material flow chain. Assessment of data from these stakeholders through tracer tracking has resulted in assessment of obsolescence rate or average life of equipment described in chapter 5.

Chapter 5: E-Waste Inventory Assessment

5.1 Introduction

This chapter describes the E-waste inventory and market scenario for the E-waste management system in Bilaspur division. Since E-waste inventory forms the basis of planning for E-waste management system, an effort has been made to assess the E- waste inventory and market potential in the country. Following sections describe each of these items followed by pollution potential and risk profiling.

5.2 Market Size Assessment of Electrical and Electronic Equipment (EEE) in Bilaspur Division

The time series data related to market size of each of the EEE items has been computed from data obtained from different agencies as well as from trend analysis. This data was compiled from data sources described in chapter 4. The EEE market size for Air Conditioners, refrigerator, washing machine, personal computers, cellular telephones, TVs and other items as per schedule 1 is shown in **Table 5.1** to **Table 5.8**.

Year	Bilaspur	Mungeli	Korba	Janjgir Champa	Raigarh
2006	5739	2017	3666	4867	4563
2007	35209	12453	22221	29626	27640
2008	53263	18959	33209	44471	41285
2009	71009	25437	43738	58837	54354
2010	85632	30871	52106	70421	64734
2011	92268	33001	56747	76174	70261
2012	102908	37041	62525	84317	77393
2013	113069	40958	67865	91956	83992
2014	122936	44816	72892	99253	90212
2015	132637	48659	77687	106320	96158
2016	142264	52522	82311	113237	101908
2017	151887	56430	86807	120066	107517
2018	161562	60405	91208	126855	113030
2019	171334	64463	95542	133643	118482
2020	181240	68621	99828	140460	123900

Table 5.1: Installed base for Cellular Telephone in Study Area (in numbers)

Source: Census 1991, 2001 & 2011, Telecom Regulatory Authority of India (TRAI), Department of Telecommunications (DOT)

Year	Bilaspur	Mungeli	Korba	Janjgir Champa	Raigarh
2006	24537	8623	15675	20810	19509
2007	20787	7352	13119	17491	16318
2008	24230	8625	15107	20230	18781
2009	22287	7984	13728	18466	17059

Year	Bilaspur	Mungeli	Korba	Janjgir Champa	Raigarh
2010	20593	7424	12531	16936	15568
2011	19859	7103	12214	16395	15122
2012	19310	6951	11732	15822	14522
2013	18777	6802	11270	15271	13948
2014	18259	6656	10826	14741	13398
2015	17755	6514	10399	14232	12872
2016	17266	6374	9990	13743	12368
2017	16790	6238	9596	13273	11886
2018	16328	6105	9218	12821	11424
2019	15880	5975	8855	12386	10981
2020	15443	5847	8506	11968	10557

Source: Census 1991, 2001 & 2011, Telecom Regulatory Authority of India (TRAI), Department of Telecommunications (DOT)

Year	Bilaspur	Mungeli	Korba	Janjgir Champa	Raigarh
2006	4612	623	3051	1836	2348
2007	7425	1003	4912	2956	3781
2008	12474	1685	8252	4965	6351
2009	21331	2882	14111	8491	10861
2010	34449	4654	22790	13713	17541
2011	54430	7354	36008	21666	27714
2012	86544	11693	57253	34449	44065
2013	141066	19059	93322	56152	71826
2014	223067	30140	147575	92128	113583
2015	358570	48449	237219	148092	182579
2016	576384	77880	381318	238050	293488
2017	926510	125188	612951	382654	471768
2018	1489321	201234	985290	615099	758345
2019	2394012	323474	1583808	988742	1219003
2020	3848262	519969	2545896	1589356	1959490

Table 5.3: Installed base for Computers in Study Area (in numbers)

Source: Census 1991, 2001 & 2011, MAIT, NSSO

Table 5.4: Installed base for Printers in Study Area (in numbers)

Year	Bilaspur	Mungeli	Korba	Janjgir Champa	Raigarh
2006	692	93	458	275	352
2007	1114	150	737	443	567
2008	1622	219	1073	646	826
2009	4053	548	2681	1613	2064
2010	8268	1117	5470	3291	4210
2011	9797	1324	6481	3900	4989
2012	12982	1754	8588	5167	6610
2013	19749	2668	13065	7861	10056
2014	22119	2989	14633	8805	11262
2015	24773	3347	16389	9861	12614

Year	Bilaspur	Mungeli	Korba	Janjgir Champa	Raigarh
2016	27746	3749	18355	11044	14128
2017	31076	4199	20558	12370	15823
2018	34805	4702	23025	13854	17722
2019	38982	5267	25788	15517	19848
2020	43659	5899	28883	17379	22230

Source: Census 1991, 2001 & 2011, MAIT, NSSO

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Year	Bilaspur	Mungeli	Korba	Janjgir Champa	Raigarh	
2006	108326	25858	74255	67306	65841	
2007	115709	28244	77978	72624	70514	
2008	123426	30777	81797	78176	75351	
2009	131493	33465	85715	83972	80359	
2010	133981	34605	88303	86263	82907	
2011	142445	37485	92370	92323	88119	
2012	151292	40537	96545	98645	93513	
2013	160539	43769	100833	105239	99093	
2014	170203	47193	105237	112116	104866	
2015	180301	50816	109761	119287	110839	
2016	190852	54650	114409	126765	117018	
2017	201874	58705	119183	134562	123411	
2018	209624	61093	122134	139078	126921	
2019	225413	67525	129126	151167	136866	
2020	237970	72314	134303	160004	143944	

Table 5.5: Installed base for TV in Study Area (in numbers)

Source: Census 1991, 2001 & 2011, ELCINA, NSSO

Table 5.6: Installed base for AC in Study Area (in numbers)

Year	Bilaspur	Mungeli	Korba	Janjgir Champa	Raigarh
2006	928	104	692	370	381
2007	1009	114	740	407	417
2008	1093	125	788	448	456
2009	1183	137	839	491	496
2010	1212	143	875	488	506
2011	1307	156	927	533	548
2012	1406	169	981	582	594
2013	1511	184	1036	634	642
2014	1621	200	1094	690	693
2015	1737	216	1152	750	748
2016	1859	234	1213	814	805
2017	1988	253	1276	883	866
2018	2124	273	1340	957	931
2019	2266	295	1407	1036	999
2020	2417	318	1476	1120	1071

Source: Census 1991, 2001 & 2011, ELCINA, NSSO

			0		,	_
Year	Bilaspur	Mungeli	Korba	Janjgir Champa	Raigarh	
2006	1007	172	723	327	507	
2007	1103	189	779	364	553	
2008	1201	207	836	404	601	
2009	1303	226	893	445	650	
2010	1341	233	934	444	668	
2011	1443	252	990	486	717	
2012	1548	272	1046	531	767	
2013	1656	292	1101	578	819	
2014	1767	313	1157	627	873	
2015	1880	335	1212	679	927	
2016	1996	357	1268	733	984	
2017	2115	381	1322	790	1041	
2018	2236	405	1377	850	1101	
2019	2360	430	1431	912	1161	
2020	2487	456	1484	977	1223	

Table 5.7: Installed base for Washing Machine in Study Area (in numbers)

Source: Census 1991, 2001 & 2011, ELCINA, NSSO

			e	• •	·
Year	Bilaspur	Mungeli	Korba	Janjgir Champa	Raigarh
2006	1839	258	1347	626	837
2007	2085	291	1504	723	946
2008	2351	327	1670	830	1064
2009	2638	366	1846	949	1191
2010	2803	389	1996	980	1254
2011	3121	432	2188	1110	1393
2012	3463	479	2391	1254	1545
2013	3832	529	2605	1413	1708
2014	4229	583	2831	1587	1885
2015	4657	641	3069	1778	2076
2016	5116	704	3319	1987	2283
2017	5610	771	3582	2217	2506
2018	6140	844	3859	2468	2747
2019	6709	923	4151	2743	3006
2020	7318	1007	4456	3043	3287

Table 5.8: Installed base for Refrigerator in Study Area (in numbers)

Source: Census 1991, 2001 & 2011, ELCINA, NSSO

Analysis of **Table 5.1** to **Table 5.8** shows that Computers have the highest installed base followed by TV, Cell phones, printers, fixed line telephone, refrigerators, washing machines and Air Conditioners. In Bilaspur cellular phone, fixed line phone, TV, Air condition, washing machine and refrigerator has the highest installed base followed by Korba, Raigarh, Janjgir Champa and Mungeli districts of Bilaspur division.

5.3 Obsolescence Rate / Average Life

Obsolescence rate / Average life for electrical and electronic equipment (EEE) has been calculated based on results of the sampling carried out for consumers, dismantlers, retailers and dumpsites along the E-waste "trade value chain" described in chapter 3 & chapter 4 and summarized in **Table 5.9**. The storage time takes into account storage at owner's premises, collection agency (scrap dealer) & dismantler's premises.

		2
EEE Item	Average Life & Reuse (Years)	Storage (Years)
Cellular Phone	3	0.5 - 1
Computer	7	0.5 - 1
Printer	5	0.5 - 1.0
Washing Machine	12	0.5 - 12
TV	10	1
Refrigerator	12	0.5 - 1
Air Conditioners	12	1 - 2
Fixed Line Telephone	5	0.5 - 1

Table 5.9: Average Life and Storage of E-waste

A conservative estimate of the average life of each EEE item has been prepared by considering highest values of average life and storage time considering the consumer behavior in five districts. This estimate has been summarized in **Table 5.10**.

	Tuble 5.10. Obsoleseence Rate of That	
Sr. No.	EEE	Average Life (Years)
1	Cellular Phone	3
2	Computer	7
3	Printer	5
4	Washing Machine	12
5	TV	10
6	Refrigerator	12
7	Air Conditioner	12
8	Fixed Line Telephone	5

Table 5.10: Obsolescence Rate of Tracer EEE

The average weights of each of the six items considered for computing E-waste inventory is given in **Table 5.11**.

Item	Average Weight (Kg)
Cellular Phone	0.100
Computer / Laptop / Server	27.2 / 2.5 to 3 / 650
Printer (MFP)	6.5 - 7
Washing Machine	60
TV (CRT) / LCD / LED	31.6 (CRT) / 12 – 15 (LCD / LED)
Refrigerator	35
Air Conditioner	55
Fixed Line Telephone	0.5 - 1.5

5.4 Weee/E-Waste Inventory

The projected district wise E-waste inventory estimates both in numbers and weights for Bilaspur division starting from 2011 till 2020 have been described in Table 5.12 to Table 5.21

and presented in Figure 5.1 to Figure 5.7.

				2	1	(/	
Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
2011	53263	24537	2180	692	333	75921	498	530
2012	71009	20787	3095	1114	488	81850	714	559
2013	85632	24230	4612	1622	568	88040	866	622
2014	92268	22287	7425	4053	651	94507	1031	688
2015	102908	20593	12474	8268	736	101264	1209	757
2016	113069	19859	21331	9797	824	108326	1403	779
2017	122936	19310	34449	12982	914	115709	1612	852
2018	132637	18777	54430	19749	1007	123426	1839	928
2019	142264	18259	86544	22119	1103	131493	2085	1009
2020	151887	17755	141066	24773	1201	133981	2351	1093

Table 5.12: E-waste Inventory of Bilaspur District (in numbers)

Table 5.13: E-waste Inventory of Bilaspur District (in Tons)

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
2011	7.99	24.54	45.64	4.84	18.32	2347.11	17.42	29.14
2012	10.65	20.79	64.81	7.80	26.84	2530.39	25.01	30.77
2013	12.84	24.23	96.56	11.35	31.26	2721.76	30.31	34.21
2014	13.84	22.29	155.46	28.37	35.81	2921.67	36.07	37.84
2015	15.44	20.59	261.18	57.87	40.49	3130.57	42.32	41.65
2016	16.96	19.86	446.62	68.58	45.31	3348.90	49.09	42.87
2017	18.44	19.31	721.28	90.87	50.27	3577.13	56.43	46.85
2018	19.90	18.78	1139.63	138.24	55.39	3815.71	64.38	51.05
2019	21.34	18.26	1812.01	154.83	60.66	4065.11	72.98	55.47
2020	22.78	17.76	2953.57	173.41	66.08	4142.01	82.28	60.13



Figure 5.1: Item wise E-waste Projection of Bilaspur District

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
2011	18959	8623	295	93	34	15887	50	55
2012	25437	7352	418	150	80	17642	102	58
2013	30871	8625	623	219	94	19511	124	65
2014	33001	7984	1003	548	109	21499	147	73
2015	37041	7424	1685	1117	124	23612	172	81
2016	40958	7103	2882	1324	140	25858	198	85
2017	44816	6951	4654	1754	156	28244	227	94
2018	48659	6802	7354	2668	172	30777	258	104
2019	52522	6656	11693	2989	189	33465	291	114
2020	56430	6514	19059	3347	207	34605	327	125

Table 5.14: E-waste Inventory of Mungeli District (in numbers)

Table 5.15: E-waste Inventory of Mungeli District (in Tons)

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
2011	2.84	8.62	6.17	0.65	1.85	491.13	1.76	3.05
2012	3.82	7.35	8.76	1.05	4.40	545.41	3.59	3.18
2013	4.63	8.62	13.05	1.53	5.19	603.17	4.34	3.58
2014	4.95	7.98	21.00	3.83	6.00	664.63	5.15	4.01
2015	5.56	7.42	35.29	7.82	6.83	729.97	6.02	4.47
2016	6.14	7.10	60.34	9.27	7.68	799.42	6.95	4.68
2017	6.72	6.95	97.45	12.28	8.57	873.17	7.95	5.17
2018	7.30	6.80	153.97	18.68	9.48	951.48	9.03	5.71
2019	7.88	6.66	244.82	20.92	10.42	1034.58	10.20	6.27
2020	8.46	6.51	399.06	23.43	11.40	1069.82	11.46	6.88



Figure 5.2: Item wise E-waste Projection of Mungeli District

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
2011	33209	15675	1442	458	251	56915	375	398
2012	43738	13119	2048	737	385	60229	572	462
2013	52106	15107	3051	1073	441	63614	683	505
2014	56747	13728	4912	2681	497	67077	801	549
2015	62525	12531	8252	5470	553	70623	926	594
2016	67865	12214	14111	6481	610	74255	1058	601
2017	72892	11732	22790	8588	666	77978	1198	646
2018	77687	11270	36008	13065	723	81797	1347	692
2019	82311	10826	57253	14633	779	85715	1504	740
2020	86807	10399	93322	16389	836	88303	1670	788

Table 5.16: E-waste Inventory of Korba District (in numbers)

Table 5.17: E-waste Inventory of Korba District (in Tons)

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
2011	4.98	15.67	30.19	3.20	13.79	1759.53	13.11	21.89
2012	6.56	13.12	42.87	5.16	21.15	1861.97	20.03	25.41
2013	7.82	15.11	63.88	7.51	24.24	1966.64	23.91	27.77
2014	8.51	13.73	102.85	18.77	27.33	2073.69	28.04	30.20
2015	9.38	12.53	172.78	38.29	30.42	2183.30	32.41	32.69
2016	10.18	12.21	295.46	45.37	33.52	2295.59	37.04	33.07
2017	10.93	11.73	477.16	60.12	36.63	2410.70	41.94	35.54
2018	11.65	11.27	753.92	91.46	39.75	2528.76	47.14	38.07
2019	12.35	10.83	1198.73	102.43	42.87	2649.89	52.64	40.68
2020	13.02	10.40	1953.93	114.72	45.99	2729.90	58.45	43.36



Figure 5.3: Item wise E-waste Projection of Korba District

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
2011	44471	20810	868	275	111	43922	166	196
2012	58837	17491	1232	443	143	48199	218	204
2013	70421	20230	1836	646	169	52668	269	230
2014	76174	18466	2956	1613	197	57337	326	258
2015	84317	16936	4965	3291	227	62213	389	287
2016	91956	16395	8491	3900	258	67306	460	302
2017	99253	15822	13713	5167	291	72624	539	334
2018	106320	15271	21666	7861	327	78176	626	370
2019	113237	14741	34449	8805	364	83972	723	407
2020	120066	14232	56152	9861	404	86263	830	448

Table 5.18: E-waste Inventory of Janjgir Champa (in numbers)

Table 5.19: E-waste Inventory of Janjgir Champa District (in Tons)

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
2011	6.67	20.81	18.17	1.93	6.12	1357.84	5.82	10.75
2012	8.83	17.49	25.80	3.10	7.88	1490.06	7.62	11.21
2013	10.56	20.23	38.44	4.52	9.32	1628.22	9.40	12.63
2014	11.43	18.47	61.88	11.29	10.85	1772.56	11.40	14.16
2015	12.65	16.94	103.96	23.04	12.47	1923.32	13.62	15.81
2016	13.79	16.39	177.78	27.30	14.20	2080.77	16.10	16.60
2017	14.89	15.82	287.11	36.17	16.03	2245.18	18.86	18.40
2018	15.95	15.27	453.63	55.03	17.97	2416.82	21.92	20.32
2019	16.99	14.74	721.27	61.63	20.02	2596.00	25.31	22.39
2020	18.01	14.23	1175.68	69.03	22.19	2666.82	29.06	24.62



Figure 5.3: Item wise E-waste Projection of Janjgir Champa District

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
2011	41285	19509	1110	352	130	44755	194	210
2012	54354	16318	1576	567	248	48685	335	219
2013	64734	18781	2348	826	289	52753	404	246
2014	70261	17059	3781	2064	331	56965	478	274
2015	77393	15568	6351	4210	374	61326	558	304
2016	83992	15122	10861	4989	417	65841	644	316
2017	90212	14522	17541	6610	461	70514	737	348
2018	96158	13948	27714	10056	507	75351	837	381
2019	101908	13398	44065	11262	553	80359	946	417
2020	107517	12872	71826	12614	601	82907	1064	456

Table 5.20: E-waste Inventory of Raigarh District (in numbers)

Table 5.21: E-waste Inventory of Raigarh District (in Tons)

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
2011	6.19	19.51	23.24	2.47	7.13	1383.59	6.78	11.54
2012	8.15	16.32	33.00	3.97	13.65	1505.09	11.72	12.04
2013	9.71	18.78	49.17	5.78	15.91	1630.87	14.14	13.50
2014	10.54	17.06	79.16	14.45	18.21	1761.08	16.73	15.06
2015	11.61	15.57	132.98	29.47	20.54	1895.90	19.53	16.71
2016	12.60	15.12	227.40	34.92	22.93	2035.46	22.54	17.36
2017	13.53	14.52	367.25	46.27	25.36	2179.93	25.79	19.12
2018	14.42	13.95	580.26	70.39	27.86	2329.49	29.31	20.98
2019	15.29	13.40	922.62	78.84	30.42	2484.29	33.11	22.96
2020	16.13	12.87	1503.86	88.30	33.05	2563.07	37.22	25.07



Figure 5.3: Item wise E-waste Projection of Raigarh District

Year	Bilaspur	Mungeli	Korba	Janjgir	Raigarh	Total
				Champa		
2011	2494.99	516.08	1862.38	1428.10	1460.44	7761.99
2012	2717.04	577.55	1996.27	1571.98	1603.94	8466.78
2013	2962.53	644.12	2136.88	1733.32	1757.86	9234.72
2014	3251.34	717.56	2303.11	1912.04	1932.28	10116.34
2015	3610.11	803.38	2511.79	2121.81	2142.30	11189.39
2016	4038.19	901.58	2762.44	2362.94	2388.33	12453.47
2017	4580.59	1018.27	3084.75	2652.45	2691.78	14027.84
2018	5303.06	1162.45	3522.01	3016.91	3086.66	16091.10
2019	6260.65	1341.75	4110.41	3478.36	3600.92	18792.08
2020	7518.03	1537.02	4969.77	4019.64	4279.58	22324.03

Table 5.22: All E-waste Items Inventory of Bilaspur Division (in Tons)



Figure 5.6: District wise Total E-waste Inventory Projection



Figure 5.7: Total E-waste Inventory Projection in Bilaspur Division from 2011 to 2020

The results of E-waste inventory estimates in (Tons) for Bilaspur division is given in **Table 5.22**. Major inferences, which can be drawn from E-waste inventory results, are given below.

- 1. Inventory estimates in Bilaspur division indicate that E-waste generation ranges from **7761.99** tons in 2011 to **22324.03** tons in 2020.
- In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 88% of the total inventory followed by Computer (6%), Washing machine (1%), Air conditioner (1%), Cellular phone (1%), Refrigerator (1%), Fixed Line Phone (1%) & Printer (1%).
- 3. In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (59%), computer will constitute about 36% of the total inventory followed by Printer (2%), Air conditioner (1%), Washing machine (1%), Cellular phone (0%), Refrigerator (1%) & Fixed Line Phone (0%).



Figure 5.8: Item-wise E-waste in Percent for Bilaspur Division in 2015



Figure 5.9: Item-wise E-waste in Percent for Bilaspur Division in 2020

5.5 E-waste Processing in Bilaspur Division

There are various processes involved for dismantling, recycling / reuse of E-waste in Bilaspur division. These processes for different types of electronic items are given in **Table 5.23**. The photodocumentation of some of these processes observed. An analysis of the different processes observed to recover metals indicates that no chemical process is occurring in study area. Only physical processes, which prepare raw material for recycling industry is observed in the study area. Iron recovered from E-waste is recycled through induction arc furnace route in the study area.

Sr.	D rocoss name			Process Status	8	
No.	Process name	Bilaspur	Mungeli	Korba	Janjgir Champa	Raigarh
1	IC's Extraction from PCB	No	No	No	No	No
2	Surface Heating of PCB and Extraction of components	No	No	No	No	No
3	Dissembling of Monitor & TV and extraction of components	Yes	Yes	Yes	Yes	Yes
4	Yoke core and Copper	No	No	No	No	No
5	Metallic Core of Transformer and Copper	Yes	Yes	Yes	Yes	Yes
6	Rare Earth Core of Transformer and Copper	No	No	No	No	No
7	Rare Earth Core of Static Transformer	No	No	No	No	No
8	Wire PVC and Copper	Yes	Yes	Yes	Yes	Yes
9	Plastic Shredder	No	No	No	No	No
10	Dismantling of Refrigerator and Compressor	Yes	Yes	Yes	Yes	Yes
11	Gold Extractions from Pins and Comb	No	No	No	No	No
12	Acid Bath for PCB	No	No	No	No	No
13	Regunning CRT's	No	No	No	No	No
14	Glass Recovery from CRT	No	No	No	No	No
15	Gold Recovery	No	No	No	No	No

Table 5.23: E-waste dismantling process occurring in the study area

Trade Economics

Trade economics has been studied in terms of various processes, which occur along the trade value chain. Each stakeholder in the processes studied is linked to the other and the trade between the two takes place based on value added. The fundamental parameters governing this trade are same as that of any other trade. These parameters are described below.

- 1. Input cost
- 2. Operating Margin
- 3. Selling price

Input costs have been classified into the following costs.

- 1. Raw material cost
- 2. Labour cost

Selling price is the price at which the products are sold. The difference between the selling price and the input costs gives the operating margin. Operating margin is an indicator of the profit and has been computed in terms of operating margin per kg of raw material.

The entire trade economics of each of the processes is summarized in **Table 5.24**. **Table 5.24** does not include capital, depreciation, taxation and transportation cost. Labour refers to workers involved in e-waste extraction industry only and only 300 working days in a year.

Item	Rate / piece	Input Cost per Kg.	Labour Cost per Kg.	Output Price per Kg.	Profitability	%
TV	600	20.00	0.39	20.83	0.44	2.18
Ref	1000	22.22	0.39	34.07	11.46	50.69
WM	750	18.75	0.39	32.17	13.03	68.06
AC	3000	54.55	0.39	73.33	18.40	33.49
PC	1100	35.48	0.39	42.85	6.98	19.45
Mobile	38	38.00	0.39	62.59	24.20	63.04

Table 5.24: Trade economics of Bilaspur Division E-waste market

Some major observations from Table 5.24 are as follows:

- 1. Operating margin for Television waste per kilogram is Rs. 0.44
- 2. Operating margin for waste refrigerator is Rs. 11.46 per kilogram
- 3. For that of Washing Machine is Rs. 13.03 per kilogram
- 4. For that of Air Conditioners is Rs. 18.40 per kilogram
- 5. For scrap old Personal Computer is Rs. 6.98 per kg and
- 6. For waste cellular phones is Rs. 24.20 per kg
- 7. The operating margin ranges from Rs. 0.44 to Rs. 24.20 per kilogram. Scrap of Mobile / cellular phones gives the maximum operating margin of Rs. 24.20 while scrap from television gives the minimum profit of Rs. 0.44 per kilogram. This indicates that informal sector if brought into formal sector considering taxation involved will only dismantle / recycle cellular phones followed by ACs and WMs to some extent. Therefore, there is a need to formulate financial instrument for making dismantling / recycling of white goods viable.

5.6 Market Risks

Market risks based on the assessment of demand, supply, collection and transportation primarily

address availability (quantity) of raw material as E-waste. These risks have been assessed and described below based on duration (short term, long term) along with their intensities.

- 1. Risks of availability of raw material (E-waste)
- 2. Risk associated with collection
- 3. Risk associated with transportation

Risk profiling giving the intensities as part of market assessment has been highlighted in Table 5.25 given below.

I able 5.25: Market Risk Matrix						
Risks/ intensities		High	Medium	Low		
Risks of availability	Short term		\checkmark			
of raw material	Long term		\checkmark			
Risk associated with	Short term					
collection	Long term		\checkmark			
Risk associated with	Short term			\checkmark		
transportation	Long term			\checkmark		
	Long term		\checkmark			

The intensities have been fixed as per following analysis.

- 1. Risks of availability of raw material has been assessed as medium since enough E-waste potential exists in Bilaspur division to be processed both in the short term and long term especially after 2014. This will depend on the implementation of regulatory regime, which will enable the E-waste generators to send the waste to dismantling / recycling facility.
- 2. Risk associated with collection is expected to be high in the short term as there is no formal collection mechanism in place in the study area. In this situation, the recycling facility will face the risk of collecting E-waste from the source, which could be geographically dispersed. In the long term this risks expected to be medium as collection and transportation mechanism is expected to be institutionalized. In the short term, the recycling facility is expected to be making their own arrangements for collection from vendors.
- 3 Risk associated with transportation is expected to be low in both short and long term as there is transportation mechanism in place both at the local and national level to carry hazardous waste. Since some E-waste is already being transported outside study area, therefore transportation risk is expected to be of low intensity

5.7 Conclusions

Market risks matrix highlight the availability of raw material, its collection and transportation as risks of high & medium intensities. Collection mechanism directly impacts the availability of raw material. Therefore, there is a need for both strict implementations of regulations as well as financial instrument for diverting E-waste inventory in to the formal sector.

Chapter 6: Conclusions & Recommendations

Major conclusions & recommendations, which have been arrived after assessment of E-waste regulations, E-waste material flow chain and inventory estimates are given below.

- Implementation of E-waste regulation is a major challenge
- There is no organized mechanism for collection, transportation and disposal of E-Waste in Bilaspur division.
- No mechanism exists in the state to monitor and track its inventory, collection, transportation and disposal.
- Currently, a majority of producers use call centre as well as dealer's network for collection of E-waste.
- Electronic items go to mechanic shops from households for repairing, and mechanic replace damaged / defunct parts/components from it and then they sold it to scrap dealers.
- Major conclusions, which can be derived, include growing market of EEE in Bilaspur division. This growth may lead to increasing E-waste generation, which may further lead to higher pollution loads, health impacts and loss of recoverable items.
- Mechanics sell E-waste to scrap dealer by weight / Pcs. mainly of ICT items (IT as per Schedule 1); TV circuit Rs. 15-45/kg; Compressor Rs. 300-400/Pcs.; Washing Machine Motor Rs. 200/Pcs.; Copper Rs. 200-350/kg; DVD Circuit Rs. 20-25/kg; Mobile kit Rs. 1000-2000/kg; SMPS Rs. 50/Pcs, Mother Board Rs. 90/Pcs.; Hard disk Rs. 120/Pcs.; CD Writer Rs. 35-40/Pcs.
- Scrap vendors sold E-waste to scrap dealer by weight at Rs. 150-250 per kg
- Scrap vendors sold damage mobile phone to scrap dealer as individual piece at Rs. 30-50 per piece
- Scrap dealer comes from Delhi yearly twice/thrice for collecting of E-waste.
- Since no mechanism exist for tracking purchase of EEE by bulk consumers and producers are not required to declare quantity of EEE placed in the market since 2012, E-waste inventory assessment has to rely on available historical market research data as well as data from collectors, dismantlers / recyclers.
- Data matrix versus methodology used for E-waste inventory assessment indicates "Market Supply" method and "Carnegie Mellon" method can be applied for E-waste inventory assessment in five districts of Bilaspur Division in Chhattisgarh. However, a combination of Carnegie Mellon method & tracer tracking has been selected for inventory assessment since it covers all the aspects of material flow chain.
- Analysis shows that Computers have the highest installed base followed by TV, printers, cell phones, fixed line telephone, refrigerators, washing machines and Air Conditioners. In Bilaspur computers, , TV, printers, cell phones, washing machine and refrigerator has the highest installed base followed by Korba, Raigarh, Janjgir Champa and Mungeli districts of Bilaspur division.
- Inventory estimates in Bilaspur division indicate that E-waste generation ranges from **7761.99** tons in 2011 to **22324.03** tons in 2020.
- In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 88% of the total inventory followed by Computer (6%), Washing machine (1%), Air conditioner (1%), Cellular phone (1%), Refrigerator (1%), Fixed Line Phone (1%) & Printer (1%).
- In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (59%), computer will constitute about 36% of the total inventory followed by Printer (2%), Air conditioner (1%), Washing machine (1%), Cellular phone (0%), Refrigerator (1%) & Fixed Line Phone (0%).

- An analysis of the different processes observed to recover metals indicates that no chemical process is occurring in study area. Only physical processes, which prepare raw material for recycling industry is observed in the study area. Iron recovered from E-waste is recycled through induction arc furnace route in the study area.
- Some major observations are that Operating margin for Television waste per kilogram is Rs. 0.44. Operating margin for waste refrigerator is Rs. 11.46 per kilogram. For that of Washing Machine is Rs. 13.03 per kilogram. For that of Air Conditioners is Rs. 18.40 per kilogram. For scrap old Personal Computer is Rs. 6.98 per kg and For waste cellular phones is Rs. 24.20 per kg. The operating margin ranges from Rs. 0.44 to Rs. 24.20 per kilogram. Scrap of Mobile / cellular phones gives the maximum operating margin of Rs. 24.20 while scrap from television gives the minimum profit of Rs. 0.44 per kilogram. This indicates that informal sector if brought into formal sector considering taxation involved will only dismantle / recycle cellular phones followed by ACs and WMs to some extent. Therefore, there is a need to formulate financial instrument for making dismantling / recycling of white goods viable.
- Market risks matrix highlight the availability of raw material, its collection and transportation as risks of high & medium intensities. Collection mechanism directly impacts the availability of raw material. Therefore, there is a need for both strict implementations of regulations as well as financial instrument for diverting E-waste inventory in to the formal sector.

List of producers – Annexure 1

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
	Television	LCD	BPL	Address Not Available Customer Care Number 1800 – 425 – 1800, 1800 – 425 – 2355
			Daenyx	A-30 & 31, Hosiery Complex, Phase II Extn. Noida - 201305 Uttar Pradesh (INDIA) Ph. No. +91-120- 3042721
			Haier	B-1/A-14, Mohan Co-operative Industrial Estate, Mathura Road, New Delhi-110044 Ph. No. 011-39496000/30674000 Toll Free No. 1800-200-9999 (24x7)
		Branch Offices	Hitachi	Hitachi India Pvt. Ltd. Units 802A and 802B, Tower 2, 8th Floor, Konnectus Building, Bhavbhuti Marg, Near Minto Bridge, Connaught Place, New Delhi – 110001 Ph. No. +91 (11) 30605252
				Hitachi India Pvt. Ltd Bangalore Branch Office Unit 103, 1st Floor, Shah Sultan Complex, No 17, Cunningham Road, Bangalore 560 052, India Ph. No. +91 (80) 2238 6986 / 987 / 984
				Hitachi India Pvt. Ltd. Mumbai Branch Office 508, Ascot Center, Next to Hilton hotel, Sahar Road, Andheri East, Mumbai 400099, India Ph. No. +91-22-28215625
				Hitachi India Pvt. Ltd. Chennai Branch Office 206, Apeejay House, No.12, Haddows Road, Nungambakkam, Chennai 600 006, India Ph. No. +91 (44) 2821 3108 / 3109
				Hitachi Ltd. Infrastructure Systems Company Mumbai Branch Office 707, Trade Centre, Opp. to MTNL Bldg Bandra-Kurla Complex

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Bandra (East) Mumbai 400 098 Ph. No. +91+22-2650-0031
				Allied IB Friction Private
				Limited
		Group		A-12, Site IV, Industrial Area,
		Companies		Sahibabad – 201010, Dist.
		1		Ghaziabad (UP), India.
				Ph. No. 0120 4539600 – 700
				Aloka Trivitron Medical
				Technologies Pvt. Ltd.
				Plot # A5, Sipcot Industrial Park,
				Irrungattukottai Sri Perambudur
				Taluk, Kanchipuram – 602117,
				TAMIL NADU
				Ph. No. 044-37183750
				Flyjac Logistics Pvt. Ltd.
				B = 1, 205, 2nd Fl, Boomerang,
				Chandivali Farm Road, Near
				Powai Andheri East, Mumbai 400
				0/2 DI NI 022 2250 5000
				Ph. No. 022 – 3359 5900
				Brivate Limited
				708 7th Floor Time Tower M G
				$\begin{array}{c} \text{Road} \text{Gurgaon} = 122\ \text{OO2}\ \text{Ph} \end{array}$
				No. $0124 - 4246498$
				Hitachi Consulting Software
				Services India Private Limited
				Plot No 9. Gachibowli
				Hyderabad – 500032. IndiaPh.
				No. 040 - 4034 3000
-				Hitachi Consulting India
				Private Limited
				Incubation Space A2, Magarpatta
				City SEZ, Hadapsar Road, Pune
				411013
				Ph. No. 020 – 6511 1001/2
				Hitachi Data Systems India
				Pvt. Ltd.
				#278/23, Trident Towers, 3rd
				tloor, 10th Main, T. Mariappa
				Road, Jaynagar 2nd Block,
				Bangalore 560 011, India
				Ph. No. +91 (80) 2657 6295
				Hitachi Hi-Kel Power
				Electronics Pvt. Ltd.B-52, 5th
				Ludges Buggelow, Bodeldow
1			1	Judges Dungalow, Douakuev,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
		outegory		Ahmedabad – 380 054 Guiarat –
				India
				Ph. No. +91 79 – 4900 2300
				Hitachi High Technologies
				(Singapore) Pte. Ltd.
				#602, 6th floor,
				Eros Corporate Towers, Nehru
				Place,
				New Delhi 110 019, India
				Ph. No. +91 (11) 4651 8450
				Hitachi Home and Life
				Solutions (India) Ltd.
				10th floor, Abhijeet,
				Mithakhali Six Road,
				Ahmedabad 380 006 Gujarat,
				Ph. No. +91 (79) 3041 4800
				Hitachi Koki India Ltd.
				Plot No. 9A, 1st Phase, Peenya
				Industrial Area, Bangalore 560
				058, India
				Ph. No. +91 (80) 4117 0777
				Hitachi Lift India Pvt. Ltd.
				Units 304-306, 3rd Floor ABW
				Elegance Tower Jasola District
				Centre New Delhi 110 025, India
				Ph. No. +91 (11) 4060 5290
				Hitachi Maxell, Ltd. Chennai
				Liaison Office
				DBS Office Business Center
				Room No. 103, 31A Cathedral
				Garden Road, Near Palmgrove
				Hotel, Nungambakkam, Chennai,
				$\frac{1 \text{India}}{1 \text{ India}}$
				Ph. No. +91 (44) 4264 9495
				Licicon Office
				No 401 4th Floor "BANADASI
				HERITACE" Mind Space Link
				Road Malad (West) Mumbai
				India
				Ph. No. ± 91 (22) 3212 8193
				Hitachi Metale (India) Pyt
				Ltd
				Plot No 94 & 95 Sector 8 IMT
				Manesar Gurgaon $= 122050$ (HR)
				Ph No ± 91 (124) 4124800 /
				4812300 / 4812400
				1012000 / 1012100
Sr. No.	Product Name	Product Sub	Brand	Address / Contact Details
------------	--------------	----------------	---------	-----------------------------------
		Category		Llitashi Matalas (India) Dut
				I td
				Plot No. 94 & 95 Sector 8 IMT
				Manesar Gurgaon - 122050 (HR)
				Ph No ± 91 (124) 4124800 /
				4812300 / 4812400
				Hitachi NeST Control Systems
				Pvt. Ltd.
				No.103, First Floor, Shah Sultan
				Complex No.17, Cunningham
				Road, Bangalore -560 052
				Karnataka. India
				Ph. No. 080 - 6789 8700
				Hitachi Plant Technologies
				India Pvt. Ltd.
				DPC 101, 102 and 103, First
				Floor, Block No. 4A, DLF
				Corporate Park, MG Road, Phase
				- III, DLF City, Gurgaon, Haryana
				Ph. No. +91+12-4455-2544
				Hitachi I ransport System
				116 & 117 1st floor Bectangle
				1 D-4 District Centre Saket
				New Delbi 110 017 India
				Ph. No. ± 91 (11) 4052 5200
				Tata Hitachi Construction
				Machinery Co. Ltd.
				Jubilee Building, 44 Museum
				Road, Bangalore – 560 025
				Ph. No. 080 – 6695 3301 ~ 03
				Toyo Machinery & Metal Co.,
				Ltd. (India Liason Office)
				Units 304-306, 3rd Floor, ABW
				Elegance Tower, Jasola District
				Centre, New Delhi-110025
				Ph. No. 011 – 4060 5252
				LG Electronics India Pvt. Ltd,
			I.O.	Plot No. 51, Udyog Vihar,
			LG	Surajpur Kasna Road,
				Greater Noida: 201306
				SCV Inductrics
				Dlot No 41 8, 42
		Manufacturing		Sector-6A Sideul Indl Area
		Facilities	Markson	Haridwar (Uttrakhand)
		1 00000000		Pin Code - 249401
				Ph. 01334-239662/63/64

Sr. No.	Product Name	Product Sub	Brand	Address / Contact Details
		Category		
				Fax No. 01334- 239661
				Email Id -
				Contact Mr. Sweil Loin (Vice
				Dresident) Mob. 0212660408
				Mr. Baiandar Sharma (Facility
				Incharge) Mob. 9212669503
				SNR Industries
				Plot No 6A & 6B
				Gabriel Road Sector-2
				Parwanoo, (H.P.)
				Pin Code - 173220
				Ph. 01792- 232711
				Contact- Mr. Alok Kumar
				(Facility Incharge) Mob.
				9212669513
				SNR Electronics Ltd.
				Plot No.2, HPISDC Indl. Area,
				Baddi, Tehsil Nalagarh,
				Dist. Solan,(H.P.).
				Pin Code - 173205
				Ph.01795- 244703
				Fax - 01795- 244703
				Contact - Mr. Alok Kumar
				(Facility Incharge) Mob.
				9212669513
				PLOT No. 378, F.I.E,
		11 100		PATPARGANJ, DEHLI -
		Head Office		DE N. 101 11 1209/201 502
				Ph. No. $\pm 91-11-43080301-302$,
				43B Okbla Industrial Estata
				New Delbi 110020 India
		Corporate ở	Moser Baer	Tel $\pm 91.11.40594444.91.11$
		Head Office	MOSCI Daci	26911570 - 74
				Fax +91 11 41635211, 26911860
				Chennai
				Moser Baer India Ltd.
				81, IInd Floor
		Branch Offices		Valluvarkottam High Road
				Nungambakkam,
				Chennai - 600 034
				Tel: Ph.+91-44-42664358-59
				M & ES Office
				Moser Baer India Ltd.
				167-169, IInd Floor, Anna Salai,
				Saidapet, Chennai - 600 015
				Tel: +91-44-45050041-42-43

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Chennai Project Office
				Moser Baer Solar Limited
				OZ-2,OZ-3,OZ-4
				Hi-TECH-SEZ, Sipcot Industrial Part-3
				Oragadam, Sriperampudur Taluk
				Kancheepuram District
				Tamil Nadu - 602105
				Mumbai
				Moser Baer Entertainment Ltd
				Mukti Foundation Building.
				A Wing, 1st Floor,
				141- A. Model Town, Village
				Ambivali
				Behind Kokilaben Dhirubhai
				Ambani Hospital
				Four Bungalows, Andheri-West
				Mumbai - 400053
-				Domestic Marketing & CE
				Moser Baer India Ltd.
				510- Maker Chambers V
				5th Floor. Nariman Point
				Mumbai-400 021
				Telefax: +91-22-66157930-31
				Bangalore
				Moser Baer India Ltd.
				Raheja Plaza, Unit No.103
				17 Commissariat Road
				Bangalore - 560025
				Telefax : 080-41649712
				Kolkata
				Moserbaer Entertainment
				Limited
				1st Floor, 13 FLT. LT.
				Tapan Chowdhury Avenue,
				Mudiali,
				Kolkata - 700026
				Tel: +91-33-65419945-54
				Delhi
				235, Okhla Industrial Estate
				Phase III
				New Delhi -110 020
				Tel: +91-11-47624100
				Pune
				Moser Baer Photo Voltaic Ltd.
				311, IIIrd Floor
				Connaught Place
				28 Bund Garden Road
				Pune - 411 001

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				USA Distributor
				Media Masters LLC
				#440, 2601 S. Minnesota
		Representative		Ave., Ste 105 Sioux Falls,
		d' Distributor		SD 57105-4750 USA
		C Distributor		Phone: +1-(888)-243-4465
				Fax: +1-(877) 835-2834
				E-mail: sales@mediamastersdisc
				.com
				BOM & M& ES
		Manufacturing		66, Udyog Vihar,
		Facilities		Greater Noida $(U.P.)$ - 201 306
				Tel: 0120-4386000
				Solid State Media
				A-164, Sector - 80,
				Phase - II, Noida (UP)
				1el: 0120-4307000
				MDPV & MD Solar
				Creator Noida (U.P.) 201306
				$T_{el}: 0120 \ 4658000$
				BOM & SSM
				A-164 Sector - 80
				Phase - II. Noida (UP) - 201 305
				Tel: 0120-4307000
				PV Technologies India Ltd.
				Oz-2, Oz-3, Oz-4
				Hi-Techsez, Sipcot Industrial
				Park-3 Oragadam, Sriperampudur Taluk
				Kancheepuram District
				Tamilnadu - 602105
				MIRC Electronics Ltd.
				Onida House, G-1, M.I.D.C,
				Mahakali Caves Road, Andheri
		Contronato		(E), Mumbai - 400 093.
		<i>Corporate</i>	Onida	Tel: 022 - 28200435 / 66975777.
		Autress		Email: response@onida.com
				For Institutional Sales:
				corporate.sales@onida.com
				For Service: service@onida.com
			Papasonic	Ph. No. 1800 108 1333 / 1860
			1 anasonic	425 1860 / 1800 103 1333
				Samsung India Electronics
				6th, 7th & 8th Floors, Ifci Tower,
			Samsung	61, Nehru Place,
				New Delhi,
1				Tel: 011 3030 8282

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Samsung Corporation
				Room No 355, Hotel Taj Palace,
				Chanakyapuri
				New Delhi, DL
				011 2688 9817
				Philips Electronics India
				Limited
			Dhilips	DLE Cyber City
			rimps	Sector 25 DI E Phase 3
				Gurgaon 122002 India
				Tel \cdot +91 - 124 - 4606000
				Philips Electronics India
				Limited
				7. Justice Chandra Madhab Road.
				Kolkata - 700020, India
				Tel : +91 - 33 - 24753621 / 27
				Philips Electronics India
				Limited
				The Estate, 4th floor (North
				Wing), (Next to Manipal Centre),
				121, Dickenson Road,
				Bangalore - 560042, India
				Tel: +91 - 80 - 66929898
				Philips Electronics India Limited
				MFAR Manyata Tech Park,
				Nagavara, Bangalore - 560045,
				1e1: +91 - 80 - 41890000
				Limited
				Temple Towers 5th Floor
				Old No \cdot 476 New No \cdot 672
				Anna Salai Nandanam
				Chennai - 600035 India
				Tel : +91 - 44 - 66501000
				Philips Electronics India
				Limited
				6-3-1109/1/P/103, 3rd Floor,
				Jewel Pawani Towers,
				Raj Bhavan Road, Somajiguda,
				Hyderabad - 500082, India
				Tel: +91 - 40 - 66467676
				Philips Electronics India
				Limited
				Technopolis Knowledge Park,
				Mahakali Caves Road,
				Chakala, Andheri (E).

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Mumbai - 400093, India Tel : +91 - 22 - 66912000
			Salora	D-13/4, Okhla Industrial Area, Phase-II New Delhi – 110 020, India Phone: +91-11-49207100 / 101
			Sansui	Adheshwar Arcade, Ist Floor, Andheri Kurla Road, Andheri East, Mumbai: 400 093
				No.62, 3rd floor, 1st main, 3rd cross, 2nd stage, Yeshwantpur Industrial Area, Bangalore – 560022
				Plot No. 296, Udyog Vihar Phase -2, Gurgaon – 122015
			Sharp	Sharp India Limited Gat No. 686/4, Koregaon Bhima, Tal: Shirur, Dist: Pune Pin – 412216 Phone: 02137-252417, 02137- 666520
			Sony	Sony India Registered Office A - 31, Mohan Co-operative Industrial Estate, Mathura Road New Delhi - 110044 Ph No : 66006600 Fax No : 26959141
				Sony India Branch Offices City Center, 3rd Floor, Plot A-5/1, Unit-IX, Sachivalaya Marg, Bhubaneswar Pin – 751022
				3rd Floor, NH Center Point Building, Opposite Bora Service, G S Road, Guwahati Ph No : 0361-2462858, 2462859
				White House, 2nd Floor, Block 2D, 119 Park Street, Kolkata - 700016 Ph No : 033-40071751/52/53/ 54/55 Fax No : 033 - 40071763 4th Floor, Block-B,
				Sai Corporate Park,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Rukanpura, Bailey Road, Patna - 800 014 Phone No : 0612 3269866
				3rd Floor, Adarsh Mall, Plot No 50, Industrial and Business Park, Phase-2, Chandigarh - 160002 Ph No : 0172-66 555 55, Fax No : 0172-66 555 66
				Unit # 405 - 407, 4th Floor, Copia Corporate Suites, Jasola District Centre, New Delhi – 110010 Contact : 1800-103-7799 (Toll Free) Fax No : 011-42458844
				SCO 38-39 G, 1st Floor, BRS Nagar, Ludhiana -141 012 Ph No : 0161-463 2222,
				24 Advocate Chambers, 2nd Floor, RDC Raj Nagar Ghaziabad, Uttar Pradesh Ph No : 0120 - 4940150 Fax No : 0120 - 4940180
				C-7, Sultan House, 1st floor, Sawai Jai Singh Highway, Bani Park, Jaipur - 302016 Ph No : 0141-4041896, 4041897 Fax No : 0141-4041894
				4th Floor, Eldeco Corporate Chambers, Vibhuti Khand Opposite Kisan Mandi Bhawan, Phase 1 Gomti Nagar Lucknow Ph No : 0522- 4041231/32/33/34/35
				U & I : VR 1 Centre , IInd Floor Plot No. 83, Sector 29, City Centre, Gurgaon, Haryana - 122002 Ph No : 0124 - 4896200, Fax: 0124 - 4896220
				No.768, 100 Feet Main Road HAL, IInd Stage, 12th Main, Indira Nagar, Bangalore - 560038 Ph No : 080-66605555 Fax No : 080-25294987
				#2-1-2/6(2), First Floor, Hill Groove, Chilimbi Hills, 2nd Cross, Mangalore – 575006

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				2nd Floor, Hameedia Centre,
				No 14/43, Haddows Road,
				Nungambakkam,
				Chennai - 600006
				Ph No : 044 - 28242571
				Fax No : 044-28234853
				2nd Floor, Muscat Tower
				S.A.Koad, Kadavanthara
				$Dh N_{0} \cdot 0484 2318616 2318619$
				2318619 Eav No $\cdot 0484-2318629$
				III Floor 1025/1 Skanda Square
				Avinashi Road
				Coimbatore - 641018
				Ph No : 0422-4334455
				Fax No : 0422-4334456
-				6-3-676/A/2/3/4,
				Punjagutta X Roads, Punjagutta
				Hyderabad - 500082
				Ph No : 040-66115000
				Fax No: 040-23400014
				Door No. 59-10-1/A,
				Matha Towers , 4th Floor,
				Ring Road, Patamatalanka,
				Vijayawada-520 010
				Mohans Arcade, 1st Floor, 47-11-
				5, Dwarka Nagar
				Vishakhapatnam - 530016
				101, Parth Complex, Ground
				noor, Swastik Cross Road
				Abmodobod 380000
				Ph No · 079-26441040
				26441041
				Fax No : 26460839
				25/1 Ground Floor.
				Yashwant Niwas Road.
				Shirish Chamber
				Indore - 452003
				Ph No : 0731-4055762, 4042013,
				4042033
				2nd floor, Crimpage
				Corporation,
				Plot No. 57, Street No.17, MIDC,
				Andheri East,
				Mumbai - 400093
				Ph No : 022-6128 8000
				Fax No : 28312935

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Office No.2, 3rd floor
				G.O.Square, Aundh-Hinjewadi
				Road, Near Mankar Square
				Wakad, Pune - 411057
				Ph No : 020-67917200
				Fax No: 020-6/91/299
				Office - 18 A, 04th Floor,
				Behind Raman Science Centre
				Sir Bezonii Mehta Marg
				Nagpur – 440018
				Ph No : 0712-6471533-557
				TCL India Holding Pvt. Ltd.
			TCI	Sco 254, 2nd Floor, Sector 44 C
			ICL	Chandigarh, CH
				Tel: 0172 464 6211
				TCL India Holding Pvt. Ltd.
				B-8/3, Uppal Industrial Area,
				Uppal, Hyderabad, AP
				Tel: 040 2344 9350
				1 CL India Holding Pvt. Ltd.
				Boad Bace Course Boad
				Indore MP
				Tel: 0731 400 3365
				TCL India Holding Pyt. Ltd.
				82, Phase 3, Okhla Industrial
				Estate, New Delhi, DL
				011 3082 3011
				Laxbro Manufacturing Company
			T-Series	W-53, MIDC Area, Bhosari Indl.
			1 oeneo	Estate, PMC – 411026,
				Maharashtra
				10SHIBA INDIA PVI. LID.
				B Dhase II
			Toshiba	DIF Cyber City
			10311104	Gurgaon - 122.002
				Harvana, India
				Board No. + 91-124-4996600
<u> </u>				TOSHIBA INDIA PVT. LTD.
				C&B Square Building , 6th Floor,
				Plot No 601, 127, Andheri Kurla
				Road, Chakla Andheri, (East),
				Mumbai 400059
				Tel: + 91-22-61911500
				TOSHIBA INDIA PVT. LTD.
1			1	284 Hothur Square, 2nd Floor,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				100 Feet Road Indiranagar,
				Bangalore - 560038,
				Karnataka, India $T_1 + 01.80.25100000$
				Teshiba India Put I td
				Business Communication Centre
				Chiramel Chambers Kurisupally
				Road, Ravipuram, Kochi-682 015
				Tel: + 91-484-2357107
				Toshiba India Pvt. Ltd.,
				Plot No 1-4, Vatika Business
				center, 3rd Floor, NSL Icon,
				Road No 12, Banjara Hills,
				Hyderabad-500034
				Tel: + 91-40-44311152
				Toshiba India Pvt. Ltd.,
				219, Regus Centre, 3rd Floor,
				Altius Olympia Technology
				Park, Sidco Industrial Estate,
				Tel: + 91-44-42994353
				Videocon Industries Ltd.
				14 Kms Stone, Aurangabad-
			Videocon	Paithan Road,
			VIGCOCOII	Chitegaon, Tq. Paithan,
				Dist. Aurangabad - 431 105
				(India)
				Corporate Office
				Fort House, 2nd Floor,
				400 001(INDIA)
				Corporate Office (Marketing,
				Service & Support):
				296, Udyog Vihar Phase-II,
				Gurgaon, Haryana. Phone No.:
				0124-32/3091
				B 102 Phase II Noida
			Weston	201305 (IIP)
			weston	Phone: 0120 4543114
				Fax: 0120 4543115
				Westway Electronics Limited
				C-189, Naraina Industrial Area
				Phase-I
				New Delhi 110028
				Phone: 011 45035222
				Fax: 011 41411110

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
No.		Category		
		LED	LG	Given Above
			Samsung	Given Above
			Panasonic	Given Above
			Toshiba	Given Above
			Onida	Given Above
				Corporate office
				Global Brands Enterprise
				Solutions Pvt. Ltd.
			Akai	Plot No. 97, Sector-44, Gurgaon -
				122 002, INDIA
				Phone No: 0124-4305000, Fax
				No.: 0124-4305020
				Global Brands Enterprise
				Solutions Pvt. Ltd.
				Flat No. 31, 3rd Floor,
				Harihar Apartment, Vishnu Dev
				Path, East Boring Canal Road,
				Patha - $800\ 001$.
			Llaion	Civen Above
			Lite -l-	Given Abase
			Distant	Given Above
			Prinips	Given Above
			T conice	Given Above
			I-series Solore	Given Above
			Videocon	Given Above
		Dlaama and	VIGEOCOII	Given Above
		HDTV	Hitachi	Given Above
			LG	Given Above
			Panasonic	Given Above
			Samsung	Given Above
			Sansui	Given Above
		Flat	BPL	Given Above
			Daenyx	Given Above
			Haier	Given Above
			LG	Given Above
				Next Retail India Limited,
				3rd Floor, Aadeshwar Arcade
				Above Loop Gallary,
			Next	Opp. Sangam Cinema,
				Andheri Kurla Road,
				Mumbai 400 102
			0.1	Phone: +91-/498218860
			Onida	Given Above
			Panasonic	Given Above
			Samsung	Given Above
			Philips	Given Above
			Salora	Given Above

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
			Sansui	Given Above
			Sharp	Given Above
			Sanyo	SANYO India Pvt. Ltd., 'Jubilee Building', 2nd Floor, 45, Museum Road, Bangalore 560025, India, Tel: +91-80-43418200, Fax: +91-80-43418222
			TCL	Given Above
			T-Series	Given Above
			Texla	TEXLA ELETROVISION A-72, OKHLA INDUSTRIAL AREA, PHASE-II, New Delhi - 110020, India 91-11-26384589/26387153
			Videocon	Given Above
			Weston	Given Above
		CTV	Daenyx	Given Above
			Haier	Given Above
			LG	Given Above
			Markson	Given Above
			Moser Baer	Given Above
			Panasonic	Given Above
			Next	Next Retail India Limited, 3rd Floor, Aadeshwar Arcade Above Loop Gallary, Opp. Sangam Cinema, Andheri Kurla Road, Mumbai 400 102 Phone: +91-7498218860
			Philips	Given Above
			Salora	Given Above
			TCL	Given Above
			T-Series	Given Above
			Videocon	Given Above
			Weston	Given Above
	Washing Machine	Semi Automatic	BPL	Given Above
			Beltek	BELTEK INDIA LTD. B-89 SEC-5 201301 NOIDA - UTTAR PRADESH Phone No.:- 0091 95 1202421676
			Daenyx	Given Above
			Electrolux	PE Electronics Ltd. Corporate Centre, 5th Floor, Andheri Kurla Road, Andheri (East), Mumbai – 400059 Phone No. +91-22-61171000

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
			Gem	Gem Equipments Pvt. Ltd. S.F. No. 103, Avanashi Road, Arasur Coimbatore – 641407 Ph. No. +91 422 2363800
			Godrej	Godrej Industries Limited. Pirojshanagar, Eastern Express Highway, Vikhroli, Mumbai - 400079, INDIA. Tel: +91-22-2518 8010 / 2518 8020 / 2518 8030 Fax: +91-22-2518 8074
				Godrej & Boyce Manufacturing Company Limited. Pirojshanagar, Vikhroli, Mumbai - 400079, INDIA. Tel: +91-22-6796 5656 / 5959
			Haier	Given Above
			Kelvinator	
			Kenstar	
			LG	Given Above
			Onida	Given Above
			Samsung	Given Above
			TCL	Given Above
			T-Series	Given Above
			Videocon	Given Above
			Weston	Given Above
			Whirlpool	Given Above
		Fully Automatic	BPL	Given Above
			Daenyx	Given Above
			Electrolux	
			Godrej	Given Above
			Haier	Given Above
			IFB	Corporate Address: IFB Industries Limited Corporate Off.: Flat No.IND-5, Sector-1,East Kolkata Township, Kolkata – 700 107 Ph: +91 33 39849524/39849475 Fax: +91 33 39849676
				Kolkata Factory: IFB Industries Limited No:14, Taratolla Road, Kolkata - 700 088. Ph: +91 33 30489299

Sr.	Due des et Nieures	Product	Duand	Address / Contract Dataila
No.	Product Name	Sub Category	Brand	Address / Contact Details
		Gategory		Fax: +91 33 30489230
				Bangalore Factory: IFB Industries
				Limited
				16/17, Visveswaraiah Indl.
				Estate,
				Off.Whitefield road, Bangalore -
				560048.
				Ph: + 91 80 30589620
				GM: +91 80 30589604
				MK1G: +91 80 30589641
			Kalvinator	Fax:+91 80 30389611
			LC	Civen Above
			Kenstar	Given Above
			Opida	Given Above
			Panasonic	Given Above
			Samsung	Given Above
			Toshiba	Given Above
			Videocon	Given Above
			Whirlpool	Given Above
			· · ·	Corporate Headquarters
				Kasturi Buildings,
				Mohan T Advani Chowk,
	Air Conditioner	Window	Blue star	Jamshedji Tata Road,
				Mumbai - 400 020
				Tel: (91) (22) 66654000
				Fax: (91) (22) 66654151
				Divisional Headquarters
				O Parrullah Paad
				9 Bazulian Koad
				Chennai - 600 017
				Tel: (91) (44) 4344 4000
				Fax: (91) (44) 28158015 / 4344
				4072
				Mumbai
				Bandbox House
				4th Flr, 254 D
				Dr Annie Besant Road
				Worli
				Mumbai - $400\ 030$
				Fer: (91) (22) 66544000
				Pax: (91) (22) 00344001
				Chennai
				No 104 Old No 46
				Garuda Buildings, Cathedral
				Road.

Sr. No	Product Name	Product Sub	Brand	Address / Contact Details
110.		Category		
				Chennai - 600 086
				Tel: (91) (44) 42444000
				Fax: (91) (44) 42444190
				Mumbai
				Blue Star House
				9A, Ghatkopar
				Sakinaka
				Tal. (01) (22) (6684000)
				Fer: (91) (22) 66684000
				Fax: (91) (22) 00084004
				Koikata 7 Llaro Stroot
				Vollata 700.001
				Tal: (01) (33) 22134000
				Fax: $(91)(33)(22134000)$
				$\mathbf{N}_{\mathbf{N}} \mathbf{N}_{\mathbf{N}} \mathbf{D}_{\mathbf{n}} \mathbf{D}$
				Block 2-A DI E Corporate Park
				DLE Outab Enclave
				Phase III
				Gurgaon - 122.002 (Harvana)
				Tel: (91) (124) 4094000
				Fax: (91) (124) 4094004
				Manufacturing Facilities
				Ahmedabad
				501/3, 503/2, Teipur Road
				Sarkhej Baula Highway
				Changodar,
				Ahmedabad- 382213
				Tel: (91) (2717) 294490
				Bharuch
				Plot Nos. 4 and 5
				GIDC Industrial Estate
				Narmada Nagar post
				Bharuch - 392 015
				Tel: (91) (2642) 246116
				Fax: (91) (2642) 246026
				Dadra
				Survey No. 265/2
				Demni Road
				Dadra 396 191
				U.T. Of Dadra & Nagar Haveli
				Tel: (91) (0260) 2668617 /
				2668618
				Fax: (91) (0260) 2668503
				Kala Amb
				Nahan Road
1	1	1	1	Kanpur lattan

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Kala Amb
				District Sirmour
				Himachal Pradesh 173030
				Tel : (91) (01702) 238760
				Fax : (91) (01702) 238461
				Nahan Koad
				Village Ogli
				District Sirmour
				Himachal Pradesh 173030
				Tel: (91) 98160 13443
				Fax : $(91) (01702) 238761$
				Thane
				IInd Pokhran Road
				Majiwada
				Thane - 400 601
				Tel: (91) (22) 67924000
				Fax: (91) (22) 67924020
				Wada
				Village-Vasuri Khurd,
				Khanivali Road,
				PO - Khupari,
				Taluka - Wada,
				Dist - Thane, 421312
				Sales and Service Offices
				Ahmedadad Abbishroo Ayonyo
				3rd Floor, Near Nehru
				Nagar Cross Roads
				Ambawadi Road
				Ahmedabad - 380 006
				Tel: (91) (79) 4022 4000
-				Bengaluru
				Ozone Manay Technology Park,
				Sy.No 56/18 & 55/9
				Hongasandra Village
				Begur Hobli
				Garvebhavipalya
				Bangalore - 560 068
				Tel: (91) (80) 41854000
				Bhubaneswar
				3A, Satya Nagar
				2nd Floor, Dhuhanam 751.007
				Enubaneswar $/51.00/$
				1 CI: (91) (0/4) 25/2403 / 2573670 / 2570024
				Fax: (91) (674) 2570544

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Chandigarh
				Adarsh Mall,
				4th Floor, Plot No. 50,
				Industrial & Business Park,
				Phase - II,
				Chandigarh - 160 002
				Tel: (91) (172) 5024000
				Fax: (91) (172) 5004007
				Chennai
				Blue Star Limited
				620, Anna Salai,
				Modern School Road,
				Chennai - 600006
				Tel: (91) (44) 40444000
				Fax: (91) (44) 40444001
				Ghaziabad
				C 53A, Third Floor,
				Raj Nagar District Center
				(RDC), Raj Nagar,
				Ghaziabad - 201001.
				Uttar Pradesh
				Tel: (91) (120) 2821400
				Guwahati
				2nd Floor, New Star Freeze
				Bldg., Opp. Kunjalata Bibah
				Bhawan, G S Road,
				Guwahati - 781005
				Tel: (91) (361) 2340620
				Indore
				1st Floor, Shri Krishna
				Classic, 139,
				Fadnis Colony, A B Road,
				Indore - 452 010
				1 el: (91) (731) 40012117
				4001311
				Jaipur
				A-19, First Floor,
				Main Sahakar Path,
				Nr. Sahakar Bhavan,
				Jaipur
				1 el: (91) (141) 4141100/
				2/44033/35
				Kuchi Millonium Diana
				Alia ak
				Annichuvadu MKK Naia Daad
				Non Delemination Lynchics
				Kochi 62024
				Tel· (91) (484) 4499000

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Fax: (91) (484) 4499190
				Lucknow
				177/4,Faizabad Road
				Lucknow 226 007
				Tel: (91) (522) 4034000
				Fax: (91) (522) 4034004
				Mumbai
				59 Forbes Street
				Mumbai 400 001
				Tel:(91) (22) 22844660
				Mumbai
				Unit G-2
				Shalimar Ind. Estate
				Dharavi Road
				Matunga
				Mumbai - 400 019
				Tel: (91) (22) 24042098
				Mumbai
				Unit 1 Prabhadevi
				Industrial Estate
				Prabhadevi,
				Mumbai - 400025
				Tel: (91) (22) 24227305
				Fax: (91) (22) 24376041
				Nagpur
				219 Bajaj Nagar, 1st Floor, South
				Ambazari Road, Nagpur - 440010
				Tel: (91) (712) 6624000
				Fax: (91) (712) 6624002
				New Delhi
				E-44/12, Okhla Industrial
				Area, Phase II,
				New Delhi - 110 020
				Tel: (91) (11) 41494000
				Fax: (91) (11) 41494001
				Panjim (Goa)
				First Floor, Buddhaseth
				Apts, Tonca, Caranzalem,
				Goa - 403 002.
				Tel:(91) (832) 2462789
				Pune
				201/A, Nityanand Complex
				247/A Bund Garden Road
				Pune - 411011
				Tel: (91) (20) 4104 4000
				Fax:(91) (20) 4104 4001
				Raipur
				Alaska Corporates,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				3rd Floor, Opp VIP Road,
				Jivan Vihar Colony,
				G E Road, Raipur,
				Chattisgarh - 492 006
				Tel: (91) (771) 6544000
				Secunderabad
				207 Sikh Road
				Samudambad 500.003
				Tel. (91) (40) 4400 4000
				Fax: (91) (40) 4400 4001 / 4190
				IInd Pokhran Road
				Majiwada
				Thane - 400601
				Tel: (91) (22) 67154500
				Fax:(91) (22) 67924020
				Thiruvananthapuram
				TC IV/962, Chandrika,
				Sree Chitra Nagar,
				Pipe line Road, Kawdiar,
				Thiruvananthapuram - 695 003
				Tel: (91) (471) 2435025
				Fax: (91) (471) 2434065
				Ramkrishna Chambers
				Alkanuni
				Vadodara
				Tel: (91) (265) 6614000
				Visakhanatnam
				D. No. 49-24-65/1.
				Resapuvani Palem Village.
				Madhura Nagar Mandal,
				Near Sankarmattam Road,
				Vishakapatnam 530 016
				Tel: (91) (891) 274 8405
				Fax: (91) (891) 270 1041
				INDIAN HEADQUARTERS :
				Carrier Airconditioning &
				Retrigeration Limited
			Carrier	Gurgaon
				Haryana, 122 004, India
				Ph. No. +91-124-4825500
				Fax No. +91- 124- 2373 241
				Carrier Airconditioning &
				Refrigeration Ltd
				Sector-29

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Near Bikaner Sweets
				Gurgaon 122 002 (Haryana)
				1 el:- 0124 - 4/0/333
				Fax:- 0124 - 2565050
				Refrigeration Ltd
				Carrier Complex
				Vill. Narsinghpur, Kherki Daula
				Post,
				Gurgaon – 122 004
				Tel:- 0124 - 482 5500
				Fax:- 0124 - 237 2230
				Carrier Airconditioning &
				Refrigeration Ltd
				Shop No # 201 E, 2nd Floor,
				Mahagun Metro Mall,
				Near Ansal Plaza, Vaishali,
				Ghaziabad (Uttar Pradesh)
				$E_{\text{ext}} = 0120 - 4183260$
				Carrier Airconditioning &
				Refrigeration I td
				Unit No.402 B & 403
				4th floor. Shalimar Square.
				126/3 B B.N.Road,Lalbagh,
				Lucknow - 226001
				Tel:- 0522 - 2202346, 2230598
				Fax:- 0522 - 2230050
				Carrier Airconditioning &
				Refrigeration Ltd
				SCO 301/302, 1st Floor,
				Sector – 38 D, Chandigarh - 160 036
				Tel:- 01/2 - 500 /548/ 50
				Fax:- 01/2 - 500/160
				Patriconditioning &
				1st Floor SS Tower New Colony
				Behind Ivanti Market
				Laipur - 302 001
				Tel Nos :- 0141 - 511 3444, 511 3999
				Carrier Airconditioning &
				Refrigeration Ltd
				C/o Bhairav Distributors,
				Shop No:- 5 & 6, Victor Bldg
				Cujira - St Cruz
				Panaji - Margao Highway,
				Panjim, Goa - 403 005
				Tel:- 0832 - 244 /028
				Fax:- 0852 - 244 /02/
				Carrier Airconditioning &
				605A Lokmat Building
				Lokmat Square. Vardha Road

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Ramdas Peth, Nagpur Tel:- 0712 - 663 0214, 645 3790 Fax:- 0712 - 645 3790
				Carrier Airconditioning & Refrigeration Ltd C/o Suman Enterprises Behind ITI, Sham Nagar Raipur – 492 006 Tel:- 0771 - 401 3245
				Carrier Airconditioning & Refrigeration Ltd 1st Floor, Milestone, Drive In Road Thaltej, Ahmedabad – 380 052 Tel:- 079 - 4026 7777 Fax:- 079 - 4026 7799
				Carrier Airconditioning & Refrigeration Ltd Shreeprasad, Office No.4, 4th floor Plot No.74, Sheela vihar colony Opp. Planet ford, Paud Road Pune -411 038 Tel:- 020 - 41051000/ 02025437741 Fax:- 020-25437742
				Carrier Air-conditioning & Refrigeration Ltd., Unit No.4, 3rd Floor Phoenix Market City, 15 L.B.S. Marg, Kurla (West) MUMBAI – 400 070. Telephone: 022-61700700
				Carrier Airconditioning & Refrigeration Ltd 315-316, Shagun tower, 7 Commercial Sector PU 4, Scheme No 54, Vijay Nagar Square, A.B. Road, Indore – 452010 Tel:- 0731-4070378 Fax:- 0731 - 252 6365
				Carrier Airconditioning & Refrigeration Ltd C/o Om Sai Enterprises, Pushpanjali Complex, Second Floor, Lake Road, Ranchi – 834 001 Tel:- 0651 –645 2488 Fax:- 0651 – 246 1818
				Carrier Airconditioning & Refrigeration Ltd C/o, Candida Enterprises R.G. Baruha Raod, Sunderpur Guwahati - 781 005 Tel:- 0361 - 259 5003

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Fax:- 0361 - 220 3508
				Carrier Airconditioning &
				Refrigeration Ltd
				204, Adarshila Complex
				South Gandhi Maidan
				Patna - 800 001
				Tel:- 0612 - 232 3517
				Telefax:- 0612 - 266 8591
				Carrier Airconditioning &
				Refrigeration Ltd
				P-339/1, CIT Road, Scheme VI-M,
				Phulbagan, Kolkatta – 700 054
				Tel:- 033 - 4020 1300
				Fax:- 033 - 2364 9766
				Carrier Airconditioning &
				Refrigeration Ltd
				Flat No:- 201, Shanti Niwas Housing
				Plot No:- 33/1747, Rasulgarh
				Bhuvaneshwar – 751010
				Tel:- 0674 - 258 7178/ 258 5893
				Fax:- 06/4 - 258 /1/8
				Carrier Airconditioning &
				Retrigeration Ltd
				6-2-9/6, Raj Bhawan Road
				Khairatabad,
				Hyderabad -500004
				Tel:- 040 - 4546 2888
				Fax:- 040 - 4011 8146
				Refrigeration Limited
				3rd Floor, Block III
				Brestige Blue Chip, No.9, Hosur
				Road
				Bangalore $= 560.029$
				Tel \cdot +91 80 43442000
				Fax:- +91.80.41321222
				Carrier Airconditioning &
				Refrigeration Ltd
				Shivas Complex
				263/5, Mettupalayam Road
				Coimbatore – 641 043.
				Tel:- 0422 - 438 4151, 438 5403
				Fax:- 0422 - 2436485
				Carrier Airconditioning &
				Refrigeration Ltd
				39/6641, Perumanoor,
				M.G. Road, (Opp. Cochin Shipyard)
				Cochin – 682 015
				Tel:- 0484 - 402 9001/ 0
				Fax:- 0484 - 235 9214
				Carrier Airconditioning &
				Refrigeration Ltd
				GRR Zone

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				271/2, Maraimalai Adigal Salai Pondicherry – 605 001 Tal: 0413 222 5853 2226 676
				Fax:- 0413 - 234 4695
				Carrier Airconditioning & Refrigeration Ltd Old No. 248, New No.114 Royapettah High Road, Royapettah, Chennai – 600 014. Phone : 044 – 42222888
			Daenyx	Given Above
			General (ETA)	ETA General Pvt Ltd ETA House ,3rd Floor #71/63,Opp.Loyola College Sterling Road, Nungambakkam, Chennai.6000034 . Tamilnadu 044- 43402345
				ETA General Pvt. Ltd.Flat no - 642 D, Ram AppartmentsOpp. Laksmi MillsPapanaicken PalayamCoimbatore - 641 037Tel. #:0422 - 2554732
				ETA General Pvt Ltd ETA House, Behind Green Park Hotel 7-1-27/5, Plot No:9, Greenlands, Ameerpet HYDERABAD - 500 016 Tel.#:040 - 66103530 / 31
				ETA General Pvt. Ltd. D NO.40-1-119, Old BATA GodownOpp. Jyothi Mahal Benz Circle, VIJAYAWADA – 522 010 Tel : 0866 - 6460278 / 3074029
				ETA General Pvt. Ltd. PLot No.153, 2nd Floor , 9th Main Road 3rd Block, Jayanagar BANGALORE - 560 011 Tel: 080-40926531 / 40926538
				ETA General Pvt. Ltd. Bldng #:30/2001-D, 'Atham' 1st Floor, Opp.Gold Souk Grande Ponnurunni Road Ponnurunni, Vytilla P.O Cochin - 682 019 Telefax : 0484 - 4011623

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				ETA General Pvt. Ltd.
				101-102, 1st Floor, Grotto
				Heritage,
				Opp.Orlem Church, Marve Road,
				Malad – West,
				$Mumbai = 400.064$ $T_{-1} = 0.022 = 42455200 / 0.02$
				ETA Conoral Dut. 1 td
				203 2nd Floor Sankaln Square
				Near Gurukul Temple
				Drive In Road
				AHMEDABAD - 380 054
				Tel: 079-27467991,40058991
				ETA General Pvt. Ltd.
				SCO 2475 - 76,
				Sector 22 - C, 2nd Floor
				CHANDIGARH - 160 022
				Tel: 0172 - 5087288, 4421121
				ETA General Pvt. Ltd.
				C - 19, Sector - J
				Aliganj,
				LUCKNOW - 226 020 (U.P)
				Tel: 0522 - 4006879
				ETA General Private Limited
				Suffise Mail, 2nd Floor, Soctor, 11 Vasundhara 201 012
				Tel: 0120-4291121
				ETA General Pyt Ltd
				221. Ist floor
				Okhla Indl. Area,
				New Delhi-110020
				# 011-43127777
				ETA General Pvt. Ltd.
				203, 2nd Floor
				Krishna Enclave, Plotno-SB-52
				Opp.SMS Stadium, Tonk Road,
				JAIPUR - 302015(Rajasthan)
				Ph. No: 0141-4012684
				ETA General Pvt. Ltd.
				Ist Floor, Unit 1 F
				216 AIC Bose Boad
				KOIKATA - 700 017
				Tel: 033 - 40602006
			Godrei	Given Above
<u> </u>			Haier	Given Above
			Hitachi	Given Above
			LG	Given Above

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
10.		Category		
			Onida	Given Above
			Samsung	Given Above
			Videocon	Given Above
			TCL	Given Above
				Voltas Limited
				Voltas House
	Corporate			'A' Block
	Headquarters		Voltas	Dr. Babasaheb Ambedkar Road
	-			Chinchpokli
				Mumbai 400 033
				Tel: 022-66656 666
	Eastarias			2nd, Pokhran Road,
	ractories			Thane - 400 601
				Tel: 022-67920111
				Dadra Plant (EM&RBG)
				Shreenath Industrial Estate, C
				Building
				Survey NO.197, Nr. Dadra Check
				Post Pin – 396230
				Tel: 0260-6619999 / 2669648
				Uttarakhand Plant
				(EM&RBG)
				Plot No.1, Sector 8
				I.I.E. Pant Nagar Industrial Area
				Dist U.S. Nagar, Rudrapur
				Pin – 263145
				Tel: 05944-250006 / 8
				Uttarakhand Plant (UPBG)
				Plot NO.2-5, Sector 8
				I.I.E. Pant Nagar Industrial Area
				Dist U.S. Nagar, Rudrapur
				Pin – 263153
				Tel: 05944-250009
			Whirlpool	Given Above
		Split	Blue star	Given Above
			Carrier	Given Above
			Daenyx	Given Above
			General (ETA)	Given Above
			Godrej	Given Above
			Haier	Given Above
			Hitachi	Given Above
			LG	Given Above
			Onida	Given Above
				Gurgaon Head Office
				2nd Floor, Tower A & B, DLF
			Mitsubishi	Cyber Greens, Dlf Cyber City,
				DLF Phase -III,Gurgaon-122002,
				India

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Phone: +91 (124) 463-0300 +91 (124) 673-9300 Fax: +91 (124) 463-0399 / 398
				Delhi Registered Office M-38/1, Middle Circle, Connaught Place, New Delhi- 11000, India Please contact Gurgaon head office for Delhi inquiries.
				Bangalore Sales Office Prestige Emerald, 6th Floor, Municipal No. 2, Madras Bank Road (Lavelle Road), Bangalore 560001, India Phone: +91 (80) 4020-1600 Fax: +91 (80) 4020-1699
				Pune FAID Head Office Emerald House, EL-3, J block M.I.D.C Bhosari, Pune -411026, India Phone: +91 (20) 2710-2000 Fax: +91 (20) 2710-2100
				Pune Sales Office 301-302, Lunkad sky Station, near HDFC Bank, Viman Nagar, Pune-411 014, India Phone: +91 (20) 4131-4868 Fax: +91 (20) 4131-4851
				Pune Sales Office F-2, Gurutej Bahadur, Housing Society, Aundh Road, Khadki, Pune - 411003, India Phone: +91 (20) 2582-0447/ 448 / 449 Fax: +91 (20) 2582-0450
				Mumbai Sales Office 305-306, 3rd Floor, "Windfall", Sahar Plaza Complex, Next to Kohinoor Hotel, Andheri Kurla Road, J. B. Nagar, Andheri (E.) Mumbai-400 059, India Phone: +91 (22) 6611-6200 Fax: +91 (22) 6611-6299
				Chennai Sales Office Citilights Corporate Centre No.1, Vivekananda Road, Srinivasa Nagar, Chepet, Chennai-600 031, Tamilnadu, India Phone: +91 (44) 4923-2222 Fax:

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				+91 (44) 4923-2249
				Hyderabad Sales Office
				4th Floor, Unit No.407, Ashok
				Bhopal Chamber S.P. Road,
				Secunderabad, A.P-500 003,
				Andhra Pradesh, India
				Phone: +91 (40) 4343-8888 Fax:
				+91 (40) 4343-8899
				Chandigarh Sales Office
				SCO 176, First Floor, Sector 38
				C, Chandigarh – 160036, India
				Phone: +91 (172) 460-1645
				Jaipur Sales Office
				111, Ground Floor, Apex Mall,
				Tonk Road, Jaipur, India
				Phone: +91 (141) 401-1109
				Ahmedabad Sales Office
				303 / A, 3rd Floor, Primate, Judges
				Bungalow Cross Road, Bodakdev,
-				Annedabad Gujarat – 380034, India
				No 551 A West Lobranus Street
				DR Pood PS Duram Compton
				641002 India
				-641002, findia Dhone: $\pm 01 (422) 438 5600$
				Vadodara Sales Office
				A 1/2 2nd Eloor Status Plaza
				Opp Relish Resort Aksar Square
				O P Road Vadodara - 390020
				India
				Phone: ± 91 (265) 231-4699 / 235-
				8137 Fax: +91 (265) 233-3307
				Kochi Sales Office
				Room No G9 Building Door No
				CC: 39/5102-A-6 Netage
				Arcade Church Landing Road
				Ernaculum Kochi-682016 India
				Phone: +91-9846013451 / +91-
				8129445670
				Mitsubishi Elevator ETA India
				Pvt. Ltd.
				Chennai Citi Centre, 5th Floor,
				10 & 11, Dr.R.K. Salai, Mylapore,
				Chennai - 600004, India
				Phone: +91 (44) 2847-7370 Fax:
				+91 (44) 2847-7374
			Panasonic	Given Above
			Samsung	Given Above
			Sanyo	Given Above

Sr. No.	Product Name	Product Sub	Brand	Address / Contact Details
		Category	/TIOT	
			ICL T 11	Given Above
			I OSMIDA	Given Above
			Videocon	Given Above
			V Oltas	Given Above
	Defrierentene	Direct Cool	wniripool	Given Above
	Reingerators	Direct Cool	DPL Electrolux	Given Above
			Com	Given Above
			Cadrai	Given Above
			Goure	Given Above
			Kolvinator	Given Above
			LC	Civen Above
			Democratic	Given Above
			Panasonic	Given Above
			Videogog	Given Above
			Which a al	Given Above
		Erect Erec	w niripooi ppi	Given Above
		FIOST Free	DPL Electrolux	Given Above
			Cadrai	Cince Above
			Goure	Given Above
			Llitachi	Given Above
			Hitachi Volvinator	Given Above
			IC	Civen Above
			Depesonic	Given Above
			Fanasonic	Given Above
			Videocon	Given Above
			Whirlpool	Given Above
			Toshiba	Given Above
			Sharp	Given Above
			onarp	Registered & Corporate Office
			Siemens	130, Pandurang Budhkar Marg, Worli, Maharashtra, Mumbai 400 018. Tel: +91 22 3967 7000
				Fax: +91 22 3967 7500
	Mobile Phones		Acer	Ground Floor, B- 28, Okhla Phase - I, New Delhi - 110020, Delhi, India Tel: +(91)-(11)-40568000
			Alcatel	India Office TCT Mobile International Limited, Elegance Tower, Regus Business Centre, 2nd Floor, Room No.252B Jasola, New Delhi- 110025

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Distributors
				Encon Impex Private Limited.
				Super Distributor
				Encon Impex Private Limited.
				No.45. 2nd Floor, Vinavaka
				Electronic Plaza, 1st Cross, S.P
				Road, Bangalore - 560 002
				Kochi Kerala
				Talktime Telesystems Super
				Distributor
				Talktime Telesystems, 48/425B.
				Main road. Elamakkara Kochi-
				682026.
				Tirunelveli Tamil Nadu
				KM Enterprises Super
				Distributor
				KM Enterprises. No 41 $E/3$.
				Vasanthapuram. South Bye-Pass
				road, Tirunelveli-627005
				Karimnagar, Andhra Pradesh
				SR Technologies, Micro
				Distributor
				SR Technologies, No 1-5-89,
				Aravindh Nagar, Jagtial,
				Karimnagar, Andhra Pradesh.
				Amazon Development Center
				India Pvt Ltd
				Q-city, 2nd Floor-Block A &
				Block B
				Survey Number-109,110,111/2,
			Amazon	Nanakramguda Village
				Serlingamplayy Mandal, Ranga
				Reddy Dist.
				Hyderabad - 500032
				Ph: 040 39921111
				Divyashree Building, Ground
				Floor, Plot No: 6
				Hi-Tech City Layout, Survey No.
				64(Part), Madhapur Village
				Serilingampally Mandal
				Hyderabad - 500081
				Ph: 040 43451000
				9th & 10th Floor,
				Bulding #9, Raheja Mindspace
				Madhapur
				Hyderabad - 500081
				Ph: 040 40005111
1	1	1	1	

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				#40,3rd Floor, SP Infocity
				M G R Salai, Perungudi
				Kandanchavady
				Chennai-600096
				Ph: 044 50885088
				Opposite LP. Techno park
				No 3 Ali Asker Road
				Bangalore - 560052
				Ph- 080 41970000
				Brigade Gateway 6th floor
				26/1, Dr. Rajkumar Road
				Malleshwaram(W)
				Bangalore-560055
				Ph: 080 33273000
				Apple India Private Limited
				19 Floor, Concorde Tower C,
			Apple	UB City No 24 Vittal Mallya
				Road
				Bangalore 560-001
				Presentec GmbH
			Danafan	Große Elbstraße 11/
			Deneton	DE-22/67 Hamburg Dhone: $\pm 40.(0)40.300.6683.0$
				Findle: $\pm 49 (0)40 300 6683 20$
				BenO India Pyt. I td
				3rd Floor, 9B Building
			BenQ	DLF Cyber City, DLF Phase 3.
				Gurgaon 122002. Harvana.
				Ningbo Bird Co.,Ltd.
				No.999, Dacheng East Road,
				Fenghua City, Zhejiang Province,
				P.R.China
			Bird	Tel : +86 574 88953465, +86 755
				36878286
				Fax: +86 574 88951025, +86 755
				36878284
				Postcode: 315500
				US & Latin Americas
				101: +00 5/4 88953405 $Mobile: +86 13738470409$
				Corporate Head Office
				BlackBerry B
				2200 University Ave. E
			BlackBerry	Waterloo, ON, Canada
				N2K 0A2
				Tel: (519) 888-7465
				Fax: (519) 888-7884
				BlackBerry United States

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				BlackBerry
				5000 Riverside Drive,
				Irving, TV 75020
				Tal: (072) 373 1700
				Fax: (972) 650 2006
				BlackBerry Europe
				BlackBerry
				200 Bath Road
				Slough, Berkshire
				United Kingdom SL1 3XE
				Tel: +44 (0)1753 667000
				Fax: +44 (0)1753 669970
				Manufacturing Facility
				BlackBerry
				451 Phillip Street
				Waterloo, Ontario
				Canada IN2L 3A2
				F_{ax} : (519) 888-0021
				Ottawa
				BlackBerry
				4000 Innovation Drive
				Kanata, Ontario
				Canada K2K 3K1
				Tel: (613) 599-7465
				Fax: (613) 599-1922
				Mississauga
				BlackBerry
				4/01 Tahoe Boulevard
				Mississauga, Ontario
				Tel: (905) 629-4746
				Fax: (905) 629-4869
				BLU Products
			DLL	10814 NW 33 rd St# 100
			BLU	Doral, FL 33172
				(305) 715 - 7171
				Bosch Sicherheitssysteme GmbH
				Robert-Bosch-Ring 5
			Bosch	85630 Grasbrunn
				GERMANY
				1 el: +49 (0) 89 6290-0
				Bosch Security Systems
				Fairport New York 14450
				USA
				Tel: +1 585 223 4060

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Bosch Security Systems Pte Ltd 11 Bishan Street 21 Singapore 573943 SINGAPORE
				Tel: +65 6571 2808
				Bosch Security Systems B.V. Postfach 80002 5600 JB Eindhoven
				THE NETHERLANDS Tel: +31 (0) 40 25 77 284
			Casio	Casio India Co. Private Ltd. 210, 1st Floor, Okhla Industrial Estate, Phase-III, New Delhi-110020 Tel: 011-66999200 Fay: 011 41054330
				601, 6th Floor, Crescent Plaza, Telly Gulli, Andheri(E), Mumbai-69, Ph.: 022-60605005
				No.7, Shah Complex, 2nd Floor, 9th Main, 5th Block Jayanagar, Bangalore- 41, Ph.: 080-60605005
				3rd Floor, Heera Panna Complex, 124/1, G.N.Chetty Road, T.Nagar, Chennai-17, Ph.: 044-60605005
				3rd Floor, 3-4-630, Padma Plaza, Opposite Ratna College, Narayanguds, Hydrabad-29, Ph.: 040-60605005
				4C, Lansdowne Place, 2nd Floor, Kolkata-29, Ph.: 033-60605005
			Celkon	CELKON IMPEX PVT LTD. 3rd floor, 2nd block, MY HOME HUB, Madhapur, Hyderabad - 500081, Andhra Pradesh, India. Contact : +91 90523 45678
			Chea	Spectrum House, Dunstable Road, Redbourn, Hertfordshire, AL3 7PR Tel: 01923 383828 International: +44 (0)1923 383828

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
			Dell	Dell Computer Corporation One Dell Way Round Rock, Texas 78682 Tel: (888) 560-8324 (800) 915-3355
			Ericsson	ERICSSON INDIA PRIVATE LIMITED Ericsson Forum DLF Cyberciti Sector-25A, Gurgaon Haryana Postal code: 122 002 Phone: +91 124 4080808, +91 124 2701001
			Fujitsu Siemens	Shiodome City Center 1-5-2 Higashi-Shimbashi, Minato- ku Tokyo 105-7123, Japan Tel: +81-3-6252-2220
			Gigabyte	Gigabyte Technology India Private Limited +91-22-40633222
			Haier	Given Above
			HP	Hewlett-Packard India Sales Pvt.Ltd 24, Salarpuria Arena Adugodi Hosur Road Bangalore - 560 030 Phone: (080) 33824000 / 33829000
				Elewiett-Packard India Sales Pvt. Ltd 501, 5th Floor, Satkar Complex Behind Swagath Building Off C.G.Road, Navrangpura Ahmedabad - 380 001
				Hewlett-Packard India Sales Pvt. Ltd. 24, Salarpuria Arena Building Adugodi, Hosur Road Bangalore - 560 030
				HP GR Tech Park Facility 10th & 11th floor, B wing, Akash Block, 6-9 floor, B wing, Akash Block, 0-3rd Floor, B wing, Akash Block, Salarpuria GR Tech Park, Sy No.69/3, Whitefield Road,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Next to ITPL,
				Bangalore - 560 066. India.
				Hewlett-Packard GlobalSoft
				Limited
				HP Avenue
				39/40, Electronics City-I
				Hosur Road
				Bangalore - 560 100
				Global e-Business Operations
				Pvt. Ltd.
				Wind Tunnel Road
				Tower 1, GVH, Murugeshpalya
				Murugeshpalya
-				Bangalore - 560 017
				Hewlett-Packard India Sales Pvt.
				Ltd. No. $66/2$ Word No. 83
				Reamana Tash Dark
				Ath Floor Wing A
				Embassy Prime CV Raman
				Nagar
				Bangalore - 560.093
				Survey No. 192
				Whitefield Road
				Mahadevpura Road
				Bangalore - 560 048
				III Floor, Khanija Bhavan,
				49, Race Course Road,
				Bangalore - 560 001
				Surya Park 2,
				No.100, Ring road,
				Bangalore - 560 100
				Surya Wave,Sy # 61(p),
				Electronic City, Hosur Road
				Bangalore - 560 100
				Prathik Tech Park,
				Survey No 93/1, Veerasandra
				village,
				Attibele Hobli, Anekal Taluk,
				Electronic City Extension
				Bangalore - 560 100
				Hewlett-Packard India Sales
				Pvt.Ltd
				NO.2, KKM Plaza,
				Harrington Koad,
				Cheppei, 600.021

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Plot 1, Olympia Technology park,
				Citius block, SIDCO industrial
				estate,
				Guindy,
				Chennai - 600 032
				Block 1, 4F - 6F
				Block 1, G - 3F
				First Software Park,
				110 Mount Poonamalie Road,
				Porur Channai 600 116
				Crewed floor Crewes Dista
				Ground floor, Crowne Plaza,
				New Friends Colony,
				Howlett Dealvard India Salas Dut
				Hewlett-Packard India Sales Pvt.
				No 18 ilabs Centre
				4th Floor, D- Block
				5th Floor, C - Block
				5th Floor, D - Block
				Madhapur
				Hyderabad - 500 081
				Hewlett Packard India Sales
				Private Limited
				Building No:-02, DLF
				Cybergreen,
				1st to 4th floors, Towers D & E,
				DLF Cyber City, Phase III,
				Gurgaon – 122 022, Haryana,
				India
				Phone:(0124) 3886000
				Fax: (0124) 3886941
				Hewlett-Packard India Sales Pvt
				Ltd.
				Plot No. 9-11A & 35-37A,
				Sector-V
				Integrated Industrial Estate,
				Pantnagar (SIDCUL),
				Rudrapur, US Nagar - 263 153.
				Uttaranchal State, India
				No 08, Major Arteral Road,
				Block - AF New Town 1st Floor,
				Rajarhat,
				Kolkata- /00 156,
				West Bengal.
				Unit No. 16N & 17, 16th & 17th
				Floor,
1				Uperoi Commerz, International

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Business Park, Oberoi Garden City, Off
				Western Express Highway,
				Goregoan,
				Mumbai - 400 063 Maharastra
				Hewlett-Packard India Sales
				Pvt.Ltd.
				Level 6, Pentagon P-2, Magarpatta City
				Hadapsar
				Pune - 411 028
			НТС	1800 266 3566
				Huawei Telecommunication
				(INDIA) Co. Pvt Ltd. 7 th Eloor Tower A
			I Internet	Spaze I-Tech Park, Sohna Road,
			riuawei	Sector-49
				Gurgaon, Haryana-122001 India Tel: +91-124-4774700
				Fax: +91-124-4774863
				Huawei
				9th Floor, Tower 6, The Gateway, No. 9, Canton Road, Tsim Sha
				Tsui,
				Kowloon, Hongkong
				Tel: 00852-21253888
				Karbonn Mobiles
				#39/13, off 7th main, HAL 2nd
			Karbonn	stage
				Appareddy Palya, Indiranagar, Bangalore – 560038
				Tel: 080 40894888
				Karbonn Mobiles
				D-1/0, Okhla Industrial Area, Phase-1
				New Delhi – 110020
				011 46604660
				<u>KYOCERA Corporation</u>
				6 Takeda, Tobadono-cho,
			Kvocera	Fushimi-ku, Kyoto 612-8501,
				Japan Phone: +81,75,604,3473
				Fax: +81-75-604-3472
Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
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				KYOCERA Asia Pacific India
				Pvt. Ltd.
				1001A, 1001B, 1002, 10th Floor
				JMD Regent Square, M.G. Road
				Gurgaon-122 002 Haryana, India $Phope: \pm 91, 124, 402, 5000$
				Fione. + 91-124-402-5000 $Fax: + 91-124-402-5001$
				Lenovo India Pyt I td
				Ferns Icon, Level -2.
				Doddenakund Village,
			т	Marathhalli Outer Ring Road,
			Lenovo	Marathhalli Post, Kr Puram
				Hobli,
				Bangalore-560037
				Phone No. :080-30533000
				Lenovo India Pvt.Ltd
				Vatlka Business Park 1st
				floor,Badshah Pur Road,
				Sebra Pood
				Gurgeon 122001
				Phone No $\cdot 0124.4315600$
				Lenovo India private ltd
				MLS Business Centres India Pvt.
				Ltd.
				6th Floor, Block A, 22, Camac
				Street
				Kolkata - 700 016.
				MPh no: 033 - 4019-2234 TO
				4019-2239
				FAX - 033 - 40192240
				#1011-12, Solitaire Corporate
				Park, Dwilding No. 10 1st Floor Andhori
				Chatkopar Link Road
				Chakala Andheri (East)
				Mumbai-400093
				Phone No. : 022- 30847000/100
				Lenovo India Pvt Ltd
				2nd Floor Kuppu Arcade, 4
				Venkatanarayana Road,
				T.Nagar, Chennai 600 017
				Phone No. : 044-39159273
			LG	Given Above
				Maxon CIC Europe Ltd
			Maron	Maxon House
			IMAXON	Hemel Hempstead Herts
				HP2 7EY

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				United Kingdom Tel: +44 (0) 1442 267777
			Meizu	Future Technology Enterprise Ltd. Unit 01-02, 19/F, Hollywood Plaza, 610 Nathan Road, Mongkok, Kowloon, Hong Kong
				Tel: (852) 2388 8022
			Micromax	Micromax House, 90B,Sector-18,Gurgaon Pin Code - 122015 Tel: +91-124-4811000 Fax: +91-124-4009603
				Micromax House, 90B,Sector-18,Gurgaon Pin Code - 122015 Tel: +91-124-4811000 Fax: +91-124-4009603
				Micromax House, 90B,Sector-18,Gurgaon Pin Code - 122015 Tel: 18605008286 Fax: +91-124-4009603
				Micromax Informatics Ltd, Plot No.234, HPSIDC Industrial Area, Tehsil Nalagarh, Distt Solan (HO)-173205
			Microsoft	Microsoft Corporation One Microsoft Way Redmond, WA 98052-6399
			Mitac	MiTAC products or general company enquiries Tel: 886-2-26525888
			Mitsubishi	Given Above
			Motorola	Motorola Mobility, Inc. 600 North U.S. Highway 45 Libertyville, Illinois 60048 USA

Sl. No.	Name	Address	Latitude			Longitude							
			Deg.	Min.	Sec.	Deg.	Min.	Sec.					
	Bilaspur												
1	Sai Kripa Electronics	Karbala Road, Bilaspur	22	4	36.3	82	9	41.6					
2	Maya Sales	Hatari Chowk, Juna Bilaspur	22	4	48.3	82	9	47.0					
3	Naresh Enterprises	Hatari Chowk, Juna Bilaspur	22	4	57.3	82	9	42.1					
4	Kanhaiya Electronics	Hatari Chowk, Juna Bilaspur	22	4	57.7	82	9	40.7					
5	Maya Traders	Hatari Chowk, Juna Bilaspur	22	4	58.5	82	9	39.4					
6	Electronics Bird	Opp. Manohar Takies, Juna Bilaspur	22	4	58.3	82	9	39.5					
7	Shree Sharda Enterprises	Near Kotwali, Telipara Rd, Bilaspur	22	5	2.5	82	9	24.0					
8	Maha Maya Enterprises	Telipara, Bilaspur	22	4	50.9	82	9	23.8					
9	Shree Leela Electronics	Telipara, Bilaspur	22	4	48.2	82	9	27.5					
10	Vijay Electronics	Telipara, Bilaspur	22	4	44.2	82	9	27.8					
11	Tuteja Enterprises (LG Shoppe)	Near old Bus stand, Bilaspur	22	4	39.6	82	9	27.7					
12	Electronics Bazar	Near old Bus stand, Bilaspur	22	4	35.9	82	9	29.6					
13	Rani Sati Electronics	Near old Bus stand, Bilaspur	22	4	35.4	82	9	17.7					
14	Amit Sale (Samsung)	Agrasen Chowk, Bilaspur	22	4	36.2	82	9	14.0					
15	Raj Electronics	Agrasen Chowk, Bilaspur	22	4	36.5	82	9	14.9					
16	Akash Store	Masanganj, Bilaspur	22	4	48.8	82	9	1.0					
17	Maha Maya Enterprises	Naka Chowk, Kota, Bilaspur	22	17	21.8	82	0	53.1					
18	Har Dev Electronics	Naka Chowk, Kota, Bilaspur	22	17	21.5	82	0	56.8					
19	Sri Sai Mobile & TV	Kargi Road, Kota, Bilaspur	22	17	22.2	82	0	56.9					
20	Kabilash Enterprises	Kargi Road, Kota, Bilaspur	22	17	21.6	82	0	57.4					
21	Sachin Enterprises	Kargi Road, Kota, Bilaspur	22	17	22.1	82	1	2.7					

Partial List of Distri	ibutor, Trader &	Retailer in l	Bilaspur Divis	sion – Annexure 2

SI No	Name Address Latitude		e	Longitude				
01. 1 10.	ituine	indites:	Deg.	Min.	Sec.	Deg.	Min.	Sec.
22	Amber Cooler & TV	Kargi Road, Kota, Bilaspur	22	17	23.4	82	1	7.7
23	Shree Ram Music Electronics	Station Road, Kota, Bilaspur	22	17	23.7	82	1	12.2
24	M.K. Electronics	Station Road, Kota, Bilaspur	22	17	24.3	82	1	15.7
25	Jai Ambey Electronics	Near Rly. Station , Kota, Bilaspur	22	17	39.1	82	1	27.7
26	Jaya Enterprises	Near Rly. Station , Kota, Bilaspur	22	17	39.7	82	1	27.7
27	Om Emporiyam	Near Rly. Station , Kota, Bilaspur	22	17	39.9	82	1	27.9
28	Sonu Electronics & Mobile	Near Rly. Crossing, Belha, Bilaspur	21	57	30.6	82	4	24.1
29	Maa Bhawani Enterprises	Bilaspur Road, Belha, Bilaspur	21	57	33.0	82	4	16.3
30	Baba Electronics	Main Market, Belha, Bilaspur	21	57	36.9	82	4	30.8
31	Sanjay Electronics & Mobile	Tahsil Road, Belha, Bilaspur	21	57	23.5	82	4	28.0
32	Vinod Electronics & Mobile	Tahsil Road, Belha, Bilaspur	21	57	23.3	82	4	28.1
33	Rakesh Electronics & Mobile	Tahsil Road, Belha, Bilaspur	21	57	21.2	82	4	26.8
34	Dev Furniture& Electronics	Tahsil Road, Belha, Bilaspur	21	57	53.4	82	4	26.8
		Mungeli		1		1		1
35	Nav Durga Electronics	Main Market, Lormi, Mungeli	22	16	13.7	81	42	1.7
36	Laxmi Electronics	Near Court, Lormi, Mungeli	22	16	17.4	81	41	52.0
37	Divya Enterprises	Tahsil Road, Lormi, Mungeli	22	16	18.0	81	41	47.7
38	Gaurav Enterprises	Pandaria Road, Lormi, Mungeli	22	16	16.7	81	41	40.6
39	Ganga Shree Electronics	Main Road, Lormi, Mungeli	22	16	18.0	81	42	2.2

SI No	Name	Address	Latitude			Longitude			
01. 1 40.	ivanic	nuitos	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
40	Mansi Enterprises	Main Road, Lormi, Mungeli	22	16	18.5	81	42	2.7	
41	Santosh Sahu Electronics	Pani Tanki, Padaria Road, Mungeli	22	4	0.5	81	40	42.1	
42	Amit Electronics	Padaria Road, Mungeli	22	3	59.3	81	40	53.8	
43	Gupta Radioa & TV Center	Balani Chowk, Mungeli	22	3	58.4	81	41	10.6	
44	Kant Radio House	Balani Chowk, Mungeli	22	3	58.8	81	41	10.5	
45	Pradeep Radio	Near Manju Takies, Mungeli	22	4	4.6	81	41	27.5	
46	Shree Raj Enterprises	Near Radha KrishnaTakies, Mungeli	22	4	4.0	81	41	29.6	
47	Satya Electronics	Dawpara, Mungeli	22	4	12.6	81	41	35.3	
48	Mahavir Electronics	Dawpara, Mungeli	22	4	13.6	81	41	34.8	
49	Anuraj Sales	Bada Bazar, Mungeli	22	3	54.9	81	41	28.4	
50	Mukesh Electronics	Sindhi Colony, Shankar Mandir, Mungeli	22	3	45.1	81	41	7.9	
51	Kotadia Sons	Gol Maket, Mungeli	22	3	59.1	81	41	19.4	
52	Maruti Electronics	Gol Maket, Mungeli	22	3	58.5	81	41	19.3	
53	Om Shanti Enterprises	Chhoti MasjidComplex, Mungeli	22	3	51.2	81	41	16.4	
54	Bhanu Enterprises	Gol Maket, Mungeli	22	3	52.5	81	41	17.0	
55	Shree Balaji Enterprises	Gol Maket, Mungeli	22	3	53.7	81	41	17.4	
		Korba							
56	Kanha Trading	Niharika Subhas Chowk, Kala Sagar Complex, Korba	22	21	43.3	82	43	42.6	
57	Shivam Electronics	Ghanta Ghar Chowk, Korba	22	21	35.2	82	43	13.8	
58	Pushpak Electronics	CSB Chowk, Korba	22	21	45.9	82	42	40.2	
59	Electropark	Main Road, Transport Nagar, Korba	22	21	44.8	82	42	39.8	

SI No	Name	Address	Ι	atitud	e	Longitude			
01. 1 (0.	i vanic	nuitss	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
60	Naresh Trading	Main Road, Transport Nagar, Korba	22	21	41.9	82	42	37.8	
61	Naresh Electronics	Main Road, Transport Nagar, Korba	22	21	41.1	82	42	37.6	
62	Gulati Electronics	Main Road, Transport Nagar, Korba	22	21	27.9	82	42	29.0	
63	Singh Electronics	Main Road, Transport Nagar, Korba	22	21	22.2	82	42	25.0	
64	Royal Watch & Electroncs	Near Bus Stand, Katghora, Korba	22	30	33.0	82	33	0.7	
65	Balaji Electronics	Main Road, Katghora, Korba	22	30	37.5	82	32	59.5	
66	Agrawal Agency	Korba Road, Katghora, Korba	22	30	27.7	82	33	6.8	
67	Jyoti Electronics	Main Road, Katghora, Korba	22	30	27.3	82	32	59.6	
68	Jyoti Agency	Main Road, Katghora, Korba	22	30	26.7	82	32	59.0	
69	New Jai Bajrang Enterprises	Main Road, Katghora, Korba	22	30	21.3	82	32	49.9	
70	Versha Electronics	Old Bus stand, Katghora, Korba	22	30	20.9	82	33	49.8	
71	Shiv Enterprises	Jay Stabh Chowk, Katghora, Korba	22	30	20.5	82	32	49.4	
72	Maa Electronics	Jay Stabh Chowk, Katghora, Korba	22	30	19.4	82	32	46.2	
73	Sri Ram Electronics	Main Market, Kartala, Korba	22	17	56.3	82	57	28.9	
74	Gauri Electronics	Main Market, Kartala, Korba	22	17	48.2	82	57	31.3	
		Janjgir - Champa							
75	Shree Shyam Electronics	Collectrate Chowk, Janjgir	22	0	53.0	82	35	39.3	
76	Himanshu Electronics	Champa Road, Janjgir	22	0	43.4	82	35	22.0	
77	Mahakali Enterprises	Link Road, Janjgir	22	0	43.0	82	34	50.5	
78	KVC Agency	Link Road, Janjgir	22	0	42.7	82	34	39.8	

SL No	Name	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
79	Kailash Electronics	Link Road, Janjgir	22	0	42.8	82	34	38.2
80	Prasant TV	Link Road, Janjgir	22	0	42.8	82	34	37.3
81	Yash TV Center	Netaji Chowk, Janjgir	22	0	42.4	82	34	32.0
82	Babloo TV Center	Naila Stn. Road, Janjgir	22	0	47.2	82	34	27.9
83	Gattani Agency	Naila Stn. Road, Janjgir	22	0	42.2	82	34	19.0
84	Kumar Radio	Naila Stn. Road, Janjgir	22	0	36.6	82	34	34.8
85	Sri Bala Ji Electronics	Birgahni Chowk, Champa, Janjgir	22	1	40.0	82	38	17.5
86	Sahu Electronics	Beriyal Chowk, Champa, Janjgir	22	1	49.6	82	38	29.9
87	Gajanand Electronics	Beriyal Chowk, Champa, Janjgir	22	1	59.8	82	38	27.3
88	Paras Electronics	Beriyal Chowk, Champa, Janjgir	22	1	59.8	82	38	25.8
89	Asgar Electronics	Beriyal Chowk, Champa, Janjgir	22	2	4.0	82	38	24.6
90	Kesharwani Enterprises	Machhali Talab, Champa, Janjgir	22	2	9.4	82	39	18.9
91	Isha TV Center	Baipali Chowk, Champa, Janjgir	22	2	9.2	82	39	17.5
92	Kediya Electronics	Baipali Chowk, Champa, Janjgir	22	2	10.2	82	39	31.2
93	Pratap Electronics	Baipali Chowk, Champa, Janjgir	22	2	10.7	82	39	25.7
94	New Om Electronics	Near Bus Stand, Bhaindih, Janjgir	21	54	24.0	82	43	12.8
95	Jain General Store & Electronics	Main Market, Bhaindih, Janjgir	21	54	8.0	82	43	6.0
96	Jaiswal Electronics	Bazar Para, Bhaindih, Janjgir	21	54	7.4	82	43	5.7
97	Ajay Electronics	Bazar Para, Bhaindih, Janjgir	21	54	6.0	82	43	7.1

SI No	Name	Address	Ι	Latitud	e	Longitude			
	T tunite	i i i i i i i i i i i i i i i i i i i	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
98	Narendra Electronics	Haldi Bazar Chowk, Baloda, Janjgir	22	8	7.1	82	28	32.5	
99	Om Electronics	Haldi Bazar Chowk, Baloda, Janjgir	22	8	7.7	82	28	31.5	
100	Mauli Music & Electronics	Haldi Bazar Chowk, Baloda, Janjgir	22	8	7.0	82	28	32.5	
101	Manish Gupta Electronics	Janjgir Road, Baloda, Janjgir	22	8	8.9	82	28	48.9	
102	Neel Kamal Electronics	Janjgir Road, Baloda, Janjgir	22	8	8.2	82	28	51.2	
103	Banti Electrical	Main Market, Akaltara, Janjgir	22	1	30.3	82	25	37.6	
104	Sai Enterprises	Shivri Naryan Road, Akaltara, Janjgir	22	1	17.9	82	25	36.0	
105	Minakshi Electronics	Main Market, Akaltara, Janjgir	22	1	9.1	82	25	34.9	
106	Chaudhary Enterprises	Main Market, Akaltara, Janjgir	22	1	29.5	82	25	37.4	
107	Navnit Electronics	Main Market, Akaltara, Janjgir	22	1	29.5	82	25	37.6	
108	Binu Agency	Main Road, Akaltara, Janjgir	22	1	32.7	82	25	37.8	
109	Gupta Enterprises	Shakhi Chowk, Akaltara, Janjgir	22	1	34.7	82	25	35.9	
110	Shree Ganesh Electronics	Mukam, Pamgarh, Janjgir	21	52	29.6	82	26	46.2	
111	Balaji Enterprises	Main Road, Pamgarh, Janjgir	21	52	29.3	82	26	47.2	
112	Jai Durga Electronics	Near Bus Stand, Pamgarh, Janjgir	21	52	24.6	82	27	0.2	
		Raighar			,		,		
113	Shyam Jyoti Electronics	Himrapur, Raigarh	21	54	33.4	83	23	24.3	
114	Tushar Sales (Sony)	Jagatpur, Raigarh	21	54	30.4	83	23	26.8	
115	Tulsi Digital	Jagatpur,Dimlapur Road, Raigarh	21	54	24.5	83	23	27.3	
116	Ambey Electronics	Dimlapur Road, Raigarh	21	54	16.3	83	23	32.8	

SI No	No Name Address		Ι	Latitud	e	Longitude		
51. 140.	Ivallic	1		Min.	Sec.	Deg.	Min.	Sec.
117	Mahamia Enterprises (LG Shoppe)	Dimlapur Road, Raigarh	21	54	17.3	83	23	31.7
118	Shivam Radio	Near Shyam Takies, Raigarh	21	53	38.3	83	23	33.1
119	Ganesh Radio & Watch	Near Shyam Takies, Raigarh	21	53	39.4	83	23	33.8
120	Voice Vision	Shyam Takies Chowk, Raigarh	21	53	37.2	83	23	34.2
121	Anupam Electronics	New Tulsi Hotel, Raigarh	21	53	27.6	83	23	45.0
122	Mukesh Traders	Ram Niwas Takies Chowk, Raigarh	21	53	29.8	83	23	43.3
123	Cinni Sales	Ram Niwas Takies Chowk, Raigarh	21	53	31.2	83	23	43.0
124	Ram Dayal Electronics (Digi World)	Subhas Chowk, Raigarh	21	53	41.4	83	23	38.4
125	Platinu Gift (Paasonic)	Near Bus Stand, Raigarh	21	54	0.6	83	23	39.7
126	Sri Ram Electonics & Electricals	Agrasen Marg, Kharsia, Raigarh	21	59	20.1	83	6	18.1
127	Rani Sati Agency	Agrasen Marg, Kharsia, Raigarh	21	59	17.0	83	6	18.9
128	Chhatisgarh Sale	Agrasen Marg, Kharsia, Raigarh	21	59	17.7	83	6	18.8
129	Shivam Electronics	Agrasen Marg, Kharsia, Raigarh	21	59	16.0	83	6	19.3
130	Prakash Watch & Radio	Raigarh Chowk, Kharsia, Raigarh	21	58	52.7	83	6	24.8
131	Shyam Furniture & Electronics	Raigarh Chowk, Kharsia, Raigarh	21	58	51.1	83	6	24.9
132	Sanjay Enterprises	Dr. Shyam Prasad Mukhargi Marg, Kharsia, Raigarh	21	59	22.6	83	6	16.0
133	Sanjay Electronics	Near Bus Stand, Dharamjaygarh, Raigarh	22	27	43.7	83	12	35.5
134	Gupta Electronics	Near Bus Stand, Dharamjaygarh, Raigarh	22	27	43.7	83	12	34.1

Sl. No.	Name	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
135	Garg Furniture & Electronics	Main Market, Dharamjaygarh, Raigarh	22	27	48.1	83	12	33.0
136	Mukesh Electronics	Near Bus Stand, Dharamjaygarh, Raigarh	22	27	40.0	83	12	33.5
137	Taj Electronics	Near Bus Stand, Dharamjaygarh, Raigarh	22	27	41.5	83	12	35.1
138	Om Electronics	Main Market, Ghardhoda, Raigarh	22	10	30.3	83	21	10.2
139	Ambey Electronics	Raigarh Road, Ghardhoda, Raigarh	22	10	32.6	83	21	0.5
140	Rashmi TV Center	Raigarh Road, Ghardhoda, Raigarh	22	10	32.0	83	21	0.0
141	Hira Watch & Electronics	Raigarh Road, Ghardhoda, Raigarh	22	10	21.1	83	20	57.6
142	Taj Electronics	Near Bus Stand, Ghardhoda, Raigarh	22	10	9.6	83	20	57.1
143	Taj Tv Center	Main Road, Ghardhoda, Raigarh	22	10	8.7	83	20	56.8

Sl. No.	Name	Address	Latitude			Longitude					
			Deg.	Min.	Sec.	Deg.	Min.	Sec.			
		Bilaspur									
1	Head Post office	Chota para, Bilaspur	22	5	13.3	82	8	41.5			
				_	40.0			264			
2	I absil office	Bilaspur	22	5	13.0	82	8	36.1			
3	Civil Court	Bilaspur	22	5	12.9	82	8	35.9			
4	Vikas Bhawan	Bilaspur	22	5	10.9	82	8	3.6			
5	Collectrate office	Bilaspur	22	5	15.2	82	8	25.0			
6	Zila Panchayat office	Bilaspur	22	5	16.1	82	8	20.5			
7	Nagar Palika Office	Kota	22	17	22.7	82	1	5.3			
8	Tahsil Office	Kota	22	17	22.5	82	1	5.1			
9	Tahsil Office	Belha	21	57	47.2	82	4	30.2			
10	Nagar Pachayat Office	Belha	21	57	1.2	82	4	22.7			
Mungeli											
11	Janpat Panchayat office	Lormi	22	16	18.2	81	41	54.1			
12	Vyavhar Court	Lormi	22	16	18.1	81	41	53.1			
13	Tahsil office	Mungeli	22	4	37.9	81	42	35.1			
14	Collectrate office	Mungeli	22	4	25.2	81	42	2.4			
15	Lok Seva Kendra	Mungeli	22	4	41.9	81	42	45.7			
16	Zila Pachayat Office	Mungeli	22	4	25.1	81	42	2.3			
		Korba	4	Į	I	Į	<u> </u>	I			
17	RTO Office	Korba	22	22	4.7	82	44	44.9			
18	Tahsil office	Korba	22	22	0.0	82	44	49.0			
19	Collectrate office	Korba	22	21	40.5	82	42	16.8			
20	Nagar Paika office	Pondi Uproda	22	35	55.6	82	33	24.8			
21	Tahsil office	Pondi Uproda	22	36	48.5	82	32	52.6			

Partial List of Bulk Consumers in Bilaspur Division- Annexure 3

Sl. No.	Name	Address	I	Latitud	e	Longitude						
	i tunic		Deg.	Min.	Sec.	Deg.	Min.	Sec.				
22	Lok sewa Kendra	Pondi Uproda	22	36	7.0	82	33	26.1				
23	Tahsil office	Katghora	22	30	13.3	82	33	25.9				
24	Nagar Paika office	Katghora	22	30	6.8	82	33	32.6				
25	Tahsil office	Kartala	22	17	54.4	82	57	9.1				
Janjgir - Champa												
26	Civil Court	Janjgir	22	0	26.9	82	34	43.1				
27	Tahsil office	Janjgir	22	0	26.9	82	34	43.1				
28	Collectrate office	Janjgir	22	0	53.2	82	35	39.9				
29	Lok Sewa Kendra	Janjgir	22	0	25.0	82	34	43.6				
30	Tahsil office	Champa	22	2	19.6	82	39	21.2				
31	Nagar Palika Office	Champa	22	2	36.6	82	38	48.7				
32	Tahsil office	Bhamindih	21	54	33.3	82	43	11.6				
33	Nagar Pachayat Office	Baloda	22	8	3.9	82	28	21.4				
34	Tahsil office	Baloda	22	8	4.1	82	29	53.8				
35	Tahsil office	Akaltara	22	1	1.7	82	25	36.3				
36	Zila Panchayat office	Pamgarh	21	52	13.3	82	27	15.0				
37	Tahsil office	Pamgarh	21	52	12.1	82	27	15.1				
Raighar												
38	Collectrate office	Raigarh	21	53	25.5	83	24	18.5				
39	Tahsil office	Raigarh	21	53	19.2	83	24	17.5				
40	Tahsil office	Dharamjaygarh	22	27	42.6	83	12	29.6				
41	Tahsil office	Gharghoda	22	10	21.1	83	20	57.7				

Sl. No.	Name of Shops	Address	Latitude			Longitude			
			Deg.	Min.	Sec.	Deg.	Min.	Sec.	
		Bilaspur							
			1	1	1	1	1	1	
1	Kaushik TV Repairing Center	Rajıv Gandhi chowk, Raipur Road, Bilaspur	22	4	38.8	82	8	21.9	
2	New Fridge Point	Karbala Road, Bilaspur	22	4	48.3	82	9	47.1	
3	Neha TV Center	Juna Bilaspur	22	5	0.9	82	9	33.5	
4	Shivam TV Radio Center	Near Shyam Takies, Juna Bilaspur	22	5	0.7	82	9	34.4	
5	Bharmal Electronics	Shastri Chowk, Bilaspur	22	5	4.5	82	9	25.9	
6	J.S. Refrigeration	Khararganj, Bilaspur	22	5	2.8	82	9	22.6	
7	Baksh Refrigeration	Sadar Bazar, Bilaspur	22	5	8.6	82	9	11.9	
8	R.K. Service	Juni Line, Sadar Bazar, Bilaspur	22	5	7.9	82	9	11.6	
9	New Baksh Refrigeration	Madhya Nagari Chowk, Bilaspur	22	5	2.1	82	9	10.0	
10	Dinesh TV Center	Telipara, Bilaspur	22	4	52.2	82	9	23.1	
11	Whirpool Cooling Center	Masanganj, Bilaspur	22	4	51.1	82	9	3.6	
12	Ahuja TV Center	Shanichari Bazar, Bilaspur	22	5	1.8	82	9	36.6	
13	Sahu Repairing Center	Kargi Road, Kota, Bilaspur	22	17	22.0	82	0	58.3	
14	Versha TV Center	Kargi Road, Kota, Bilaspur	22	17	22.4	82	0	58.2	
15	Bajrang Electronics	Kargi Road, Kota, Bilaspur	22	17	22.1	82	0	59.1	
16	Geeta Electronics	Kargi Road, Kota, Bilaspur	22	17	23.3	82	1	9.3	
17	Amisha Refrigeration	Near Rly. Station , Kota, Bilaspur	22	17	28.8	82	1	23.1	
18	Saxena Electronics	Hatri Chowk , Kota, Bilaspur	22	17	42.5	82	1	28.8	
19	Durga Radio & Color TV	Hatri Chowk , Kota, Bilaspur	22	17	45.5	82	1	29.0	
20	Jai & Jala Ram Electronics	Near Rly. Station , Kota, Bilaspur	22	17	48.9	82	1	30.4	

Partial List of Service centers	in Bila	spur division-	Annexure 4
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SI No	Name of Shops	Address	Latitude			Longitude					
01. 1 10.	Traine of Shops	nuitss	Deg.	Min.	Sec.	Deg.	Min.	Sec.			
21	Shree Durga Electronics	Main Road, Near Rly Crossing, Belha, Bilaspur	21	57	30.1	82	4	25.0			
22	Bagga TV Center	Bilaspur Road, Belha, Bilaspur	21	57	27.5	82	4	29.0			
23	Ravi Radio	Tahsil Road, Belha, Bilaspur	21	57	18.3	82	4	25.5			
24	Saurya Refrigeration	Bodri Road, Chakar Bhata Camp, Belha, Bilaspur	21	57	2.6	82	4	23.5			
25	Raj TV Repairing Center	Shanichari Bazar, Belha, Bilaspur	21	57	15.4	82	4	23.4			
Mungeli											
26	Babloo Electronics	Main Market, Lormi, Mungeli	22	16	13.9	81	42	1.4			
27	Paras Electronics	Main Market, Lormi, Mungeli	21	16	15.8	81	42	1.3			
28	Rajpoot Electronics	Mungeli Road, Lormi, Mungeli	22	16	17.0	81	42	1.1			
29	Santosh TV Center	Near Police Station, Lormi, Mungeli	22	16	18.5	81	41	59.0			
30	Maa Godawari Electronics	Main Market, Lormi, Mungeli	22	16	17.7	81	41	57.4			
31	Maa Durga Electronics	Tahsil Road, Lo r mi, Mungeli	22	16	18.1	81	41	49.8			
32	Maa Sarswati Electronics	Main Road, Lormi, Mungeli	22	16	17.4	81	41	48.7			
33	Satyavan Sound & Ganesh TV Repairing	Main Road, Lormi, Mungeli	22	16	17.7	81	41	48.7			
34	Prakash Mobile & TV Repairing	Main Road, Lormi, Mungeli	22	16	17.5	81	41	40.2			
35	Maa Maha Maya Refrigeration	Main Road, Lormi, Mungeli	22	16	18.8	81	42	6.6			
36	Jai shakti Electronics	Padaria Road, Mungeli	22	4	1.0	81	40	43.5			
37	Sahu Electronics	Padaria Road, Mungeli	22	4	0.9	81	40	57.6			
38	Suraj Electronics	Balani Chowk, Mungeli	22	3	58.8	81	41	10.7			
39	Manju TV Repairing	Balani Chowk, Mungeli	22	4	0	81	41	11.9			

SI No	Name of Shops	Address	Latitude			Longitude			
01. 1 40.	Traine of onops		Deg.	Min.	Sec.	Deg.	Min.	Sec.	
40	Om TV Repairing	Balani Chowk, Mungeli	22	4	1.7	81	41	11.2	
41	Patel Frigde Repairing	Near Radha KrishnaTakies, Mungeli	22	4	3.9	81	41	30.1	
42	Nikhil Electronics	Bilaspur Road, Mungeli	22	4	3.8	81	41	30.3	
43	Amit Watch & Electronics	Lormi Road, Mungeli	22	4	12.8	81	41	30.5	
44	Mukesh Electronics	Sindhi Colony, Shankar Mandir, Mungeli	22	3	45.1	81	41	7.9	
45	Maa Ambey Electronics	Near Bus Stand, Mungeli	22	3	44.4	81	41	3.6	
46	Dwivedi TV & Electronics	Near Kotwali, Mungeli	22	4	2.1	81	41	19.9	
47	Shakti Electronics	Near Kotwali, Mungeli	22	4	1.6	81	41	19.9	
48	Laxmi Prasad Electronics	Sardar Patel ward, Mungeli	22	4	0.9	81	41	20.7	
		Korba							
49	Sahu TV Center	Sunday Market, Korba	22	20	36.5	82	41	56.1	
50	Laxmi Electronics	Power House Road, Korba	22	21	4.9	82	42	14.3	
51	Kisan Electronics	Mudapar bypass, Korba	22	20	58.1	82	42	33.0	
52	TV Janta Electronics	Transport Nagar, Korba	22	21	19.3	82	42	22.2	
53	Saurabh Refrigeration	Suvidha ComplexTransport Nagar, Korba	22	21	19.4	82	42	22.1	
54	Shahabuddin Electronics	Transport Nagar, Korba	22	21	23.0	82	42	26.4	
55	Q Max (Freeze Repairing shop)	Budhwari Bazar, Korba	22	21	56.0	82	43	1.9	
56	Anil Electroncis (TV &Freeze Repairing)	Budhwari Bazar, Korba	22	21	55.5	82	43	1.9	
57	Refrigeration Care	Budhwari Bazar, Korba	22	21	56.2	82	43	1.7	
58	Bareth Electronics	ITI Chowk, Korba	22	22	4.9	82	44	47.9	
59	Refrigeration (Friends	Kasabadi Chowk, Korba	22	21	48.7	82	44	3.7	

SI No	Name of Shops	Address	Latitude		Longitude			
01. 1 (0.			Deg.	Min.	Sec.	Deg.	Min.	Sec.
	Engineering Training)							
(0)				21	44.5	00	12	21.1
60	Shree Krishna Electronics	Pushpanjali Chowk, Korba	22	21	41.5	82	43	31.4
61	Prahlad Electronics	Niharika Chowk, Korba	22	21	41.1	83	43	30.1
62	Yadav Electronics	Tahsil Chauraha, Pondi Uproda, Korba	22	36	48.5	82	32	52.6
63	Royal Watch & Electroncs	Near Bus Stand, Katghora, Korba	22	30	33.0	82	33	0.7
64	Royal Watch & Computer Repairing	Main Road, Katghora, Korba	22	30	32.3	82	33	0.9
65	Balaji Electronics	Main Road, Katghora, Korba	22	30	37.5	82	32	59.5
66	Javed TV Repairing	Durga Mandir, Katghora, Korba	22	30	12.9	82	32	41.2
67	Prakash TV Repairing	Durga Mandir, Katghora, Korba	22	30	12.9	82	32	40.8
68	Sunil TV Repairing	Main Road, Katghora, Korba	22	30	21.6	82	32	50.6
69	Culcutta Refrigeration	Abikapur Road, Katghora, Korba	22	30	52.2	82	32	57.3
70	Vimal Electronics	Main Market, Kartala, Korba	22	17	59.5	82	57	26.4
71	Narendra Electronics	Main Market, Kartala, Korba	22	17	51.6	82	57	30.3
72	Prakash Electronics	Main Market, Kartala, Korba	22	17	48.0	82	57	31.0
73	Gauri Electronics	Main Market, Kartala, Korba	22	17	48.2	82	57	31.3
		Janjgir - Champa						
74	Refrigeration & Auto Electricals	PTI Chowk, Janjgir_Champa	22	0	41.6	82	35	11.7
75	Sani TV Center & Refregeration	Link Road, Janjgir_Champa	22	0	42.5	82	34	44.7
76	Kabir Refregeration	Link Road, Janjgir_Champa	22	0	42.3	82	34	42.7
77	Namdev TV Center	Link Road, Janjgir_Champa	22	0	42.4	82	34	42.5

NameDeg.Min.Sec.Deg.Min78Raju RefrigerationLink Road, Janjgir_Champa22042.6823479Paras ElectronicsLink Road, Janjgir_Champa22042.6823480Shatrughan ElectronicsNailaStn.Road, Janjgir_Champa22119.28234	Sec. 36.4 36.2 2.2
78Raju RefrigerationLink Road, Janjgir_Champa22042.6823479Paras ElectronicsLink Road, Janjgir_Champa22042.6823480Shatrughan ElectronicsNaila Stn. Road, Janjgir_Champa22119.28234	36.4 36.2 2.2
79Paras ElectronicsLink Road, Janjgir_Champa22042.6823480Shatrughan ElectronicsNailaStn.Road, Janjgir_Champa22119.28234	36.2
80Shatrughan ElectronicsNailaStn.Road, Janjgir_Champa22119.28234	2.2
	2.1
81 Patel Electronics Naila Stn. Road, 22 1 19.2 82 34 Janjgir_Champa	3.1
82SahuElectronics&Kera Road, Janjgir22036.98234Refrigeration	34.6
83Sanju ElectronicsKera Road, Janjgir22016.68234	48.6
84 Banti TV Center Kera Road, Janjgir 22 0 19.3 82 34	46.4
85Ritesh TV CenterJanjgir Road, Champa, Janjgir22151.78238	44.9
86Manoj Electronics Refrigeration& Beriyal JanjgirChowk, Champa, 22Champa, 2222146.78238	32.6
87 Suresh Electronics Birgahni Chowk, Champa, 22 1 39.6 82 38 Janjgir	14.7
88Samleshwari ElectronicsBeriyal JanjgirChowk, Chowk, Champa, 22148.28238	31.6
89Ashok Electronics & TV CenterBeriyal JanjgirChowk, Chowk, Champa, Champa, Center22149.48238	30.1
90 Kumar TV Center Thana Chowk, Champa, 22 1 53.9 82 38 Janjgir	47.8
91 Baba Akash TV Center Thana Chowk, Champa, 22 2 1.2 82 38	55.9
92 Om TV Center Machhali Talab, Champa, 22 2 7.2 82 39 Janjgir	6.1
93Sandeep TV CenterTahsil Road, Champa, Janjgir22213.48239	21.5
94Sahu TV CenterMain Chouraha, Bhaindih, Janjgir215421.18243	14.7
95New Star Music CenterMain Market, Bhaindih, Janjgir215419.78243	12.7
96Anant ElectronicsMain Market, Baloda, Janjgir2288.88228	41.9

SI No	Name of Shops	Address	Latitude			Longitude			
			Deg.	Min.	Sec.	Deg.	Min.	Sec.	
97	Rizvi Refrigeration	Haldi Bazar Chowk, Baloda, Janjgir	22	8	7.8	82	28	31.5	
98	Santosh TV Center	Haldi Bazar Chowk, Baloda, Janjgir	22	8	7.0	82	28	30.4	
99	Rohit Electronics & TV Center	Haldi Bazar Chowk, Baloda, Janjgir	22	8	7.8	82	28	30.0	
100	Arun TV center	Haldi Bazar Chowk, Baloda, Janjgir	22	8	7.1	82	28	32.3	
101	Raju Electronics	Near Bus Stand, Baloda, Janjgir	22	8	8.5	82	28	49.7	
102	Dwivedi Electronics	Shivri Naryan Road, Akaltara, Janjgir	22	1	29.6	82	25	37.5	
103	Azad TV Center	Shivri Naryan Road, Akaltara, Janjgir	22	1	22.3	82	25	36.0	
104	Dewangan Electronics	Main Road, Akaltara, Janjgir	22	1	27.8	82	25	37.2	
105	Chhotu Electronics	Main Road, Akaltara, Janjgir	22	1	30.3	82	25	37.8	
106	Jai Electronics & Refrigeration	Staton Road, Akaltara, Janjgir	22	1	39.6	82	25	26.0	
107	Vikrant Refrigetation & AC Repairig	Rly.Staton Road, Akaltara, Janjgir	22	1	39.9	82	25	24.9	
108	Kashyap TV Center	Near Police Station, Akaltara, Janjgir	21	52	27.7	82	26	56.1	
109	Patel Electronics	Near Police Station, Akaltara, Janjgir	21	52	27.3	82	26	56.5	
110	Jai Durga Electronics	Near Bus Stand, Pamgarh, Janjgir	21	52	24.6	82	27	0.2	
111	Khushi Electroics	Somvari Bazar, Pamgarh, Janjgir	21	52	21.9	82	27	5.8	
112	Amber Enterprises	Tahsil Road, Pamgarh, Janjgir	21	52	19.3	82	27	8.2	
113	Sanjay Electronics	Near Bus Stand, Pamgarh, Janjgir	21	52	23.3	82	27	2.5	
	1	1		1					

SL No.	Name of Shops Address	Ι	atitud	e	Longitude			
	······································		Deg.	Min.	Sec.	Deg.	Min.	Sec.
		Raighar		<u> </u>		L		<u> </u>
114	Sri Vinayak Refrigeration	Stadium Road, Raigarh	21	53	55.2	83	24	49.9
115	Deep Electronics	Stadium Road, Raigarh	21	53	56.6	83	24	53.0
116	Pradeep Electronics	Stadium Road, Raigarh	21	53	56.6	83	24	52.5
117	Latest TV Training Center	Stadium Road, Raigarh	21	53	41.9	83	24	26.1
118	Raju Electronics	Chakradhar Nagar, Raigarh	21	53	32.5	83	24	11.5
119	Speed Computer sale & Service	Chakradhar Nagar, Raigarh	21	53	31.8	83	24	9.9
120	Guru Kripa Electronics	Jail Parisar Shop No23, Raigarh	21	53	23.0	83	23	51.4
121	Ankit Electronics	Jail Parisar, Raigarh	21	53	23.1	83	23	48.9
122	TV Case Electronics	Kabir Chowk, Raigarh	21	52	44.7	83	23	29.8
123	Sur Sangam TV	Kabir Chowk, Raigarh	21	52	44.5	83	23	29.4
124	Sahil Electronics	Sattaguni Chowk, Raigarh	21	53	50.8	83	23	17.5
125	Bhuvneshwar Electronics	Sattaguni Chowk, Raigarh	21	53	50.6	83	23	17.5
126	Gupta Electronics	Katra Road, Raigarh	21	53	55.8	83	22	51.5
127	Bhuvneshwar Electronics	Katra Road, Raigarh	21	53	55.2	83	22	51.3
128	AC Friedge Repairing Shop	Himrapur, Raigarh	21	54	48.4	83	23	9.7
129	Jagat Electronics	Ram Niwas Takies Parisar, Raigarh	21	53	29.1	83	23	42.2
130	Video Tech	Ram Niwas Takies Chowk, Raigarh	21	53	29.2	83	23	42.3
131	Raja Electronics & Refrigeration	Kewda badi Bus stand, Raigarh	21	53	57.8	83	23	39.7
132	Maha Maya Freeze & Ac Repairing	Raigarh Chowk, Kharsia, Raigarh	21	59	23.9	83	6	44.5

Sl. No.	Name of Shops	Address		Latitude			Longitude			
			Deg.	Min.	Sec.	Deg.	Min.	Sec.		
133	Devi TV Repairing	Raigarh Chowk, Kharsia, Raigarh	21	58	40.2	83	6	26.3		
134	Bharat Musical	Atal Chowk, Kharsia, Raigarh	21	59	23.0	83	6	53.5		
135	Mishra Electronics	Mauhapali Road, Kharsia, Raigarh	21	59	24.0	83	6	25.5		
136	Mahesh Music & Electronics	Near Railway Crossing, Kharsia, Raigarh	21	59	25.6	83	5	43.7		
137	Sima Radio & TV center	Near Bus Stand, Dharamjaygarh, Raigarh	22	27	45.3	83	12	33.6		
138	Mangla Electronics	CDO office, Jashpur Road, Dharamjaygarh, Raigarh	22	27	46.5	83	12	29.1		
139	Om Electronics	Jashpur Road, Dharamjaygarh, Raigarh	22	27	46.4	83	12	29.5		
140	Babloo Electronics	Main Market, Ghardhoda, Raigarh	22	10	31.2	83	21	8.0		
141	Hira Watch & Electronics	Raigarh Road, Ghardhoda, Raigarh	22	10	21.3	83	20	57.4		

Sl No.	Name	Address
1.	M/s Navrachna Recycling Pvt. Ltd.	Plot No 1B, Somni Industrial Area, Rajnandgaon
2.	M/S ADV Metal Combine Private Limited	Borai Industrial Growth Center, Durg

Inventory of Established Collection centers- Annexure 5

Sl. No.	Name	Address	Latitude			Longitude			
			Deg.	Min.	Sec.	Deg.	Min.	Sec.	
		Bilaspur							
1	Satu Lal Banajre	Jarha Bhata, Raipur Road, Bilaspur	22	4	35.4	82	8	21.9	
2	Saligram Jamulkar	Maharana Pratap Chowk, Gaura Path Road, Bilaspur	22	4	28.5	82	8	9.3	
3	Bholu Kabadi	Jarha Bhata,Jarha Bhata, Bilaspur	22	4	26.7	82	8	17.4	
4	Anil Panday	Masanganj, Imalipara, Bilaspur	22	4	44.0	82	9	9.9	
5	Mohd. Anish	Imalipara, Bilaspur	22	4	38.8	82	9	21.6	
6	Junaid	Khararganj, Bilaspur	22	5	3.0	82	9	21.2	
7	Smyle	Khararganj, Bilaspur	22	5	3.2	82	9	20.4	
8	Salim Quiraisi	Khararganj, Bilaspur	22	5	4.0	82	9	17.5	
9	Anil Panday	Near old Bus stand, Bilaspur	22	4	32.2	85	9	33.2	
10	Sunil	Bilaspur Road, Kota Tahsil	22	17	12.9	82	0	47.0	
11	Malti	Lormi Naka, Kota Tahsil	22	17	20.8	82	0	44.3	
12	Santosh Das	Belgaha, Road, Kota Tahsil	22	17	31.9	82	0	48.6	
13	Chandu Lal	Near Rly. Crossing, Belha, Bilaspur	21	57	30.4	82	4	24.9	
		Mungeli				<u> </u>		<u> </u>	
14	Niranjan Ahirwal	Near Bus Stand, Lormi, Mungeli	22	16	8.8	81	42	7.8	
15	Vikki	Raja Bada, Lormi, Mungeli	22	16	12.2	81	42	9.5	
16	Mustaq	Mungeli Road, Lormi, Mungeli	22	15	56.2	81	41	50.1	
17	Rasooq	Mungeli Road, Lormi, Mungeli	22	15	55.7	81	41	49.8	
18	Samim Bhai	Hira Lal ward, Mungeli	22	4	17.1	81	41	27.7	

Partial Inventory of Scrap vendor/ Dismantler in Bilaspur Division - Annexure 6

SI No	Name	Address	Latitude			Longitude				
01. 1 40.	ivanic	nuiress	Deg.	Min.	Sec.	Deg.	Min.	Sec.		
19	Fariyad Ahmad	Bada Bazar, Mungeli	22	3	52.3	81	41	25.9		
20	Ashif Khan	Near Guru dwara, Mungeli	22	3	50.6	81	41	20.3		
21	Asla Khan	Phokat para, Raipur Road, Mungeli	22	3	35.9	81	41	12.0		
	Korba									
22	Sanjay Jaiswal	Indira Nagar, Durpa Road, Korba	22	20	41.2	82	41	27.9		
23	Mohd. Wasim Memad	Sunday Market, Korba	22	20	33.4	82	41	56.1		
24	Ikbal	Mudapar bypass, Korba	22	21	5.9	82	42	30.7		
25	Tanvir	Mudapar bypass, Korba	22	20	56.0	82	42	33.6		
26	Rishi Agrawal	Mudapar bypass, Korba	22	21	12.8	82	42	34.1		
27	Om Prakash	Budhwari bypass, Korba	22	21	41.5	82	42	44.3		
28	Kadir Khan	Machhali Market, Katghora, Korba	22	30	14.3	82	32	43.4		
Janjgir - Champa										
29	Tariq Meman	Atlas Industries, Dara bhata Road, Janjgir	22	1	48.4	82	37	29.9		
30	Nausad Ali	Station Road Naila, Janjgir	22	1	19.1	82	34	3.1		
31	Javed Khan	Station Road Naila, Janjgir	22	0	42.0	82	34	17.5		
32	Arif	Station Road Naila, Janjgir	22	1	2.4	82	34	0.6		
33	Sonu Rathore	Kera Road, Janjgir	22	0	17.0	82	34	48.7		
34	Mukesh Dewangan	Near Hardev River, Champa, Janjgir	22	1	41.1	82	38	19.6		
35	Bhagirath	Birgahni Chowk, Champa, Janjgir	22	1	37.8	82	38	15.5		
36	Arif	Idgah Complex, Champa, Janjgir	22	1	50.6	82	38	42.5		
37	Ajay Aditya	Haldi Bazar Chowk, Baloda,	22	8	11.5	82	28	39.9		

SI No	Name	Address	Latitude			Longitude		
51. 140.	Address		Deg.	Min.	Sec.	Deg.	Min.	Sec.
		Janjgir						
38	Dewangan	Rajiv Chowk, Baloda, Janigir	22	8	6.4	82	28	33.3
	C 11.			-				
39	Gudda	Near Bus Stand, Janjgir Road, Baloda, Janjgir	22	8	8.3	82	28	49.7
40	Nizam Khan	Shivri Naryan Road, Akaltara, Janjgir	22	1	29.5	82	25	37.8
41	Hasnen Kabadi	Shivri Naryan Road, Akaltara, Janjgir	22	1	26.9	82	25	37.1
42	Mustaq	Baloda Road, Akaltara, Janjgir	22	2	10.5	82	25	39.8
43	Bole Tharwai	Pamgarh, Janjgir	21	52	30.9	82	26	43.4
		Raighar						
44	Chunna Bhai	Chakradhar Nagar, Raigarh	21	53	30.7	83	24	10.4
45	Munna	Chhata Mura, Raigarh	21	52	8.2	83	22	52.2
46	Kamal	Chhata Mura, Raigarh	21	52	59.5	83	22	44.6
47	Murad Ali	Chhata Mura, Raigarh	21	51	38.7	83	22	24.6
48	Azhar	Himrapur, Raigarh	21	54	48.1	83	23	8.7
49	Raj	Himrapur, Raigarh	21	54	48.8	83	23	8.0
50	Kamal	Kewda badi Bus stand, Raigarh	21	53	57.9	83	23	38.0
51	Naresh Murli	Panchmukhi Hanuman Mandir, Bhilwadih, Kharsia, Raigarh	21	59	24.3	83	8	4.7
52	Kapoor Chand Agrawal	Guru Ghasi Das Chowk, Kharsia, Raigarh	21	59	23.9	83	6	44.5
53	Taj Mall	Post office Road, Kharsia, Raigarh	21	59	22.5	83	6	11.1
54	Chandrika Rathor	Dr. Shyam Prasad Mukhargi Marg, Kharsia, Raigarh	21	59	22.7	83	6	3.2
55	Vikki Mahihal	New Bus Stand, Kharsia,	21	59	11.8	83	6	10.1

Sl. No.	Name	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
		Raigarh						
56	Sattar	New Bus Stand, Kharsia, Raigarh	21	59	12.0	83	6	9.2
57	Gulsan	Jashpur Road, Dharamjaygarh, Raigarh	22	27	57.7	83	12	53.1











Sample Photo Documentation – Annexure 8









Annexure - 9

Methods for Inventory Assessment

The Time Step Method

The calculation of WEEE/E-waste is made on the basis of private and industrial stock and sales data. Mathematically, the time step method is given below.

WEEE generation (t) =Stock (t1) – Stock (t)] private + [Stock (t1) - Stock (t)] industry + • Sales (n) - • WEEE (n) n=t1+1 to t-1 n=t1+1 to t with t1 < t

Stock private = Number of households * (saturation level of households / 100)

= Population / average size of household * (saturation level of households / 100)

Stock industry = number of work places * (saturation level in the industry / 100)

= number of employees / number of users per appliance *saturation level in the industry/100

The Market Supply Method

The calculation of WEEE/ E-waste is made from sales data, together with typical lifespan. The waste potential during collection phase at time t is calculated from sales figures and information about consumption patterns. Mathematically, the market supply method is given below.

WEEE generation (t) = sales $(t - d_N)$ + reuse $(t - d_S)$ Where,

- d_N Average lifetime of new items
- dS Average lifetime of second-hand items

The Carnegie Mellon Method

This method is a variation of "market supply method", where the calculation of WEEE/E-waste is made from sales data, assumptions about typical lifetimes, recycling and storage. The model considers consumer behaviour when disposing of end-of-life EEE. This method defines the pathways of electrical and electronic equipment from purchase to end-of-life. At the point of obsolescence, there are four options of reuse, storage, recycling & landfill available to the owner.

Approximation 1

The calculation of WEEE is estimated on the basis of stock and average lifetime data. This method has also been referred to as the 'Consumption and Use' method. This method was used to calculate WEEE/ E-waste in the Netherlands. Mathematically, the method is represented by the following equation.

WEEE generation (t) = [Stock private (t) + Stock industry (t)] / average lifetime

Stock private = Number of households *saturation level of the households / 100

= Population / average size of household *saturation level of the households / 100

Stock industry = number of work places *saturation level in the industry / 100

= number of employees/number of users per appliance *saturation level in the industry /

100

Approximation 2

This method is based on the assumption, that with the sale of a new appliance, an old appliance has to be disposed of. Mathematically, it can be represented as given below.

WEEE generation (t) = sales (t)

Methodology/Features	Requirements	Constraints	Advantages
The Time Step Method	 Information about domestic sales. Appliance stock levels for household. Industrial stock levels. 	 Household saturation levels are based on predetermined stock levels Industrial stock levels are assumed in the calculations because they are difficult to obtain and require assumptions. Assumption that all the WEEE/E- waste generated is collected and transferred to treatment and disposal facility. 	 Calculations can be carried out very easily. Method gives good results in a saturated market.
The market Supply Method	 Information about domestic sales. Average life of new and second hand items. 	 The average life is to a large extent is subjective because in most of the developed countries electrical and electronic equipment is often replaced and disposed of before it reaches its technical end-of-life. WEEE/ E-waste are often stored for years. Assumed that all appliances produced in the same year will be in line for disposal after exactly the average life. Assumption that the average variance in life of items of EEE does not change very much, whereas, in reality, lifetimes may 	 Necessary data need not be very wide-ranging Calculations can be carried out very easily using a simple formula Sales data is derived from official statistics from market research institutes or trade organisations and are of good quality and available for a large number of products.

Features of the five inventory assessment methods

Methodology/Features	Requirements	Constraints	Advantages
		become shorter in the future. Therefore, this method is not especially useful in the calculation of WEEE for a dynamic market where technology and life are changing rapidly.	
The Carnegie Mellon Method	Sales data, date for typical life times, recycling & storage.	 Assumptions are made regarding the pathways or "material flow" during reuse, storage, recycling and landfilling. These assumptions are both product and country specific and therefore demand a good knowledge of consumer behaviour and the disposal position. This model also requires a full coverage of sales data as early as possible in the WEEE/E-waste trade value chain. 	 The model allows for an electrical and electronic equipment to be purchased, reused, stored and finally recycled or landfilled representing "material flow" more precisely. This method is ideal for more extensive examination of individual products. Because of the larger amount of input data the calculation of WEEE is
			clearly more extensively structured.
Approximation 1	The required input data for application of this method is stock data and assumptions about average lifetime of appliance.	 A product's constant mean lifespan is assumed in this method. This method is suitable for estimating WEEE in widely saturated markets with no major deviations from the mean lifespan, 	This method is particularly useful when reliable stock data for an appliance is available

Methodology/Features	Requirements	Constraints	Advantages										
Methodology/Features Approximation 2	Requirements Sales statistics is used to calculate WEEE/E-waste generation in a particular year assuming a saturated market.	 Constraints which is a subjective variable. 1. This method is only suitable in a fully saturated market where the purchase of a product leads to the same quantity of waste from the old product. Therefore, this method has limited application in dynamic and developing markets because in these markets a larger part of the sales serves to increase stock and does not initially contribute to waste. 2. This method is unsuitable if the temporary storage or second use of old 	 Advantages This method is suitable for carrying out an initial assessment. Very limited range of input data required for application of this method. No historical data is required, only sales figures for a particular period of time are required. 										
		appliances plays a significant role in consumer behaviour.											
Methodology/	Satur	ration Level	Number of		Calc	ulated Sales	Stock Data		Average	Storage			
---------------------------	--------------	--------------	-------------------------	----------------	----------------	------------------------------	------------	-------------------------	--------------	--------------	--------------	--------------	--------------
Data Requirement	Household	Industry	Household	Export Data	Import Data	Manufacturing /Production	Private	Industry	Lifetime	data	Reuse	Recycle	Landfill
Time Step Method	\checkmark	\checkmark		V	V		V	V					
Market Supply Method				V	\checkmark	\checkmark			V				
Carnegie Mellon Method				V	\checkmark	\checkmark			\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
Approximation 1	\checkmark		$\overline{\mathbf{v}}$					$\overline{\mathbf{v}}$	V				
Approximation 2					V	\checkmark							

Data Requirements for E-waste Inventory Assessment

Note: √ means 'Yes'



Generic E-waste material flow chain

Methodology

A two-prolonged approach was adopted for the collection of relevant data and arriving at the results. Firstly, a primary survey was undertaken for data collection from the end users side. The information was then projected to the all-India level using robust projection techniques. Secondly, All-India estimates were validated by the feedback obtained from the vendors and the trade channel members.



End User Survey

Two broad user segments were covered in this phase of data collection viz. business establishments (having at least a telephone connection) and households (SEC A, B, C and D/E households). The following paragraphs explain the method of arriving at the final estimates from the end users route.

Business Establishments

A representative sample of establishments was contacted personally by our trained field personnel and relevant information on the IT products installed in the establishment during April 2012 to March 2013 and the number of units of each installed etc. was obtained. This information was then projected to the universe of establishment stratified by the Principal activity carried out at the respective establishment and the number of employees working in the respective establishment.

The detailed sampling process is as explained below:

Stratification of the Universe of Establishment

The universe of establishment was stratified on the basis of "Principal Activity carried out at the respective establishment" Classified by "Employee size" (ACE), which has been ascertained through an extensive telephonic survey conducted as a part of ITOPS' 97 – the baseline study in the ITOPS series. During the survey, 32000 telephonic contacts ware made in the Top 22 cities to determine the distribution of telephone owning establishments among different (nature of) Activity X Employee size (ACE) cells. This provided the ACE grid distribution for each of the 22 cities.

The universe of establishment as well as the ACE grid obtained from ITOPS' 97 is continuously updated and used for this study.

On the basis of the ACE grid composition thus obtained for each of the 22 centres covered, sample quota were set for the number of establishments that had to be contacted for each cell formed by the intersection of the nature of activity and numbers of employees as in the ACE grid.

Random starting addresses were selected from the telephone directory and at each starting address, 5 interviews were conducted with telephone owning establishments.

The variables used in ACE grid are robust indicator, which explains consumption of IT and Office automation products.

The market size for establishments has been obtained by applying product acquisition rate in each employee band to the respective size of universe of establishments in each city.



Households

With the growing awareness of the benefits of using IT at home, this segment has grown well in the last 3-4 years and offers a huge potential for such products. A representative sample of affluent households (SEC A, B and C & D/E) was personally contacted and relevant information was obtained. The universe of households for projection purpose has been taken from National Readership Survey 2006.

The steps involved in the household sampling and the purpose of these steps have been explained in the following table:

Purpose
 To identify the target group household (SEC A/B/C/D/E) To determine the penetration of PC and other IT products in the households To stratify the household universe into 2 broad categories Pure households Home offices
 To determine the market size and profile of the owners and non-owners To determine the brand share To determine the usage of IT products among the owners To determine the intention to arm IT and determines the near the

Step	Purpose
	 And to obtain there relevant information as needed for the study.

For the market size estimation for home offices and households, the acquisition rate in each SEC class in home offices and households were applied to their respective universe strata.

Validation from Vendors and Trade Channel

Major IT manufacturers of each of these products were contacted and their views and facts & figures on the sales during April 2012 to March 2013 and their likely share of the market were collected. This information was used to validate the findings of the End User Survey.

List of Sources of Data in the Study Area- Annexure 10

National/ Local Government Agencies	Industry/ Trade/ Recyclers/ Waste Disposal Operator's Association (Reports/ Published Data/ Field Work)	Market Research Agencies (Reports/ Published Data)
National Census Data, (1991, 2001 & 2011)	Major Trading Agencies, (Retailers)	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
National Census Data, (1991, 2001 & 2011)		
NSSO (1994 – 2010)	Industry Association, Scrap Dealers, Recyclers, EEE Retailers	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
TRAI, MOCIT, Govt of India.	Industry Association, Scrap Dealers, Recyclers, EEE Retailers	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
TRAI, MOCIT, Govt of India.	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications, Annual Reports of Major Brands
	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications, Newspapers
	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications
	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	
City Municipalities	Scrap Dealers, Recyclers, EEE Retailers	

FINAL REPORT

E-WASTE INVENTORIZATION IN ALL FIVE DIVISIONS OF CHHATTISGARH





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2016

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Abbreviations	
AC	Air Conditioner
BFR	Brominated Flame Retardants
CECB	Chhattisgarh Environment Conservation Board
CCC	Common Collection Centres
CFCs	chloro-fluoro-carbons
СРСВ	Central Pollution Control Board
CRT	Cathode Ray Tube
DEFRA	Department for Environment, Food and Rural Affairs
EEE	Electronic & Electrical Equipment
ELCINA	Electronic Industries Association
EPR	Extended Producer Responsibility
GPS	Global Positioning System
HCFCs	hydro-chloro-fluoro-carbons
ICT	Intermittent cervical traction
IT	Information & Telecommunication
LCD	liquid crystal display
M, H&TM	Management, Handling & Transboundary Movement
MoEF	Ministry of Environment & Forests
MFP	Multi Function Product
МТ	Metric Tonne
MOCIT	Ministry of Communications & Information Technology
MAIT	Manufacturers Association for Information Technology
NGOs	Non Government Organizations
NSSO	National Sample Survey Organization
NCAER	National Council for Applied Economic Research
ODS	ozone-depleting substances
P&C	Pollution & Control
PC	Personal Computer
PCB	Printed Circuit Board
PCBs	Poly Chlorinated Biphenyl
PCC	Pollution Control Committee
PPEs	Personal protective equipments
REF	Refrigerator
RoHS	Restriction of Hazardous Substances
RWAs	Resident Welfare Associations
SoW	Scope of Work
SPCB	State Pollution Control Boards
ToR	Terms of Reference
TSDF	Treatment Storage and Disposal
TRAI	Telecom Regulatory Authority
TEMA	Telecom Equipment Manufacturers Association
TV	Television
UNEP	United Nations Environment Programme
WM	Washing Machine

Executive Summary

E-waste is one of the fastest growing waste streams in the world. In developed countries, it equals 1% of total solid waste generation on an average. In this context, Ministry of Environment & Forest, Government of India at first notified E-waste guidelines followed by Hazardous Waste (Management, Handling & Transboundary) Rules in 2008. This was followed by formulation of E-waste (Management & Handling) Rules 2011, which came into effect from 1st May 2012. In order to implement these regulations, each state mandated to prepare their E-waste inventory which can assist State Pollution Control Boards (SPCB) to monitor & regulate E-waste Management as per E-waste rules. Each of the State Pollution Control Board's have been assigned the responsibility for inventorization of E-waste in their State, grant and renewal of authorization, registration of recyclers, monitoring of compliances of authorization and registration conditions and action against violation of these rules. In view of the dues and responsibility defined under the E-waste rule, 2011, Chhattisgarh Environment Conservation Board (CECB) has planned for inventorization of E-waste in the five divisions for the State of Chhattisgarh. IRG Systems South Asia Pvt. Ltd. has been assigned the task to carryout the inventorization in five divisions of Chhattisgarh. The current effort will assist to prepare an inventory of E-waste generated in the state so that an action plan can be formulated for future interventions.

The objective of the E-waste Assessment is to identify and quantify the E-waste generation for reuse, recycle and final disposal in the study area by adopting uniform approach and methodology. SoW as per ToR includes assessment of E-waste generation, present handling practices, storage, and channelization for its recycling or disposal, by producers, consumer, or bulk consumers. The report shall also include the detail list of producers, consumer or bulk consumers, collection centers, dismantlers and recyclers with the name, address contact no. and their practices for E-waste handling & management. Finally, the inventorization of E-waste shall be done for different categories (Information Technology and Telecommunication and consumer / household appliances) listed in schedule – 1 of E-waste Rules 2012. The study area includes Raipur, Bilaspur, Durg, Bastar and Surguja divisions of the state of Chhattisgarh.

This final report has been compiled division-wise in six chapters. This report is being compiled giving inventory of various stakeholders and present handling practices, storages & channelization for recycling.

Some of the major features of E-waste regulation having implication on E-waste inventory assessment indicate that no target has been fixed to collect E-waste from the time of enforcement. Producer is not bound by any collection target. There are no mandatory provisions for producers in the rules to declare quantity of EEE placed in the market since 2012. No mechanism for tracking purchase of EEE by bulk consumers exists.

Therefore, monitoring of E-waste inventory through evaluation of Form 2 or Form 3 in accordance with Rule 4(9) of E-waste Rule by CECB in the state is possible only through the producers data obtained from centralized agency e.g. CPCB or the state where these producers are registered after 2012. CPCB data shows that as of September 2013. Therefore, CECB can track & monitor E-waste inventory in the state through the dismantler's / recycler's data obtained from centralized agency e.g. CPCB or the state where dismantler's / recycler's are registered. This also indicates that E-waste is either dismantled or recycled in informal sector in the state. Producers are majorly responsible for all the activities including financing of E-waste management. It indicates that producers may be fulfilling their responsibility through collection system catering to dismantlers & recycler within and outside the state. Therefore, collection centres registered in the state may offer a limited opportunity of E-waste inventory tracking & monitoring mechanism in the state. Assessment on the upstream side of the E-waste chain especially of both types of consumers (bulk & individual consumer), also indicate that only bulk consumer offer opportunity of Ewaste inventory tracking & monitoring. Though, bulk consumers are required to maintain records of Ewaste, they are not required to file the returns. Since no mechanism exist for tracking purchase of EEE by bulk consumers and producers are not required to declare quantity of EEE placed in the market since 2012, E-waste inventory assessment has to rely on available historical market research data. Therefore, there is need to identify different producers, profile of consumers & bulk consumers, collection centre, dismantlers & recyclers who are catering to E-waste in the state.

Tracer technique, which was pilot tested in Chhattisgarh has been used in major urban centers/towns in Chhattisgarh to fix E-waste trade value chain. A tentative E-waste trade value chain for study area which

has emerged out of field work from tracer techniques indicates the following profile of stakeholders & their inventory.

<u>Producers</u>: EEE producers / manufacturers do not exist in the study area. However, their products are being sold in these divisions. Secondary data confirms that EEE producers do not have manufacturing facilities in these divisions and therefore they are not registered with CECB. Since these producers are responsible for their products under EPR, their detailed **inventory** as per schedule 1 of E-waste (Management & Handling) rules are given in **Annexure 1**.

<u>Distributors / Traders / Retailers</u>: EEE from these producers are sold in the study area through Distributor / Trader / Retail network as well as directly through the company. Items like Centralized Data Processing, Mainframes, and Minicomputers of Schedule 1 are used by large corporates, State and Central Government agencies falling under the category of bulk consumers whose profile is given below. **Inventory** of Distributors / Traders / Retailers selling items other than mentioned above in the study area is given in **Annexure 2**. However, retailers / dealers do not fall under the purview of E-waste (Management & Handling) Rules 2011, unless they serve as collection centre or drop off point.

<u>Consumers</u>: There are two types of consumers, which are found in the five divisions of study area; Individual Consumers & Bulk Consumers. **Inventory** of bulk consumers is given in **Annexure 3**.

<u>Collection Centres / Channel</u>: Tracer analysis indicates that EEE, which becomes E-waste in the study area partly gets collected & transported in the informal sector and partly in formal sector. Primary survey carried out through Tracer technique indicates that bulk of E-waste generated in the study area goes to informal sector. Majority of the producer / manufacturer have established collection channel in the study area. These collection channels work through following mechanism.

- 1. Single point call centre
- 2. Distributors / Retailers
- 3. Service Centres
- 4. Physically established collection centre / drop off point

The producers use a combination of these mechanisms. Inventory of Service centres in the study area is given in **Annexure 4**. Inventory of Physically established collection centres is given in **Annexure 5**. Majority of producers use call centre as well as dealer's network for collection of E-waste. There are two possibilities of onward transportation & disposal of E-waste. The first possibility is the disposal through informal sector & the second is through registered recycler.

E-waste is collected & dismantled in informal sector in the study area. Further, its major fractions are transported outside the state mainly to Delhi through informal sector traders. An inventory location of major scrap vendor / dismantler, temporary stockpile site / informal collection centre is given in **Annexure 6**.

Small scrap dealer purchase waste from Household / Commercial Area / Institution, etc. At first stage, they segregate the waste than break the item and collect valuable items like Aluminum, Copper, Iron & Steel, Compressor, motor, etc. from E-waste. They sell their collected item to the large scrap dealer. They visit nearby area on daily/weekly basis and purchase the waste. These scrap dealers are not licensed by the municipalities but are part of the networks of large scrap dealers. Dismantling and segregation of E-waste occurs in a major way at large scrap dealers. Inventory of hotspots, identified in the study area have been geographically shown & also mapped in **Annexure 7**. Some of the major findings of the disposal mechanism are:

- Electronic items go to mechanic shops from households for repairing, and mechanic replace damaged / defunct parts/components from it and then they sold it to scrap dealers.
- Mechanics sell E-waste to scrap dealer by weight mainly of ICT items (IT as per Schedule 1) at Rs. 200-250 per kg
- Scrap vendors sold E-waste to scrap dealer by weight at Rs. 150-250 per kg
- Scrap vendors sold damage mobile phone to scrap dealer as individual piece at Rs. 20-25 per piece

- Scrap dealer comes from Delhi yearly twice/thrice usually at the time of Bishwakarma Puja and Diwali for collecting of E-waste
- CPCB data shows that as of September 2013, Chhattisgarh has M/s Navrachna Recycling Pvt. Ltd. & M/s ADV Metal Combine Private Limited, two E-waste dismantler / recycler, located at Rajnandgaon & Durg districts having a license. Therefore, this indicates that E-waste is either dismantled or recycled in both formal and informal sector in state because of their limited capacity. Further, there is no organized mechanism for collection, transportation and disposal of E-Waste in Chhattisgarh.
- No mechanism exists in the state to monitor and track its inventory, collection, transportation and disposal.

The entire amount of E-waste from these towns is transported to Delhi for dismantling and further supply to Delhi market. Photo documentation captured division-wise for the all the divisions of Raipur, Bilaspur, Durg, Bastar and Surguja divisions of Chhattisgarh is given in **Annexure 8**.

<u>Repair Shops (AC/WM/REF)</u>: One person repairs one of these items every day. E-waste fractions/ waste Parts, like plastic body of these items, etc. is dumped into community bin and valuable item sold to nearby scrap dealer. Some of the respondent informed that Item which is not in repairable condition is returned to the owner of the product who in turn sells to the scrap dealer. Majority of the product are in repairable condition.

<u>Repair Shops (TV / PC / Mobile Phone)</u>: Majority of mobile phones, TV & computers repair shop owners are local citizens. Waste Parts, like plastic body of these items, etc. are dumped into community bin and valuable item sold to nearby scrap dealer. They also store valuable item and use it to repair other EEE. In case of mobile phone, they utilize maximum parts while waste parts are dumped in municipal bin. Majority of the product are in repairable condition.

The description of each of these methods is given in **Annexure 9**. **Annexure 9** also describes constraints and advantages of each of these methods. The data requirement for each methodology based on mathematical expressions is also given in **Annexure 9**. The extent of data required depends on the extent of geographical boundary, which could be national, regional or city boundary. Conceptually, the source of data can be identified by understanding the "material flow chain" within the given geographical boundary. A list of sources of data in study area, which was required for application of inventory assessment methodology as per Schedule 1 is given in **Annexure 10**. Workshop presentation given in **Raipur division of Chhattisgarh is given in Annexure 11**. Workshop Photo documentation is given in **Annexure 12**.

Data matrix versus methodology used for E-waste inventory assessment indicates "Market Supply" method and "Carnegie Mellon" method can be applied for WEEE / E-waste inventory assessment in Raipur, Bilaspur, Durg, Bastar ans Surguja divisions of Chhattisgarh. However, a combination of Carnegie Mellon method & tracer tracking has been selected for inventory assessment since it covers all the aspects of material flow chain. Assessment of data from these stakeholders through tracer tracking has resulted in assessment of obsolescence rate or average life of equipment described in chapter 5. Major sources of secondary data included Saturation Level - National census data was obtained from office of the Registrar General & Census Operation, Govt. of India, National Sample Survey Organization (NSSO), Department of Statistics, Government of India, State Statistics from Department of Statistics, Government of Chhattisgarh, Telecom Regulatory Authority of India (TRAI), Ministry of Communications & Information Technology (MOCIT), Government of India, Industry Association like Manufacturers Association for Information Technology (MAIT), Electronic Industries Association of India (ELCINA), Telecom Equipment Manufacturers Association of India (TEMA) & Research Institutions e.g. National Council for Applied Economic Research (NCAER). Data related to average life time, storage data, reuse, recycling & disposal at landfill site was obtained through "tracer tracking" technique & primary survey.

In <u>Raipur Division</u> data analysis shows that TV have the highest installed base followed by Cellphones, Computers, fixed line telephone, Printers, refrigerators, washing machines and Air Conditioners. Raipur has the highest installed base of all the items followed by Baloda Bazar & other districts of Raipur division. In **Bilaspur Division** data analysis shows that TV have the highest installed base followed by Cellphones, Computers, fixed line telephone, Printers, refrigerators, washing machines and Air Conditioners. Bilaspur has the highest installed base of all the items followed by Korba, Janjgir Champa, Raigarh and Mungeli districts of Bilaspur division. In **Durg Division** data analysis shows that TV have the highest installed base followed by Computers, Cell phones, fixed line telephone, Printers, refrigerators, A C and washing machines. Durg has the highest installed base of all the items followed by, Rajnandgaon, Bemtara, Kabeerdham and Balod districts of Durg division. In **Surguja Division** data analysis shows that TV have the highest installed base followed by Cellphones, Computers, fixed line telephone, Printers, refrigerators, washing machines and Air Conditioners. Surguja has the highest installed base of all the items followed by Koriya, Surajpur, Jashpur and Balrampur districts of Surguja division. In **Bastar Division** data analysis shows that TV have the highest installed base followed by Koriya, Surajpur, Jashpur and Balrampur districts of Surguja division. In **Bastar Division** data analysis shows that TV have the highest installed base followed by Cellphones, Computers, fixed line telephone, Printers, refrigerators, washing machines and Air Conditioners. Bastar has the highest installed base of all the items followed by Cellphones, Computers, fixed line telephone, Printers, refrigerators, washing machines and Air Conditioners. Bastar has the highest installed base of all the items followed by Bastar, Kanker, Kondagaon and other districts of Bastar division.

Inventory estimates in Chattisgarh indicate that E-waste generation ranges from **30016.78** tons in 2011 to **86002.35** tons in 2020.

Inventory estimates in **Raipur division** indicate that E-waste generation ranges from 8296.25 tons in 2011 to 25319.07 tons in 2020. In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 88% of the total inventory followed by refrigerator (1%), Washing machine (1%), Air conditioner (1%), Cellular phone (1%), Computer (6%), Fixed Line Phone (1%) & Printer (1%). In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (60%), computer will constitute about 35% of the total inventory followed by Refrigerator (1%), Air conditioner (1%), Washing machine (1%), Cellular phone (0%), Printer (2%) & Fixed Line Phone (0%). Bilaspur division indicates that E-waste generation ranges from 7761.99 tons in 2011 to 22324.03 tons in 2020. In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 88% of the total inventory followed by Computer (6%), Washing machine (1%), Air conditioner (1%), Cellular phone (1%), Refrigerator (1%), Fixed Line Phone (1%) & Printer (1%). In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (59%), computer will constitute about 36% of the total inventory followed by Printer (2%), Air conditioner (1%), Washing machine (1%), Cellular phone (0%), Refrigerator (1%) & Fixed Line Phone (0%). Durg division indicates that E-waste generation ranges from 7570.17 tons in 2011 to 20042.42 tons in 2020. In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 88% of the total inventory followed by refrigerator (1%), Washing machine (1%), Air conditioner (1%), Cellular phone (1%), Computer (6%), Fixed Line Phone (1%) & Printer (1%). In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (59%), computer will constitute about 36% of the total inventory followed by Refrigerator (1%), Air conditioner (1%), Washing machine (1%), Cellular phone (0%), Printer (2%) & Fixed Line Phone (0%). Surguja division indicates that E-waste generation ranges from 3511.59 tons in 2011 to 10783.29 tons in 2020. In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 89% of the total inventory followed by Computers (6%), Printer (1%), Washing machine (1%), Refrigerator (1%), Fixed Line Phone (1%), AC (1%) & Cellular Phone)%. In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (63%), computer will constitute about 33% of the total inventory followed by Printer (2%), Refrigerator (1%), Washing machine (1%), Air conditioner (1%), Cellular phone (0%), & Fixed Line Phone (0%). Bastar division indicates that E-waste generation ranges from 2876.78 tons in 2011 to 7533.54 tons in 2020. In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 63% of the total inventory followed by refrigerator (12%), Washing machine (8%), Air conditioner (8%), Cellular phone (3%), , Computer (5%), Fixed Line Phone (1%) & Printer (0%). In 2023, it is expected that E-waste from TV (CRT/LCD/LED) (46%), computer will constitute about 27% of the total inventory followed by Refrigerator (10%), Air conditioner (5%), Washing machine (6%), Cellular phone (5%), Printer (1%) & Fixed Line Phone (0%).

In <u>Chhattisgarh</u> some major observations are that the average Operating margin for Television waste per kilogram is Rs. 0.44. Operating margin for waste refrigerator is Rs. 11.46 per kilogram. For that of Washing Machine is Rs. 13.03 per kilogram. For that of Air Conditioners is Rs. 18.40 per kilogram. For scrap old Personal Computer is Rs. 6.98 per kg. For waste cellular phones is Rs. 24.20 per kg. The operating margin ranges from Rs. 0.44 to Rs. 24.20 per kilogram. Scrap of Mobile / cellular phones gives the maximum operating margin of Rs. 24.20 while scrap from television gives the minimum profit of Rs. 0.44 per kilogram.

This indicates that informal sector if brought into formal sector considering taxation involved will only dismantle / recycle cellular phones followed by ACs and WMs to some extent. Therefore, there is a need to formulate financial instrument for making dismantling / recycling of white goods viable.

Market risks matrix highlight the availability of raw material, its collection and transportation as risks of high & medium intensities. Collection mechanism directly impacts the availability of raw material. Therefore, there is a need for both strict implementations of regulations as well as financial instrument for diverting E-waste inventory in to the formal sector.

Chapter 1: Introduction & Background

1.0 Introduction & Background

E-waste is one of the fastest growing waste streams in the world. In developed countries, it equals 1% of total solid waste generation on an average. As the fastest growing component of municipal waste across the world, it is estimated that more than 50 MT of E-waste is generated globally every year. The rapid change in technology, low initial cost, and planned obsolescence has resulted in its fast growth. These rapidly increasing numbers of electronic equipment and appliances have the potential to create serious environmental and health impacts at the "end of life" if not treated and disposed in an environmentally sound manner. E-waste is also a source of resource as some of these materials and valuable parts used in manufacture of electrical and electronic (EEE) items can be recycled and re-used. The harnessing of E-waste as a "resource" provides potential economic opportunities through the development of collection, recovery and recycling facilities. As per CPCB / MoEF 2006 estimates, India generated 1, 46,000 metric tones of E-waste from six items in 2006, which were projected to exceed 7, 00,000 metric tones by 2012. A report of the United Nations predicted that by 2020, E-waste from old computers would jump by 500 percent on 2007 levels in India. In this context, Ministry of Environment & Forest, Government of India at first notified E-waste guidelines followed by Hazardous Waste (Management, Handling & Transboundary) Rules in 2008. This was followed by formulation of E-waste (Management & Handling) Rules 2011, which came into effect from 1st May 2012. In order to implement these regulations, each state is mandated to prepare their E-waste inventory which can assist State Pollution Control Boards (SPCB) to monitor & regulate E-waste Management as per E-waste rules.

1.1 Need for Study

Despite of enactment of law for handling E-waste in India, this particular waste is being disposed off unaudited, in absence of appropriate inventory of E-waste in most of the states / cities. As per National Ewaste inventory estimates carried out by CPCB in 2006, Chhattisgarh state ranks among top twenty states generating WEEE in India. Therefore, in Chhattisgarh an effective inventory comprising the details of Ewaste and related components is yet to be created to manage & handle E-waste in eco-friendly manner and to combat the problem associated this waste. In this context, it is proposed to prepare an Inventory of E-waste & related components in **five divisions** of Chhattisgarh viz. Raipur, Bilaspur, Durg, Surguja and Bastar. The overall aim of this initiative is to assess the generators, quantity and present practices for handling of E-waste in these divisions. Raipur being educational & industrial belt is one of the biggest electronic items manufacturing / user hubs of the state. Thus, Raipur is not only the port of import for new and used electronics but also a base for a large number of users as well as manufacturers, both generating large volumes of E-waste. Similarly, Bilaspur is also a hub for commercial as well as educational institutions. All the selected **five divisions** of the state are fast growing regions especially after bifurcation from Madhya Pradesh.

In the light of above justification, the current effort will assist to prepare an action plan for WEEE (Waste Electrical and Electronic Equipments) for implementation of the legislations framed. The items to be covered in this assessment include personal computers, mobile phones, televisions, washing machines and refrigerators etc. as mentioned in E-waste (Management & Handling) Rules, 2011. A list of these items is given in **Table 1.1**.

	Table 1.1: Categories of Electrical and Electronic Equipment
Sr. No.	Categories of Electrical and Electronic Equipment
i.	Information Technology and Telecommunication Equipment
	Centralized Data Processing
	Mainframes, Minicomputers
	Personal Computers (Central Processing Unit with input and output devices)

Sr. No.	Categories of Electrical and Electronic Equipment
	Laptop Computers (Central Processing Unit with input and output devices)
	Notebook computers
	Notepad Computers
	Printers including cartridges
	Copying equipment
	Electrical and Electronic typewriters
	User terminals and systems
	Facsimile
	Telex
	Telephones
	Pay telephones
	Cordless telephones
	Cellular telephones
	Answering systems
ii.	Consumer Electrical and Electronics
	Television sets (including sets based on liquid Crystal Display and Light Emitting Diode
	technology), Refrigerator, Washing Machine, Air conditioners excluding centralized air
	conditioning plants.

1.2 **Objective**

The objective of the Rapid WEEE Assessment is to identify and quantify the WEEE generation for reuse, recycle and final disposal in the study area by adopting uniform approach and methodology. The main objectives of this study are as follows:

- ➤ To assess identify and quantify the WEEE generation
- ➤ To examine the existing WEEE recycling system
- > To study the problems / risks posed by the recycling system at present future
- To estimate the existing and future quantity of WEEE in the study area
- To evaluate the capacities / capabilities of existing stakeholders and infrastructure for reuse, recycle and disposal of e-wastes
- > To analyze the environmental and social sustainability of present system.
- To determine e-trade economics
- Preparation of directory of the stakeholders
- Conduct 04 sensitizing workshops in the each study area

1.3 Scope of Work (SoW)

It is estimated that Chhattisgarh accounts for more than 20000 metric tones of E-Waste of which a major chunk is accounted by Raipur and Bilaspur region. In order to achieve the above objectives identified by CECB, IRGSSA would develop a comprehensive Methodology addressing the need to develop and implement an effective E-waste management based on the need to quantify and characterize this waste stream, identify major waste generators, assess risks involved and develop and implement a scientific, safe and environmentally sound management system, including policies and technologies.

The project aims to promote identification and implementation of environmentally sound and commercially viable technologies for the various elements of waste management *viz* collection, segregation, transportation, treatment, recovery and/ or recycle and disposal.

A very comprehensive approach has been proposed by IRGSSA to carry out this WEEE rapid assessment. The fundamental approach can be summarized in the following three phases.

Phase 1: Mobilization and work plan

Team will be mobilized & work plan will be prepared & presented to CECB.

Phase 2: Data Collection / Field Work

IRGSSA would be following the approach suggested by CECB. In order to execute this assignment, it is essential to establish the WEEE business chain linking different stakeholders to understand the trade economics and associated environmental impacts. An example of this chain is given in **Figure 1.1**.



Figure 1.1: Conceptual WEEE business chain

This chain will be mapped geographically (Figure 1.1 on maps given below) in the study area to describe the following:

- > The stakeholders
- > Their respective geographical distribution in the study area and
- ➢ WEEE generation cycle
- Material flow across stakeholders

Study Area: As per ToR, the study area is Raipur, Bilaspur, Durg, Surguja and Bastar divisions of Chhattisgarh. However, the current report is being submitted for **all the five divisions** of the study area. In these divisions Raipur (five districts), Bilaspur (five districts), Durg (five districts), Surguja (five districts) and Bastar (seven districts) are covered.

This study would lead to the identification of stakeholders, classification of organization as organized / unorganized sector. Further their geographical location would be determined in the terms of their operating base coverage. Conceptually, some of the major stakeholders would include:

Ist Group

- ➢ The Importers, Manufacturers
- > The distributors, traders and retailers
- The consumers Individual households, Business sector, IT sector, BPO, teaching institutions, Railways, Airlines, Defence establishments, Transport Corporations, PUCs etc.

2nd Group

- > The Collectors Scrap dealers, Big Bazaars or malls who are buying the e-waste
- > The Recyclers dissemblers, dismantlers, material recoveries,
- The Road side vendors
- The authorized / unauthorized Auctioneers, the sellers of the used electronic goods on the footpaths.

The study would also aim at establishing WEEE trade chain using conceptual input output analysis. This idea has been developed based on "WEEE material flows" through region and on its way its disintegration and processing in numerous steps until it rejoins the raw streams or ends in a final disposal. This will be done through "tracer techniques", which includes identification of tracer for each item and its tracking through the chain from the start of dismantling process till its final disposal. **Inventorization**

Inventorization of WEEE would be done as follows:

• Inventory of obsolescence rate of each electronic product (viz. Personal computer / TV / Mobile phones as mentioned in the e-waste rules and guidelines issued by CPCB) using scenario analysis from secondary / market research data.

- Confirm obsolescence rate from data of primary survey using "tracer technique".
- Identify a tracer for each product and follow it from the start of dismantling process till its final disposal.
- The inventorization other than households (on sample basis) would also be on actual basis.

A sample size of 2000 as per SoW distributed across 1st & 2nd Group stakeholders will be used to carry out this study in each division.

Analysis of existing WEEE recycling system & quantification of WEEE

This will include description & documentation of each process used in dismantling of an e-product, the location details. Carry out photo documentation and geographical setting of each step. Estimate the quantity of material dismantled at each step. Estimate the quantity of E-waste for a particular year based on market projections & obsolescence rate.

Phase 3: Report findings

A Final report will be prepared for each division & findings will be presented in ten workshops, one each for five divisions.

1.4 Approach & Methodology

IRGSSA will follow a very comprehensive approach and methodology as described below. This is based on UNEP's manuals 1 and 2 and its application in a number of countries globally including India. The consortium will carry out the following activities and will follow the following step wise approach and methodology for each of these activities.

Activity 1: Development of Policy & Regulatory Framework

Step 1: Carry out due diligence on WEEE / E-waste policy / laws / regulations eg. EPR.

Step 2: Identify the gaps with respect to existing environmental regulations and recommend tentative content, extent and coverage of WEEE / E-waste policy/ laws/ regulatory framework.

Step 3: Carry out due diligence on expected WEEE / E-waste institutional mechanism like collection and transportation system and registry e.g. Collective and clearing house system, B2C and B2B model. Identify the gaps with respect to existing collection and transportation system and recommend tentative collection and transport framework.

Activity 2: Assessment of WEEE / E-waste Market

Step 1: Determine WEEE / E-waste item of interest as per Schedule 1 of E-waste (Management & Handling) Rules 2011. This will assist in studying the items of interest ex. PCs, TVs, cellular telephones, and refrigerators etc. Determine the brands, local, national and international, which are available in the market for each item and the year of their introduction in the market. Determine brands which existed earlier. This can be determined through review of secondary data from industry association or by interacting with local dealers. If the product is manufactured under a brand name, the broad feature of technology used to manufacture item is generally disclosed. This will also assist in identifying its dealer's network, existing facilities for item's manufacture and repair and its membership with local industry association.

Step 2: Determine average weight and size of local, national and international E-waste item from each brand ex. capacity of refrigerator (liters) / washing machine, size of monitor / TV / cellular phone. The variation in size of each item should be documented under each brand. Average weight and size along with percentage composition should be estimated. This can be further confirmed while carrying out field survey for documenting dismantling operation.

Step 3: Determine broad components out of the 26 components of E- waste items. Determine composition of E-waste item from available source like industry association / manufacturer. Determine technology of E-waste item e.g. ODS based refrigerator / 386 / 486 / Pentium series of PCs and laptops / CRT / front loading / top loading washing machines etc. Determine approximate quantity of recoverable elements from each item based on outputs of step 2. Determine possible hazardous substance in WEEE / E-waste item.



Figure 1.2: Geographical mapping of different attributes

Step 4: Establish geographical boundary / system boundary of study area. Procure maps of the area and prepare base map of the area with physical features marked on it. If the detailed map is not available easily then procure city map and fix up the municipal boundaries. Alternately, maps of the study area can be prepared based on standard map search engines available on the internet. The base map will be used for generation of different thematic layers as shown in **Figure 1.2**. This mapping will give an insight into the possible sources of E-waste and assist in carrying out the primary survey.

Step 5: Identify different stakeholders from Group 1 & Group 2 who could be E-waste generators and mark them as layer two on the base map. Physically verify by carrying out preliminary reconnaissance survey of the identified locations of the stakeholders. Mark the tentative locations by taking latitudes and longitudes of the identified locations through GPS instrument. Identify the stakeholders, which are in the formal / organized sector and which are in the informal sector.

Step 6: Prepare a tentative E-waste trade value chain as per conceptual life cycle; four phase model and E-waste trade value chain. These figures should be customized as per preliminary survey, which will be confirmed and established during field survey.

Step 7: Identify E-waste dismantling sites, recycling sites and landfill / dump sites. Physically verify these sites by preliminary reconnaissance survey and marking the tentative locations by recording their latitudes and longitudes through GPS instrument.

Step 8: Identify data needs from these stakeholders based on identified stakeholders in step 5 and trade value chain identified in step 6.

Activity 3: Selection of Methodology for E-waste Inventory

Step 1: Identify data requirements. This is carried out by classifying data needs under the heads of saturation level, households, calculated sales, stock data, average life, storage data, reuse, recycle and landfill for each electronic item ex. PC, TV, refrigerator, cellular phone, etc.

Step 2: Identify tentative sources of data for each electrical and electronic item. This will be based on preparing preliminary or detailed interview guide / checklist / questionnaires for data collection for each time.

Step 3: Document secondary sources of data for each electrical and electronic equipment and visit the respective agency to procure data i.e. published / unpublished / historical.

Step 4: Check the availability, reliability, amount and range and completeness of data against following decision criteria.

Availability of data

- 1. Number of sources of data, which can provide data for study area. Generally, more than one source of data is preferred for item of interest.
- 2. In what format, data is available i.e. yearly, half yearly, cumulative or distributed.
- 3. Whether the data is published/ unpublished, confidential/ public.
- 4. Mode of procurement of data.

Reliability of data

- 1. Data of at least two sources should match.
- 2. If there is any variation in sources of data, check the methodology of calculating and compiling the data from each source. If there is a difference in the calculation and compilation of data, then check the factor responsible for the difference.
- 3. Check the trends from the data obtained from different sources and correlations with other data.

Amount and Range of data

- 1. Check the availability of historical data for each E-waste item.
- 2. Historical data should be available for more than anticipated average life time of the E-waste item.

Completeness of data

- 1. Historical data should be complete without any gap.
- 2. If gap exists then source, which provide data with minimum gap should be selected so that the gaps can be supplemented.
- 3. Incomplete data can be supplemented by trend analysis or by national / regional / city level assumptions.

Step 5: Prepare the constraint matrix by mapping outputs of steps 4 and step 5. Decide the most suitable and applicable methodology for E-waste inventory assessment

Activity 4: E-waste Inventory Assessment:

Sub Activity1: Establishment of the study area and its geographical limit

This activity will include the establishment of geographical limits of study area i.e. geographically defining the area. This will include assessment of landuse maps of the study area, fixing of rural and urban boundaries and mapping of tentative locations of stakeholders. The investigation team will geographically verify the tentative locations where generation, stockpiling, collection, handling and brokering, processing and production of other items from E-waste are taking place by using transect walk.

Sub Activity 2: Identification of E-waste and establishment of E-waste trade value chain

This activity will include identification of specific E-waste item and its tracer (CRT / Compressor / LCD screen / any other) followed by tracking of tracer's geographical movement within the identified

geographical limits of the area to its final end of life, e.g. places where items are unloaded, traded, transported, dismantled, recycled, reused, repaired and disposed, using output of activity 1. The following steps are involved in field investigations.

Step 1: Identify the E-waste streams of specific E-waste item

Step 2: Identify the E-waste processes i.e. unloaded, treated, transported, dismantled, recycled, reused, repaired, and disposed.

Step 3: Follow the E-waste tracer through the process in the E- waste stream by using tracer/ hazardous process walk.

A typical, E-waste trade chain will be established in a geographical context after verification of the tentative trade value chain obtained as an output of activity 1 and activity 2. This superimposition of E-waste trade value chain on a map will facilitate spatial analysis.

Sub Activity 3: Estimate the E-waste and obsolescence rate/ average life through secondary data by following "approach and methodology upstream of demarcation" mentioned. By using secondary data e.g. market research data like market supply and imports data, installed base of the E-waste item. The key to estimate E-waste is fixing of obsolescence rate based on market research data, industry data or on consumer behaviour. Since obsolescence rate is dynamic in nature, therefore, a range is fixed with upper and lower limits. Carry out sensitivity analysis for E-waste inventory using upper and lower limits of obsolescence rate.

Sub Activity 4: Verification of obsolescence rate / average lifespan through primary data. The obsolescence rate / average life can be verified through identification of E- waste stream and E-waste processes and tracking of tracer item. The following steps are involved in tracer verification.

Step 1: Identify the tracer item

Step 2: Follow the tracer item through the process in the E-waste stream

Step 3: Identify all the organized and unorganized market of a tracer in the geographical area.

Step 4: Establish the extent of dismantling / recycling happening in a geographical boundary.

The primary survey methodologies used for tracer technique and outputs are described in Table 1.2.

	_ = = = = = = = = = = = = = = = = = = =	Primary Survey	
Objective	Detail	Methodologies	Output
WEEE / E- waste stream	Material flow	Follow tracer materials: semi- structured interviews about quantities, quality, economics, and labor.	Key-players are known (dealers, disassembly workers, recycler) Material flow (quantities / qualities) from input to output are identified Labor in E-waste streams are identified
	Input quantities / Import	Interviews with E- waste producers (manufacturers / retailers, auctions) to find out E-waste quantities Survey of key-players for import: structured questionnaires /interviews	E-waste quantity input is estimated Percentage of imported / household E-waste is known
	Reuse	Surveys of scrap dealers, retailers, computer repair shops: structured interviews (using questionnaires)	Quantities of reused entire equipment are estimated Quantities of reused equipment parts are estimated
	Disposal	Sampling on different landfills (using questionnaires)	Existence of E-waste fractions in landfills is known
Recycling technologies	Recycling technology	Transect walks in different districts (semi-structured interviews)	Applied recycling technologies are known Labor needed for different recycling processes is known
	Hazardous processes	Semi-structured interviews in districts, where potentially hazardous processes.	Hazards in different recycling processes are identified

Table 1.2: Methodology for estimation of E-waste quantity

The structured and semi structured interviews can be conducted using questionnaires. The questionnaire has been developed to quantify and photo document each step in the E-waste value chain.

Sub Activity 5: Identify the products, by products and waste products and back calculate E-waste dismantled.

Identify products, by products and waste products. This can be carried out by using a combination of qualitative and quantitative estimations with the identified stakeholders across the value chain using photo documentation of sampled E-waste tracer. Using this data, back calculate to check the best fit scenario of E-waste inventory obtained as an output from activity 3. The output from back calculation should confirm the obsolescence rate / average life of E-Waste within the range used in activity 3. This obsolescence rate is used for calculating WEEE / E-waste projections based on historical data.

Sub Activity 6: Establish WEEE / E-waste trade economics

Each stakeholder in the dismantling processes is linked to the other and the trade between the two takes place based on profit. Therefore, the basic parameters driving this trade, which should be estimated, are as follows.

- 1. Input cost
- 2. Selling Price
- 3. Operating margin

Estimate input cost in terms of raw material cost / energy cost and labour cost. Estimate raw material cost / energy cost and labour cost using data collected from questionnaire add the two costs to arrive at input cost. Estimate selling price of the product by using data from questionnaire. Establish operating margin as the difference between selling price and input cost.

Sub Activity 7: Identify and assess the impacts

Identify the effluents / solid waste / emissions from each of the process. Establish their quantity if possible. Establish the geographical location of their discharge and history of the site. Classify impacts into environment, health and business impacts. Use relative ranking technique to quantify impacts. Relative ranking technique is based on scores where each sector i.e. health, environment and business are assigned with individual score subject to identified negative and positives impacts on the workers, surroundings and economy.

Activity 5: Compilation of draft & final reports.

Activity 6: Workshops in each five divisions of Chhattisgarh.

1.5 Format of the Report

This Final Report has been compiled in six chapters. The table of contents of each chapter is given below.

Chapter 1 Introduction and Background: Introduction; Objective of the Study as per ToR; Scope of Work (SoW) as per ToR; Approach and Methodology; Format of the Report.

Chapter 2 Policy & Regulatory Framework: Overview of Regulatory Framework; Policy, Regulations, their Scope and Institutional Responsibility; Reforms in Waste Management; E-waste and Environmental Legislation in India and Chhattisgarh.

Chapter 3 Assessment of E-waste Market: Introduction; E-waste Composition; Mechanism of E-waste Trade; Conclusions.

Chapter 4 Methodology for E-waste Inventory: Introduction; Methods for Inventory Assessment; Material Flow Chain, Data Sources and Data Gaps in Chhattisgarh; Constraints / Limitations and Selection of Methodology; Methodology / Approach & Instruments Used; Conclusion.

Chapter 5 E-waste Inventory Assessment: Introduction; Market Size Assessment of Electrical and Electronic Equipment (EEE) in Chhattisgarh; Obsolescence Rate / Average Life; E-waste Inventory; E-waste Processing in Chhattisgarh; Environmental Pollution; Market Risks; Conclusions.

Chapter 6 Conclusions & Recommendations: Regulations; E-waste Market; Methodology for Inventory Assessment; E-waste Inventory.

Chapter 2: Policy & Regulatory Framework

2.0 Overview of Regulatory Framework

E-waste management comes under the broad regulatory framework related to environment, foreign trade and local rules & regulations. A number of policy & regulatory initiatives & application have comes into effect since 2006. The following sections describe the policy framework, relevant rules and regulations, which regulates E-waste management and emerging framework under extended producer responsibility (EPR). Further, their implications in the context of current situation in the study area have been described.

2.1 Policy, Regulations and their Scope

During the 1990s, Ministry of Environment & Forests (MoEF) adopted pollution control policy by formulating multi-pronged strategies in the form of regulations, legislations, agreements, fiscal incentives and other measures to abate pollution. National Environmental Policy, which was declared in 2006, identified pollution abatement as an important issue affecting human health and poverty. The policy focuses on optimizing resource efficiency and minimizing pollution loads. An analysis of policy statements reveals that there has been a gradual shift from simple pollution control to the pollution abatement leading to reduction, recovery and recycling. Policy states about strengthening informal sector through technological upgradation & incentivization. It states about promotion of segregation, reuse & recycling & benign disposal of waste. The policy further states involvement of private sector for hazardous waste management. The policy also focuses on optimizing resource efficiency and minimizing pollution loads. National Environment Policy clearly states about the need for preparation of guidelines & regulations for E-waste management in India.

2.1.1 E-Waste and Environmental Legislation in India

The Environment (Protection) Act 1986, an umbrella act also covers industrial waste and provides broad guidelines to address it. Under the umbrella act, a number of rules have been formulated to address hazardous waste like Hazardous Waste (Management Handling & Transboundary) Rules, Battery (Management & Handling) Rules & Bio Medical (Management & Handling) Rules. Specific laws for electronic waste have been notified in May 2011, effective from 1st May 2012 in the country. Further, India is also a signatory to international conventions like Basel Convention, whose provisions are applicable for export and import of E-waste. These provisions find expression in terms of Rules 13, 14, 15 & 16 of the HW (Management, Handling and Transboundary Movement) Rules, 2008. Therefore, there are two regulatory scenarios related to E-waste management as shown in **Table 2.1**. At first, E-waste (Management & Handling) Rules 2008 have been described. This is followed by description of guidelines for implementation of regulations.

	J		-							
E-waste Management						Export & Import of E-waste				
Regulations / Guidelines	Pre 2012	1 st	May	Post 2012	1 st	May	Pre 2012	1 st	May	Post 1st May 2012
E-waste (Management & Handling) Rules 2011				\checkmark						
Hazardous Waste (Management, Handling & Transboundary) Rules 2008	\checkmark						\checkmark			
Guidelines for Environmentally Sound Management of E-waste 2008	\checkmark									
Guidelines for Implementation of E-waste Regulations 2012	\checkmark			\checkmark						

Table 2.1: E-waste Regulatory Scenario

Source: IRGSSA

Table 2.1 clearly indicates that pre 1st May 2012 Hazardous Waste (Management Handling) Rules were used to regulate E-waste management. It is specifically relevant in case of E-waste recyclers, who got registered prior to 1st May 2012 & whose registration extends beyond this date.

CPCB data shows that as of September 2016, Chhattisgarh has M/s Navrachna Recycling Pvt. Ltd. & M/s ADV Metal Combine Private Limited has two E-waste dismantler / recycler, located at Rajnandgaon & Durg districts having a licensed center. Therefore, this indicates that E-waste is either dismantled or recycled in both formal and informal sector in state because of their limited capacity.

2.1.2 E-Waste (Management and Handling) Rules, 2011

Salient features of the E-waste rules are given below.

- These rules are applicable to every producer(s), collection centre(s), dismantler(s), recycler(s), consumer(s) or bulk consumer(s) involved in the manufacture, sale, purchase and processing of electrical and electronic equipment or components as specified in Schedule-I. However, micro, small and medium enterprises are not covered under this regulation.
- The rules clearly define electrical and electronic equipment (EEE) and E-waste. Definition of E-waste categorizes them into two broad categories, i.e., IT and Telecommunication Equipment and Consumer Electrical and Electronics. As per Schedule-I of the rules, seventeen items have been specified under the IT and Telecommunication Equipment category and four items have been specified under the Consumer Electrical and Electronics category. The categories of E-waste covered under the rules are provided in Section 1.4 of Chapter 1.
- The rules also clearly define producers, bulk consumer, consumer, collection centre, transporter, dismantler and recycler. These form an integral part of material flow chain. The physical, financial & compliance responsibilities of each of the above stakeholders, as specified in the rules have been summarised in **Table 2.2** below.
- The rules provide direction to domestic EEE manufacturers/ producers to be RoHS (reduction in the use of hazardous substance) compliant within three years. It also allows imports of only RoHS compliant EEE.

Respon	Producer	Consumer	Bulk Consumer	Collection Centre	Dismantler	Recycler/ Reprocessor	
Collection	Manufacturing						
	End of Life						
Take-back	Individual						
	Collectively						
Transportation to	Producer						
	Collection Centre						
	Dismantlers/ Recyclers		\checkmark	\checkmark	\checkmark	\checkmark	
	TSDF* Facility	\checkmark					
Storage							
Financing					,	1	
Registration		N			\checkmark	\checkmark	\checkmark
Filing of Annual Returns		\checkmark				\checkmark	\checkmark

Table 2.	2:	Responsibilities	of	Stakeholders	for	Collection,	Transportation,	Storage	and
Disposal	of	E-waste							

Responsibilities	Producer	Consumer	Bulk Consumer	Collection Centre	Dismantler	Recycler/ Reprocessor
Return of Annual Inventory Handled	\checkmark					

Note: \sqrt{means} "Yes", TSDF means Treatment Storage and Disposal Source: IRGSSA

Table 2.2 indicates the producers' major responsibility for all the activities including financing of E-waste management. Since, the state has two registered dismantler & recycler with limited capacity; it indicates that producers may be fulfilling their responsibility through collection system catering to dismantlers & recycler outside the state.

Therefore, there is need to identify different producers, profile of consumers & bulk consumers & collection centre in the study area and dismantlers & recyclers who are catering to E-waste.

2.1.3 The Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008

The Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008, defines hazardous waste as "any waste" which by reason of any of its physical, chemical, reactive, toxic, flammable, explosive or corrosive characteristics causes danger or likely to cause danger to health or environment, whether alone or when on contact with other wastes or substances, and shall include:

- Waste substances that are generated in the 36 processes indicated in column 2 of Schedule I and consist of wholly or partly of the waste substances referred to in column 3 of same schedule.
- Waste substances that consist wholly or partly of substances indicated in Schedule II, unless the concentration of substances is less than the limit indicated in the same Schedule.
- Waste substances that are indicated in Part A or Part B of Schedule III in respect of import or export of such wastes in accordance with rules 12,13, 14, 15 and 16 or the wastes other than those specified in Part A or Part B if they possess any of the hazardous characteristics in Part C of that schedule.
- Schedule IV includes E-waste as item 18 in its list of hazardous wastes requiring registration for recycling/ reprocessing. This item covers components of waste electrical and electronic assemblies comprising accumulators and other batteries included on list A, mercury switches, activated glass cullets from cathode ray tubes and other activated glass and PCB-capacitors, or any other component contaminated with Schedule 2 constituents (e.g. cadmium, mercury, lead, polychlorinated biphenyl) to an extent that they exhibited hazard characteristics indicated in part C of this schedule.
- Rule 9 of Chapter III on procedures for recycling, reprocessing or reuse of hazardous waste states that the occupier generating hazardous waste specified in schedule IV may sell it only to recycler having a valid registration from the CPCB for recycling or recovery.

2.1.4 Basel Convention and its Application to E-waste

The Basel Convention defines waste by disposal destination or recovery processes. These various processes are listed in Anne IV of the Convention. For example, virtually any material that will be recycled or processed in order to reclaim a metal, or to reclaim an organic or inorganic substance for further use, is deemed a waste. Electronic components that are used without further processing are likely to not be defined as a waste. The convention has provided for two lists. List A found in Annex VII is presumed to be hazardous and thus covered by the Basel convention; and list B, found in Annex IX, is presumed to be non-hazardous and thus not subject to Basel convention. The waste listed in list A is waste that poses serious threats to environment

and human health. As a result of their adverse effects these substances require special handling and disposal processes.

The Basel Annex-VII hazardous waste lists the following applicable entries to e-waste:

A1010 Metal wastes and waste consisting of alloys of any of the following: antimony, arsenic, beryllium, cadmium, mercury, selenium, tellurium, thallium.

A1020 Waste having as constituents or contaminants, excluding metal waste in massive form, any of the following: antimony compounds, beryllium, beryllium compounds, cadmium, cadmium compound, lead, lead compounds, selenium, selenium compounds, tellurium, tellurium compound.

A1030 Wastes having as constituents or contaminants any of the following: arsenic, Arsenic compounds, mercury, mercury compound, thallium, thallium compounds.

A1160 Waste lead-acid batteries, whole or crushed.

A1170 Unsorted waste batteries excluding mixtures of only list B batteries. Waste batteries not specified on list B containing Annex I constituents to an extent to render them hazardous. [Note: List B batteries include: waste batteries conforming to a specification, excluding those made with lead, cadmium or mercury]

A1180 Waste electrical and electronic assemblies or scraps containing components such as accumulators and other batteries included on list A, mercury- switches, glass from cathode ray tubes and other activated glass and PCB- capacitors, or contaminated with Annex 1 constituents (e.g. cadmium, mercury, lead, polychlorinated biphenyl) to an extent that they exhibit hazard characteristics contain in Annex III.

A2010 Glass waste from cathode ray tubes and other activated glass destined for direct reuse and not for recycling or final disposal.

It is also important to note that the Basel convention's list B includes:

B1110 Electrical and electronic assemblies (including printed circuit board, electronic components and wires) destined for direct reuse and not for recycling or final disposal.

From the above we can conclude that at the very least, circuit board, CRTs, and other electronic boards or components and assemblies containing lead based solders and copper beryllium alloys (which include most computer circuit boards and much other electronic equipment), are hazardous wastes according to Basel convention. Likewise, whole, used, discarded computers, printers, and monitors that contain such circuit boards or CRTs that are not to be reused directly are to be considered as hazardous waste and subject to the Basel convention.

The provisions of Basel Convention & its provisions under Hazardous Waste Rules are not applicable currently in Chhattisgarh unless export and import of E-waste is carried out by any registered dismantler / recycler. Therefore, they have been described considering E-waste management intervention in future.

2.1.5 Guidelines for environmentally sound management of E-waste, 2008

Guidelines for environmentally sound management of E-waste have been formulated by CPCB in 2008, which provide broad framework to recyclers and regulators on the technologies as well as issues related to compliance.

The objective of these Guidelines is to provide guidance for identification of various sources of waste electrical and electronic equipments (E-waste) and prescribed procedures for handling E-waste in an environmentally sound manner.

These Guidelines are reference document for the management, handling and disposal of E-wastes. These are intended to provide guidance and broad outline, however, the specific methods of treatment and disposal for specific wastes needs to be worked out according to the hazardous / risk potential of the waste under question. These Guidelines provide the minimum practice required to be followed in the management of E-wastes and the State Department of Environment or State Pollution Control Board may prescribe more stringent norms as deemed necessary.

These Guidelines shall apply to all those who handle e-waste which includes the generators, collectors, transporters, dismantlers, recycler and stakeholders of E-wastes irrespective of their scale of operation

These guidelines under classification of E-waste, describe Composition of E-waste; Components of E-waste; possible hazardous substances present in E-waste; E-waste scenario; Basis of Defining E-waste; Proposed definition of E-waste; Reduction of the Hazardous Substances (RoHS) in the Electronic & Electrical Equipments and Extended Producer Responsibility (EPR). It gives guidelines for environmentally sound management for E-waste. Under this head, it describes E-waste Composition and Recycle Potential; Assessment of Hazardousness of E-waste; Recycling, Reuse and Recovery Options; Treatment & Disposal Options and E-waste Recycling / Treatment technologies in India.

Further, it describes environmentally sound treatment technology for E-waste, consisting of description of environmentally sound E-waste treatment technologies; Environmental Impacts of the 1st, 2nd and 3rd level E-waste treatment system; Technology Currently used in India; Best available technology and Available operating facilities. Lastly it describes guidelines for establishment of integrated E-waste recycling & treatment facility consisting of Facility operation requirements; Procedures for setting up & management of integrated E-waste facility and Procedures for compliance with the existing regulations and guidelines.

In the context of current study, these guidelines provide guidance related to assessment of current handling practices, storages & channelization of E-waste in the study area as per SoW.

2.1.6 Guidelines for Implementation of E-waste Rules, 2011

MoEF/CPCB after consulting various stake holders felt the need for preparing a guidance document for implementation of the provisions of the E-Waste (Management & Handling) Rules, 2011 that may help the Producers, Consumer & Bulk Consumer, Collection Center, Dismantler, Recycler and Regulatory agencies (SPCBs/PCCs) for effective compliance / implementation of these rules. This document also provides guidance on setting up collection mechanism, dismantling and recycling operations. Further, guidelines also clarifies issues related to RoHS e.g. the rules call for the reduction in the use of hazardous substances in electrical and electronic equipment. Every producer of equipment listed in Schedule 1 of the Rule shall ensure that the covered products do not contain lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls or poly-brominated di-phenyl ethers above a specified threshold. The threshold for cadmium is 0.01% by weight in homogeneous material, for all other substances, the threshold is 0.1% by weight in homogeneous material. Various clarifications offered by the guidelines are given below.

1. Clarification regarding definitions

- **Producer** is any person who, irrespective of the selling technique used, "manufactures and offers to sell electrical and electronic equipment under his own brand; or offers to sell under his own brand, assembled electrical and electronic equipment produced by other manufacturers or suppliers; or offers to sell imported electrical and electronic equipment" and has to take authorization under these Rules for implementation of EPR.
- **Bulk Consumers** are bulk users of electrical and electronic equipment such as central government or state government departments, public sector undertakings, banks, educational institutions, multinational organizations, international agencies and private companies that are registered under the Factories Act, 1948 and Companies Act, 1956; they have to maintain records on E-waste generated and channelized to registered/authorized collection centres / recycler / dismantler.

- **Extended Producer Responsibility** is a responsibility of any producer of electrical or electronic equipment, for their products beyond manufacturing until environmentally sound management of their end of life products.
- **Collection Centre is a centre e**stablished individually or jointly or a registered society or a designated agency or a company or an association to collect e-waste which has to obtain authorization under E-Waste Rules, 2011.
- **Dismantler** is any person or registered society or a designated agency or a company or an association engaged in dismantling of used electrical and electronic equipment into their components who has to obtain authorization and registration E-Waste Rules, 2011. The association may include a consortium as well.
- **Recycler** is any person who is engaged in recycling or reprocessing of used electrical and electronic equipment or assemblies or their component. Recycling facility may be set up by an individual or a company or a joint venure or a consortium.
- **SPCBs/PCCs** have been given the responsibility as regulatory agencies for ensuring implementation of the E-waste Rules in their respective States.

2. Clarification regarding scope and requirements for compliance to EPR:

- Producers intending to sell their EEEs listed in Schedule-I are required to take authorization only in the place where their manufacturing facilities and corporate head offices are located. In case, of producers importing EEEs listed in Schedule-I, authorization may be taken from SPCB of the State where the port of landing is located.
- Since these products are sold across the country, SPCB/PCC concerned granting the authorization would inform the CPCB of the details of the authorization granted. CPCB would maintain a centralized database on their website, which will be available to all stakeholders. Producers will also place this information on their website and provide details of products sold to the SPCB from whom they have obtained authorization. SPCBs will provide consolidated information to CPCB on an annual basis which CPCB will maintain on the centralized database.
- In the application for authorization, it should be clearly mentioned, how the producer would ensure channelization of the E-waste at the end of its life; details of his own collection centres or take-back systems or the collection centres authorized by him, shall be specified.
- As per the EPR under the Rules, the producers are required to achieve 100% collection and channelization of the end of the life equipment. However, for the purpose of monitoring, targets need to be fixed. Such targets should be based on the life of the product, type of the product, usage and consumption patterns and other relevant factors. CPCB will, therefore, set up a Committee, which will examine the issue of fixing targets, based on the aforesaid factors and also taking into consideration the level of compliance achieved during the first two years.
- Producer who has manufacturing facility shall comply with prevailing environmental regulations under Water (P&C) Act, 1974, Air (P&C) Act, 1981, Hazardous Waste (M, H&TM) Rules, 2008 and other relevant regulations. In the case of manufacturers, who has obtained authorisation under the Hazardous Waste (Management, Handling & Transboundary Movement) Rules, 2008 need not take separate authorization under the e-waste rules till the validity/expiry of that authorization. Subsequent authorisation has to be taken under the e- waste rules, 2011 to ensure that electronic scraps, rejects etc. generated during the manufacturing shall be sent or channelized to registered E-waste recycling facilities. Such producer shall obtain authorization only from SPCB/PCC of the State where the manufacturing facility is located.
- The producer is required to maintain records in form 2 along with the details of the e-waste

handled/generated and has to submit the annual returns in form 3 in accordance with Rule 4(9) of these Rules.

• Producer shall finance the EPR system either by setting up individual collection system or by joining a common collection system by authorizing them.

Scope of EPR for the Producer:

- i. Producer may assess their individual requirements and design a collection or product take back system as they deem appropriate as long as it facilitates channelization of E- Waste for environmentally sound management.
- ii. Producer may arrange for collection from both, individual and bulk consumers and channelize the waste to collection centres or recyclers/dismantlers.
- iii. The producer may opt to implement EPR on his own individually or collectively. There can be two distinct models; (i.) individual producer responsibility where producer implements EPR managed on his own by setting up his own authorized collection centres or (ii.) collective producers responsibility, where producers may authorize common collection centres (CCC) independently or by joining a consortium as a member. Producers importing EEE listed in schedule I, may take authorisation from the State where the landing port is located
- iv. In the E-waste rules, the logo has been printed without a bar below the symbol, whereas the present practice commonly followed by the producer, the Logo has a bar below the symbol. Logo without the bar below the symbol and the logo with bar below the symbol as shown below are acceptable. Symbol may be placed on the products or printed in the accompanying product documentation.



- v. As per Rule 4(6) of the E-waste Rules, 2011 the producer is responsible for creating awareness for the consumer about the product that has been placed on the market. The information should essentially convey the message for the compliance under the rules and the responsibility undertaken by the producer on safe handling and disposal of the end-of-life product. Various modes for creation of awareness such as publications, advertisements, posters, information booklets, use of Television, radio, newspaper etc., could be adopted for communicating the information. The details of awareness programs under taken shall be provided to SPCBs/PCCs while submitting annual returns as per Form 3.
- vi. Under Rule 4(5) it is mandatory for the producer to publicize the contact details of the authorized collection centres and collection points or their collection mechanism to the consumers and such information should be periodically updated. The detailed information should comprise of the full address, telephone number, fax number e-mail etc for each State. The helpline number (like call centre) may also be publicized so that the consumer can reach the nearest collection centre from where he/she is located.
- vii. Awareness is essential regarding the hazardous constituents present in the equipment as well as the safe handling and disposal of the product after its use. In case of the products complying with the provisions of rule 13(1), the same should be indicated in the product information booklet.
- viii. Producer may manage a system directly or with a help of any professional agency on his behalf for collection and channelization system of E-waste by involving relevant stakeholders such as consumer, bulk consumer, NGOs, informal sector, resident associations, retailers, dealers, etc.
- ix. The scope of implementing the EPR by the producers is also explained in the schematic diagram given in **Figure 2.1**.



Figure 2.1: Scope of implementing EPR for Producers Source: E-waste Regulation Guidelines 2012

3. Clarifications regarding Collection Centres

A collection centre is a store/warehouse where the E-waste collected from consumers, bulk consumers, urban local bodies and retail outlets/collection-points/collection-bins/mobile-units etc. established by producers or collection centres, can be received and stored safely for necessary channelization for dismantling/recycling. These guidelines suggest the following options and requirements for setting up Collection Centres;

- i. Collection centres can be established by various ways. If a collection centre is set up for a particular producer, it may be called individual collection centre. If a collection centre caters the EPR requirements of multiple producers it may be called common collection centre. All collection centres require authorization from SPCBs/PCCs of respective States.
- ii. In case a producer himself sets up a collection centre, he shall take separate authorization from SPCBs/PCCs for setting up such individual collection centre.
- iii. Producer may organize take-back system through their retailers or through service centres and set up collection points or bins or drop-off points and link them to their authorized individual collection centres. Such collection points can also be set-up by authorized common collection centres.
- iv. Producer may organize take-back system through their retailers or service centres and set up collection points or bins and channelize the E-waste directly to registered dismantlers or recyclers.
- v. The collection points can be designated places where e-waste can be collected through residential areas, office complexes, commercial complexes, retail outlets, customer care stores, educational and research institutions, resident welfare associations (RWAs), NGOs working with rag pickers, etc. These collection points can be financed by producers or common collection centres (on behalf of producers) to channelize the E-waste to registered dismantler or recyclers. The e-waste collected through these points should be transported to collection centres or registered dismantling or recycling plants within a stipulated time period as per rule 12. These collection points do not require taking authorization from SPCBs/PCCs.
- vi. Collection Bins could be installed in public places such as kerbsides, restaurants, malls, offices etc. which can be owned by the authorized collection centres or the producer. The contact details of authorized collection agencies should be printed on these bins for reference purposes of the general public. The E-waste collected in these bins should be transported to collection centres or channelized to registered dismantler or recyclers by the producers. These collection Bins do

not require authorization.

- vii. Mobile collection vans can also act as collection systems for door to door collection of e-waste or from institutions/ individuals/small enterprises and such vans shall be linked to collection centre or provided by producer to channelize the E-waste to collection centres or registered dismantler or recyclers. A mobile collection van does not require authorization but their detail has to be provided to SPCBs/PCCs while seeking authorization by the producers or collection centres.
- viii. SPCBs shall ensure that authorized collection centres comply with the provisions of the Rules and ensure that the e-waste collected by them is stored in a secured manner and no damage is caused to the environment during storage and transportation till the e-waste reaches registered dismantler (s) or recycler (s) by undertaking periodic inspections and verifications
- ix. The Rules specify that Collection Centres are allowed to store E-waste for a maximum period of 180 days. However, this period may be extended up to one year in the exceptional cases with genuine reasons when the Collection Centres are located in the States, which do not have any registered dismantling or recycling facility and are unable to send the e-waste for recycling within the stipulated time period.

The criteria for setting up collection centres are:

- i. The collection, transportation, storage and handling of E-Waste in the collection centres has to be done carefully without breaking the end of life equipments.
- ii. Collection centers, established under these Rules, need not seek Consent to Establish and Consent to Operate under the Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981.
- iii. Producers who has pan India presence having large number of distributors/dealers in each of the State and has large warehouses already in place can use the space if available in these ware house for establishing collection centre. However, the space used for collection centre has to be clearly demarcated (by enclosure or partition) from the space meant for new goods.
- iv. The storage capacity of any collection centre should be commensurate with available area, volume of operations (in weight) and type of E-waste.
- v. The collection centre where Refrigerator and Air conditioners are also stored should have adequate facilities for handling / arresting leakage of compressor oils, CFCs/HCFCs if any.
- vi. Covered shed/spaces may be used for storage of E-waste generated from IT and Telecommunication equipments while open spaces can be used for storage of refrigerators / washing machines /air conditioners. In case of storage of e-waste, generated from IT and Telecommunication equipment, in open spaces, containers with lids/covers may be used. E-waste comprising of IT & TE waste preferably be segregated and stored at collection centre in suitable racks/containers/bins.
- vii. Containers of appropriate size and shape may be used for segregation of e-waste items generated from IT and Telecommunication equipments to facilitate effective collection and handling operations. Containers can be made either of wood or plastic or mild steel or any appropriate material with sufficient strength and shapes (top open containers, caged boxes, rakes etc.) for holding the e-waste. These containers/racks may be placed in such a way that there should be adequate space for movement of workers and material.





Different Types of Bins for open storage

viii. Producer can assess their individual requirements and design a collection or product take back systems as they deem appropriate as long as it facilitates channelization of WEEE for environmentally sound management.

4. Clarification regarding E-waste Dismantler

As per these rules any person or registered society or a designated agency or a company or an association can engage in dismantling of end of life electrical and electronic equipments into their components by obtaining registration and authorization from the respective SPCB/PCC.

- Dismantling operation can be manual, semi manual and automatic involving physical segregation operations for plastics, glass, steel, non-ferrous material, wires, gases, liquids and printed circuit boards. Dismantlers may perform the following operations.
- Decontamination
- Manual dismantling using appropriate tools, PPEs and dust control equipment.
- Hammering
- Shredding
- Segregation and
- Specialized separation processes
 - a. CRT cutting into funnel and panel including removal of phosphor coating from the panel as well as lead paste binding the panel with the funnel.
- The first step is to decontaminate E-waste and render it non-hazardous by separating hazardous components and materials. Hazardous electronic components such Hg switches, Poly Chlorinated Biphenyl (PCBs) etc. can be recovered and sent to TSDFs for treatment and disposal. In case of refrigerators and air conditioner, the refrigerant gases such as chlorofluorocarbon (CFCs), hydrochlorofluorocarbons (HCFCs) etc. can be collected by using gas recovery equipment for their recovery and storage. The refrigerant gases may be re-used or may be diposed by thermal destruction adopting any of the following options:
 - i. By incineration in existing common HW incinerators
 - ii. By co-processing in cement kiln
 - iii. By plasma destruction
- Dismantling operations shall not include Fine grinding / wet shredding / wet grinding operations. Dismantling operations shall not be permitted for chemical leaching or heating process or melting the material. Dismantlers shall not shred segregated LCDs.
- Dismantler shall have adequate facilities for disposal of bag filter residue and floor cleaning dust in secure manner or shall obtain membership with TSDF for safe disposal.
- Dismantlers can be permitted shredding or cutting of printed circuit boards not below the size of 20mm which have to be handled by employing minimal manual handling and with adequate air pollution control systems.

5. Clarification regarding E-waste Recyclers

As per these rules any person who is engaged in recycling or reprocessing of used electrical and electronic equipment or assemblies or their component is a recycler. Recyclers may also set up their own authorized collection centres and may establish linkages with producers/bulk generators/other collection agencies. They may also establish a scheme for household collection of e-waste or may establish tie–ups with other agencies involved in collection of e-waste from individual consumers.

The functions of the recycling facilities are similar to the dismantlers but implements high degree technologies for recycling or recovery operations. There shall be no restriction on degree of operations that can be permitted for recyclers. The following processes can be employed by recyclers;

- 1. Manual / semi-manual / automatic dismantling operations
- 2. Shredding / crushing / grinding / enrichment operations
- 3. Pyro-metallurgical operations Smelting furnace

- 4. Hydro metallurgical operations
- 5. Electro-weaning
- 6. CRT cutting
- 7. Toner cartridge recycling
- 8. Melting, casting, molding operations (for metals and plastics)
- A recycling facility can be permitted to receive any kind of E-waste covered under E-waste Rules.
- The recycling facilities shall comply with the requirements as specified for dismantlers in the above section for the operations specified therein.
- A recycling facility shall install adequate wastewater treatment facilities for process wastewater and air pollution control equipment depending on type of operations undertaken.
- Suitable space de dusting equipment shall be installed where manual dismantling, shredding operations are carried out.
- Suitable fume hoods connected with bag dust collectors followed by wet (chemical) scrubbers shall be installed for control of fugitive emissions from furnaces or chemical reactor fumes.
- In additions to dismantling operations, recyclers may adopt suitable technologies for shredding, wet grinding, gravity / magnetic/density/eddy current / electromagnetic separators with adequate air pollution control equipment. It shall be ensured that dust control equipment comprises of mechanical dust collectors followed by fabric filters or two stage fabric filters or fabric filter followed by wet (chemical) scrubbers.
- Adequate facilities for onsite collection and storage of bag filter residues, floor cleaning dust and other hazardous material shall be provided and sent to secure landfill facility by obtaining membership with TSDF operator.
- The degree of refining and % recovery of resource or precious material present in the E- waste shall be given due importance.

6. Clarification regarding Recycling of CRT Monitor and TVs

- 1. Large volumes of CRTs are expected to be generated in coming years. Care should be taken for recycling of CRTs as it contains harmful substances.
- 2. CRT monitors and TVs can be manually removed from plastic/ wooden casing. The CRT is split into leaded funnel and unleaded panel glass using different splitting technology in a closed chamber under low vacuum environment and the funnel section is then lifted off from the panel glass section and the internal metal gasket is removed for facilitating the removal of internal phosphor coating.
- 3. The CRT can be split manually adopting Ni-Chrome hot wire cutting, Diamond wire method or Diamond saw separation
- 4. Manual shredding, cutting, and segregation operations for CRTs should be carried out in vacuum chambers where the dust is extracted through cyclones, bag filters, ID fan and a suitable chimney. The operators should use gloves fixed to the walls of the vacuum chamber while handling CRTs as shown in the figure below.





- 5. The internal phosphor coating from the inner side of panel glass is removed by using an abrasive wire brush and collected separately. The extracted air is cleaned through high efficiency bag-filter system to collect the phosphor dust. The phosphor dust so collected in the filter bags should be sent to TSDF.
- 6. Segregated CRTs can also be shredded in automatic shredding machines connected with dust control systems. The mixed shredded glass is separated into leaded glass and glass cullet using electro-magnetic field or by density separation.

7. Clarification Regarding Bulk Consumers

- As per these rules a bulk consumer has to ensure that the E-waste generated by them have to be channelized to authorized collection centres or registered dismantler or recycler or is returned to the producer through its pick up or take back services or through its collection points.
- The bulk consumer has to maintain records of E-waste generated by them in Form 2 and make such records available for scrutiny to SPCBs/PCCs whenever demanded.

8. Clarification regarding reduction in the use of Hazardous Substances (RoHS) in the manufacture of electrical and electronic equipments:

The E-waste rules specifies limit for hazardous substance in the components of electrical and electronic equipments. The limits are detailed below

i. Every producer of electrical and electronic equipments as per Schedule I shall ensure that new electrical and electronic equipments should not have concentration value more than 0.1% by weight in homogenous materials for Lead, Mercury, Cadmium, Hexavalent Chromium, Polybrominated biphenyls or polybrominated diphenyl ethers and for Cadmium more than 0.01% by weight in homogenous materials. The above maximum concentration limit should be achieved before 01-05-2014. The above limits will not apply to components of electrical and electronic equipment manufactured or placed in the market six years before the date of
commencement of these rules. The above limits will also not apply to applications listed in Schedule II of the e-waste rules and electrical and electronic equipments used for defense purpose.

- ii. Import or placement in the market for new electrical and electronic equipment shall be permitted only for those equipments which are RoHS compliant.
- iii. Components of electrical and electronic equipment manufactured or placed in the market before the date of 01-05-2014 are exempted from above provisions.
- iv. The reductions have to be achieved before 1 May 2014 i.e. within two years from the dates of commencement of these rules. Certain applications listed in Schedule II are exempted from the above requirement and there is also an exemption for components of electrical and electronic equipment manufactured or placed in the market six years before the date of commencement of the reduction.

9. Clarification regarding interstate transportation or E-waste

- Transportation of e-waste, being sent for dismantling or recycling to a facility in a State other than the State, where it is generated or collected, does not require 'No objection certificate' from the SPCBs/PCCs concerned.
- However, Transporter of the e-waste is required to give prior intimation to the SPCBs/PCCs concerned i.e. the States in which the e-waste is generated, transited and being sent for the purpose of recycling or dismantling.

10. Clarification Over-all Compliance Mechanism

A compliance mechanism has been set out in E-waste Rules for producers, collection centers, consumer, bulk consumers, dismantler, recyclers and the regulatory authorities (SPCB's, PCCs, CPCB and MoEF). It also sets out the responsibilities for producers to finance and organize the take back and recycling system. However, while ensuring that the given compliance mechanism is followed the same be can be visualized in the following schematic flow sheet given in **Figure 2.2**.



Figure 2.2: Implementation of E-Waste Rules 2011 Source: E-waste Regulation Guidelines 2012

2.2 Institutional Structure

The Ministry of Environment and Forests, Government of India, is the nodal agency at the central level for policy, planning, promoting and coordinating the environmental programs. A number of enforcement agencies assist the Ministry of Environment and Forests at the state level in executing the assigned responsibilities. The Central Pollution Control Board (CPCB) advises on the policy and enforcement. State Pollution Control Boards (SPCB) carries out the enforcement at the state level. The roles & responsibilities of different agencies under E-waste rules are provided in **Table 2.3**.

Sr. No.	Authority/(ies)	Duties
1.	Central Pollution Control Board, Delhi	Coordination with State Pollution Control Boards/ Committees of UT Preparation of Guidelines for Environmentally Sound Management of e- waste Conduct assessment of e-waste generation and processing Recommend standards and specifications for processing and recycling e- waste Documentation, compilation of data on e-waste and uploading on websites of CPCB Conducting training & awareness programmes. Submit Annual Report to the Ministry. Any other function delegated by the Ministry under these rules. Enforcement of provisions regarding reduction in use of hazardous substances (RoHS) in manufacture of electrical & electronic equipment. Initiatives for IT industry for reducing hazardous substances. Set targets for RoHS compliance in manufacture of electrical & electronic equipment. Incentives and certification for green design/products
2.	State Pollution Control Boards/ Committees of Union Territories	Inventorization of e-waste. Grant & renewal of Authorization Registration of recyclers of e-waste Monitoring compliance of authorization and registration conditions Maintain information on the conditions imposed for authorization etc. Implementation of programmes to encourage environmentally sound recycling Action against violations of these rules . Any other function delegated by the Ministry under these rules
3.	Urban Local Bodies (Municipal Committee/Council/Corporatio n)	To ensure that e-waste if found to be mixed with Municipal Solid Waste is properly segregated, collected and is channelized to either authorized collection centre or dismantler or recycler. To ensure that e-waste pertaining to orphan products is collected and channelized to either authorized collection centre or dismantler or recycler.

Table 2.3: List of Authorities and	Corresponding Duties as per	E-waste (Management and
	Handling) Rules, 2011	

Source: E-waste Rules 2012

The roles and responsibilities of different agencies related to hazardous waste and its export and import is given below in **Table 2.4**.

Table 2.4: The authority	v. duties and	corresponding	rule as p	er Schedule V	II of the HW	Rules , 2008
	,,	••••••••••••••••••••••••••••••••••••••				

Sr. No.	Authority/(ies)	Duties and Corresponding Rule
1.	Ministry of Environment and forests, under	Identification of hazardous wastes
	the Environment (protection) Act, 1986	Permission to exporters of hazardous wastes
	2 <i>i</i>	Permission to importers of hazardous wastes.
		Permission for transit of hazardous wastes through India.
		Sponsoring of training and awareness program on Hazardous
		Waste and Management related activities.

Sr. No.	Authority/(ies)	Duties and Corresponding Rule					
2.	Central Pollution Control Board constituted under the Water (Prevention and Control of Pollution) Act, 1974	Coordination of activities of the State Pollution Control Boards/ committees. Conduct training courses for authorities dealing with management of hazardous substances. Recommend standards for treatment, disposal of waste and leachates. Recommend procedures for characterisation of hazardous wastes. Sector specific documentation to identify waste for inclusion in Hazardous Wastes (Management, Handling and transboundary Movement) Rules 2008. Prepare guidelines to prevent/ reduce/ minimize the generation and handling of hazardous wastes. Any other function under rules delegated by MoEF.					
3.	State Government/ Union Territory Government and Administration	Identification of site (s) for common hazardous was treatment, storage and disposal facility (TSDF). Assess EIA reports and convey the decision of approval site or otherwise. Acquire the site or inform operator of facility or occupier association of occupiers to acquire site. Notification of sites. Publish periodically an inventory of all disposal sites in t state/union territory.					
4.	State Pollution Control Boards constituted under the Water (Prevention and Control of Pollution) Act, 1974	Inventorization of hazardous waste. Grant and renew authorization. Monitor the compliance of the various provisions and conditions of authorization including conditions of permission for issued by MoEF exports and imports. iii. Examining the applications for imports submitted by the importers and forwarding the same to MoEF. Implementation of programs to prevent/ reduce/ minimize the generation of hazardous wastes. Registration and renewal of registration of Recyclers/ Re- Processors. Action against violations of Hazardous Wastes (Management, Handling and Transboundary Movement) Rules 2008. Any other function under these rules assigned by MoEF from time to time.					
4.	Directorate General of Foreign Trade constituted under the Foreign Trade (Development & regulation) Act 1992	Grant licence for import of hazardous wastes. Refuse licence for hazardous wastes prohibited for imports and exports.					
5. Source: F	Port Authorities under Indian Port Act 1908 and Customs Authorities under the customs Act, 1962 Hazardous Waste (Management, Handling & Transboun	Verify the documents Inform the ministry of Environment and Forests, Govt. of India of any illegal traffic Analyze wastes permitted for imports and exports. Train officials on the provisions of the Hazardous Waster Rules and in analysis of hazardous wastes. Take action against export/import Acts, 1908/ Customs A- 1962. <i>ndary</i>) Rules 2008					

Applicability	of E-waste	Rules is	given	in	Table 2.5.
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	Table 2.5:	E-Waste	(M&H)	Rules -	2011	applica	bility
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			T				

Sr. No.	Type of Applicant	To Maintair Records	Maintain n Record Form -2	Filling Annual inReturn Form - 3	Authorization ⁱⁿ Form-I	Registration Form-IV	RoHS Compliance
1.	Consumer	Х	Х	Х	Х	Х	Х

IS 1pliance

Source: E-waste Rules guidelines

X = Not applicable

$\sqrt{=}$ Applicable

Clarification of the role of State Pollution Control Boards as per E-waste Guideline 2012.

- SPCB/PCC shall also ensure that Producer having manufacturing facility or corporate head office in their State shall obtain authorization. SPCB/PCC shall also ensure that a Producer having their port of landing of imported equipments in their State obtains authorization.
- Shall ensure that manufacturer has set-up adequate collection mechanism to cater the collection needs from entire State.
- The number of collection centres or take-back systems may depend on quantum of sales, number of urban centres in that State
- The authorization granted to each producer shall be evaluated on case to case basis depending on their proposed EPR implementation scheme. The details of EPR with respect to authorized collection centres, collection points, take-back systems, authorized recyclers, authorized dismantlers and details of agreement between producers, authorized collection centre, dismantler and recycler are required for evaluation.
- Shall ensure that the collection centres, who have applied for authorization, should have adequate space for storing the quantity of E-waste for which application has been made.
- Shall ensure that adequate numbers of containers proportionate to the applied capacity are available for storing e-waste.
- Shall ensure that collection centre should not store E-waste for a period exceeding one hundred and eighty days. The storage period may be extended to one year in those States which do not have any registered dismantling and recycling facility or in such cases where the e-waste needs to be stored for development of a process for its recycling or reuse.
- Shall ensure that collection centre should have arrangement in place for transferring the E-waste to the registered dismantler or recycler.
- Shall ensure that dismantlers and recyclers, who have applied for authorization and registration, possess appropriate facilities, technical capabilities and equipment to handle e-waste safely. The land may be owned by the dismantlers/recyclers or could be on lease.
- SPCBs/PCCs shall ensure that no one starts dismantling or recycling of e-waste without having prior permission (registration and authorization) to do so from SPCBs/PCCs.
- Shall ensure that dismantler and recyclers should have appropriate equipments for dismantling and recycling of E-waste.
- Grant of registration for dismantling and or recycling has to be evaluated on case to case basis depending on their capacity and level of operation. The SPCBs/PCCs should ensure that dismantler should not exceed their mandate for processing any e-waste for recovery or refining of materials.
- SPCBs/PCCs shall ensure that dismantlers have well set mechanism for providing dismantled material to recyclers. Action Plan for channelizing the disposal of dismantled component in an environmentally sound manner has to be provided by dismantler.
- SPCBs/PCCs shall ensure that dismantlers/recyclers should be members of TSDF.

- SPCBs/PCCs shall ensure that dismantlers/recyclers should file their annual returns within the stipulated time period.
- SPCBs/PCCs shall place on their web site the conditions imposed on the collection centre, dismantler and recycler while granting authorization and registration and ensure that these conditions are strictly met with by the facility concerned.
- SPCBs/PCCs should regularly monitor the compliance of authorization and registration.

Role of Municipal Authorities

- There is possibility of mixing of e-waste with municipal solid waste. In such cases, the Urban Local bodies (Municipal Committees/ Councils/ Corporations) are required to ensure that E-waste if found to be mixed with MSW is properly segregated, collected and is channelized to either authorized collection centre or dismantler or recycler.
- The Urban Local bodies (Municipal Committees/Councils/ Corporations) are also required to ensure that E-waste generated from non branded or assembled electrical and electronic equipment as specified in Schedule I is collected and channelized to either authorized collection centre or dismantler or recycler. The ULBs are also required to collect E-waste generated from those EEEs which are covered under the rules and produced by a company, which has closed its operation or has stopped product support.
- ULBs may also set up their own collection points at MSW disposal site, public places; residential locality etc to collect the e-waste and such collection points shall be connected to authorized collection centres/dismantlers/recyclers.

2.3 Overall Assessment with respect to Emerging Regulatory Scenario

Major conclusions drawn from regulatory assessment having implications an E-waste management in the state are given below.

National Environment Policy 2006 provided overall guidelines on waste management including E-waste. These provided road map for preparation of guidelines and regulation policy. At first guidelines came into effect in 2008, which provided a minimum practice required for environmentally sound management of E-waste.

These guidelines also provided the basis for amendment of Hazardous Waste (Management, Handling & Transboundary Movement) Rules 2008 & E-waste was included as part of Schedule IV. This development brought E-waste recycling into the ambit of hazardous waste regulations and facilitated control of export & import of E-waste. A number of E-waste recyclers got registered under these rules indicating the part formalization of the E-waste trade value chain but diversion less than 5% of the E-waste generation to these recyclers paved the way for separate E-waste regulation based on EPR.

In 2011, new E-waste (Management & Handling) Rules were notified, which came into effect in 2012. These rules were formulated in close consultation with producers & their associations and other stakeholder. Some of the major features of this regulation having implication on E-waste inventory assessment are given below.

- No target has been fixed to collect E-waste from the time of enforcement. Producer is not bound by any collection target.
- There are no mandatory provisions for producers in the rules to declare quantity of EEE placed in the market since 2012.
- No mechanism for tracking purchase of EEE by bulk consumers exists.

2.4 Conclusions

None of the major brands manufacturing / importing items mentioned in Schedule 1 of the E-waste rules have manufacturing facilities or corporate head offices located in Chhattisgarh. Therefore, monitoring of E-

waste inventory through evaluation of Form 2 or Form 3 in accordance with Rule 4(9) of E-waste Rule by CECB in the state is possible only through the producers data obtained from centralized agency e.g. CPCB or the state where these producers are registered after 2012.

CPCB data shows that as of September 2013, Chhattisgarh has M/s Navrachna Recycling Pvt. Ltd. & M/s ADV Metal Combine Private Limited has two E-waste dismantler / recycler, located at Rajnandgaon & Durg districts having a licensed. Therefore, this indicates that E-waste is either dismantled or recycled in both formal and informal sector in state because of their limited capacity.

Table 2.2 indicates that producers are majorly responsible for all the activities including financing of E-waste management. Since, the state has two registered dismantler & recycler; it indicates that producers may be fulfilling their responsibility through collection system catering to dismantlers & recycler both inside & outside the state.

Assessment on the upstream side of the E-waste chain especially of both types of consumers (bulk & individual consumer), also indicate that only bulk consumer offer opportunity of E-waste inventory tracking & monitoring. Though, bulk consumers are required to maintain records of E-waste, they are not required to file the returns.

Since no mechanism exist for tracking purchase of EEE by bulk consumers and also producers are not required to declare quantity of EEE placed in the market since 2012, E-waste inventory assessment has to rely on available historical market research data.

Therefore, there is need to identify different producers, profile of consumers & bulk consumers, collection centre, dismantlers & recyclers who are catering to E-waste in five divisions in the study area.

Chapter 3: Assessment of E-waste Market

3.0 Introduction

The increasing market penetration of the consumer electronics will lead to reduced life of electronics items and greater generation of E-waste in Chhattisgarh. Therefore, an assessment of E-waste market structure requires an understanding of E-waste as a "tradable commodity" and its "mechanism of trading". In Chhattisgarh E-waste as a "tradable commodity" can be described in terms of its composition and its potential for material recovery. "Mechanism of Trading" can be described in terms of E-waste trade value chain. This chain will identify different stakeholders consisting of producers, consumer or bulk consumers, collection centers, dismantlers and recyclers, while mechanism of trading will determine E-waste generation, present handling practices, storage and channelization for its recycling or disposal. The following sections describe each of these items to facilitate an understanding of E-waste market in five divisions of Chhattisgarh.

3.1 E-Waste Composition

E-waste Composition has been described in terms of components, which contain items of economic value. At first E-waste has been classified into 19 components forming "building blocks", which are easily "identifiable" and "removable", followed by their respective hazardousness.

3.1.1 E-waste Components

A number of components, which are assembled to produce "Electrical and Electronic Equipment" are metal, motor / compressor, cooling, plastic, insulation, glass, LCD, rubber, wiring / electrical, concrete, transformer, circuit board, fluorescent lamp, incandescent lamp, heating element, thermostat, FR / BFR – containing plastic, batteries, CFC / HCFC / HFC / HC & external electric cables. Specific component, which are found in Air Conditioners, refrigerator, washing machine, personal computers, cellular telephones, TVs and other items as per schedule 1 are described in **Table 3.1**.

Large household appliance like Air Conditioners / refrigerator may consist of electric motor, a circuit board, a transformer, capacitor, thermal insulation, switches, wiring, plastic casing (containing flame retardants) etc. A typical washing machine may consist of the metal casing, inner and outer drums, a motor, a pump, washing cycle controller unit, switches and other components. IT and telecom equipments sector is observing a trend of "micro miniaturization", while CRTs in monitor are being replaced by LCD screens. Further, there is an increasing trend of reduction in weights of these items.

Table 3.1 indicates that the range of different items found in E-waste is diverse classifying it a waste of complex nature. However, it shows that E-waste can be dismantled or disassembled into relatively small number of common components for further treatment. This disassembly results in segregation and treatment of E-waste.

3.1.2 E-waste Composition, Recyclability and Hazardousness

During market survey of major stakeholders in five divisions of the study area, it was revealed that broadly E-waste consists of ferrous and non-ferrous metals, plastics, glass, wood, printed circuit boards, rubber and other items. Iron and steel constitutes about 50% of the E-waste followed by plastics, non - ferrous metals and other constituents. Non-ferrous metals consist of metals like copper, aluminum and precious metals ex. silver, gold, platinum, palladium etc. Therefore, these items are dismantled in informal sector. However, the presence of elements like lead, mercury, arsenic, cadmium, selenium, hexavalent chromium and flame retardants in E-waste and their components beyond threshold quantities render them hazardous in nature.

	_	_	_	_	_	Ta	able 3.1	l: Com	ponen	ts in E	-waste	_		_	_	_		_	
of cal & nic nent's ation Tech	Metal	Dependent / Cooling	Plastic	Insulation	ssel Equip	CRT	ICD	Rubber	Wirring / Electrical	Transformer	Magnetron	Circuit Board	Fluorescent lamp (in ballast)	Incandescent lamp	Heating element	Thermostat	FR / BFR - containing plastic	Batteries	CFC, HCFC, HFC, HC
lized	√				√ √		\checkmark	\checkmark				\checkmark					\checkmark		
rocessing																		_	
ames																			
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ioners ing ized air oning																		

component ence as a component from WEEE & Hazardous Waste, A report produced for DEFRA, UK Government, March 2004, AEA Technology

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The possible substances of concern, which may be released during recovery of secondary raw material from E-waste, are given in **Table 3.2**.

Component	Possible Hazardous Content
Metal	
Motor \ Compressor	
Cooling	ODS
Plastic	Phthalate plasticize, BFR
Insulation	Insulation ODS in foam, asbestos, refractory ceramic fiber
Glass	
CRT	Lead, Antimony, Mercury, Phosphors
LCD	Mercury
Rubber	Phthalate plasticizer, BFR
Wiring / Electrical	Phthalate plasticizer, Lead, BFR
Concrete	
Transformer	
Circuit Board	Lead, Beryllium, Antimony, BFR
Fluorescent Lamp	Mercury, Phosphorus, Flame Retardants
Incandescent Lamp	
Heating Element	
Thermostat	Mercury
BFR – containing plastic	BFRs
Batteries	Lead, Lithium, Cadmium, Mercury
CFC, HCFC, HFC, HC	Ozone depleting substances
External electric cables	BFRs, plasticizers

Table 3.2: Possible Hazardous Substances in E-waste Components

Source: Compiled from WEEE & Hazardous Waste, A report produced for DEFRA, March 2004, AEA Technology

Major components, which cause most concern, include lead, mercury, cadmium and chromium (VI), halogenated substances (e.g. CFCs), polychlorinated biphenyls, plastics and circuit boards that contain brominated flame retardants (BFRs). BFR can give rise to dioxins and furans during incineration and open burning of E-waste fractions at dump site can lead to other toxic release. Other materials and substances that can be present in E-waste are arsenic, asbestos, nickel and copper. These substances may act as a catalyst to increase the formation of dioxins during incineration.

3.2 Mechanism of E-Waste Trade

"Material Flow" along the "Life Cycle" of electrical and electronic equipment within a "Geographical Boundary" of Raipur, Bilaspur, Durg, Surguja and Bastar divisions of Chhattisgarh forms the basis of E- waste generation. The following sections describe a conceptual understanding of material flow, along the life of electrical and electronic equipment, its conversion into an "obsolete" item followed by its transformation into new material. A conceptual E-waste trade value chain showing material flow along the E-waste trade value chain is shown in **Figure 3.1**. This is followed by customization of the conceptual E-waste trade value chain for the study area.

Raw Material Input



Figure 3.1: Conceptual E-waste trade value chain Source: UNEP Manual Vol. I; Inventory Assessment Manual

The establishment of material flow within a geographical boundary assists in identifying, networks / chain connecting different phases of life cycle of electrical and electronic equipment and associated stakeholders. The material flow, when applied to "life cycle" of electrical and electronic equipment leads to evolution of the 'Four-Phase-Model', where each phase describes respective unit operations and different stakeholders. Each of these phases and associated stakeholders is described in **Table 3.3** and depicted in **Figure 3.2**. The dotted vertical line in the **Figure 3.2** indicates the stage of "obsolescence" in between the second and third phase of life cycle.

Sr. No	Phase	Stakeholders
110.	<u>Phase I:</u> Unit Operations / Processes / Activities: Production and sales of electrical and electronic equipment including import, export, and input of equipment for re-use from repair of E-waste.	Stakeholders: Manufacturers, importers, exporters, and retailers (brand new / second hand)
	<u>Phase II:</u> Unit Operations / Processes / Activities: Consumption of electrical and electronic equipment, use of electrical and electronic equipment in households, offices and industry.	Stakeholders: Consumers like households, commercial places like offices and industry
	<u>Phase III:</u> Unit Operations / Processes / Activities: Consumption of electrical and electronic equipment, use of electrical and electronic equipment in households, offices and industry.	Stakeholders: Consumers, importers, exporters, collectors, traders, dismantlers, waste treatment operators
	<u>Phase IV:</u> Unit Operations / Processes / Activities: Treatment / disposal alternatives for E-waste ex. repair, decontaminating, dismantling, shredding, landfill and incineration.	Stakeholders: Dismantlers, Recycling, Hazards landfill site operators.

Table 3.3: Phases of material flow model

Source: Prepared from Waste from electrical and electronic equipment (WEEE) – quantities, dangerous substances and treatment methods, EEA Copenhagen, 2003

In developed countries, where E-waste management system is in operation, the entire trade value chain occurs in organized / formal sector. The blue line indicates the starting point of informal sector involvement in E-waste management in a developing country. An example of generic E-waste trade value chain in a developing country is shown in **Figure 3.2**. In majority of developing countries, the informal sector engagement starts from the point of collection and continues till the last stage in some capacity. However, other steps / unit operations like E-waste processing, production / end products may be present or absent in a country. Therefore, this chain can be further modified or customized with inter or intra linkages depending on the E-waste processing or end production in the study area.



Figure 3.2: Generic E-waste trade value chain in a developing country Source: UNEP Manual Vol. II; Inventory Assessment Manual



Figure 3.3: The 'Four-Phase-Model'

Source: Prepared from Waste from electrical and electronic equipment (WEEE) – quantities, dangerous substances and treatment methods, EEA Copenhagen, 20

3.3 E-waste trade value chain in Five Divisions of Chhattisgarh

A tentative E-waste trade value chain for study area which has emerged out of field work is shown in **Figure 3.4**. Tracer technique, which was pilot tested in five divisions of Chhattisgarh to fix E-waste trade value chain. A brief description of the identified stakeholders is given below.



Figure 3.4: Tentative E-waste trade value chain in Study Area

<u>Producers</u>

Figure 3.4 indicates that EEE producers / manufacturers do not exist in the study area. However, their products are being sold in the division. Secondary data confirms that EEE producers do not have manufacturing facilities in the division and therefore they are not registered with CECB. Since these producers are responsible for their products under EPR, their detailed **inventory** as per schedule 1 of E-waste (Management & Handling) rules are given in Annexure 1.

Distributors / Traders / Retailers

EEE from these producers are sold in the study area through Distributor / Trader / Retail network as well as directly through the company. Items like Centralized Data Processing, Mainframes, and Minicomputers of Schedule 1 are used by large corporates, State and Central Government agencies falling under the category of bulk consumers whose profile is given below. **Inventory** of Distributors / Traders / Retailers selling items other than mentioned above in the study area is given in **Annexure 2**. However, retailers / dealers do not fall under the purview of E-waste (Management & Handling) Rules 2011, unless they serve as collection centre or drop off point.

<u>Consumers</u>

There are two types of consumers, which are found in five divisions of the study area; Individual Consumers & Bulk Consumers. **Inventory** of bulk consumers in the study area is given in **Annexure 3**.

Collection Centres / Channel

Tracer analysis indicates that EEE, which becomes E-waste in the study area partly gets collected & transported in the informal sector and partly in formal sector. Primary survey carried out through Tracer technique indicates that bulk of E-waste generated in the study area goes to informal sector. Majority of the producer / manufacturer have established collection channel in the study area. These collection channels work through following mechanism.

- 1. Single point call centre
- 2. Distributors / Retailers
- 3. Service Centres

4. Physically established collection centre / drop off point

The producers use a combination of these mechanisms as given in Table 3.4.

Brands	Collection through Call Centre	Collection through Dealers / Retailer	Collection through Service Centre	Collection through Collection Centre / establishment	Remarks
LG			\checkmark	\checkmark	Mainly done by Attero Recycling Collection Centre
Panasonic	\checkmark		\checkmark		Through Collection Centre / Service Centre
Samsung	\checkmark			V	Technician come to the site of E-waste discarded item, check the item and collect. (No compensate) provides certificate. (All the E-waste discarded item go to Haridwar, Rorkee) Attero Recycling Company.
Toshiba	\checkmark				Collection is carried out by a logistic service provider "M/s Kintetsu World Express Pvt. Ltd.", earlier "Gati"
Haier	\checkmark		\checkmark	\checkmark	Through Collection Centre / Service Centre
Kelvinator	\checkmark	\checkmark			Exchange your electronic item to your nearest dealer or where you buy the product
Electrolux		\checkmark			Exchange your electronic item to your nearest dealer or where you buy the product
Godrej	\checkmark	\checkmark			Exchange offer contact to your dealer no collection
Hitachi	N				To collect the product from the location and recycling will be done free of cost to the customers through our authorized recycling agencies. Not claim any costs towards the value of E-waste or the costs associated with delivery packaging or any other costs.
BPL		\checkmark			Contact to your dealer where you buy the product
Akai	\checkmark	\checkmark			To the dealer he gives the cost of the product.
Sansui	\checkmark	\checkmark			E-waste Regarding no information Contact to nearest dealer

Table 3.4: Manufacturer's E-waste Collection Centre System in Chhattisgarh

Brands	Collection through Call Centre	Collection through Dealers / Retailer	Collection through Service Centre	Collection through Collection Centre / establishment	Remarks
Philips	\checkmark			\checkmark	Call on customer care door to door collection of E- waste / discarded items of Philips
Whirlpool	\checkmark	\checkmark			To dealer he exchange your electronic item
			Printers		
HP	\checkmark	\checkmark			Drop your items as dealer's drop off locations.
Canon	\checkmark		\checkmark	\checkmark	Through Collection Centre / Service Centre
Brother			\checkmark	\checkmark	Through Collection Centre / Service Centre
TVSE	\checkmark		\checkmark	\checkmark	Through Collection Centre / Service Centre

Inventory of Service centres in the study area is given in **Annexure 4.** The List of agencies involved in transportation, dismantling, recycling of E-waste collected by producers through their marketing network i.e. through dealers / distributors / retailers / service centers **Annexure 5. Table 3.4** indicates that majority of producers use call centre as well as dealer's network for collection of E-waste. There are two possibilities of onward transportation & disposal of E-waste. The first possibility is the disposal through informal sector & the second is through registered recycler. Since dealers are not covered under E-waste Rules, they are not legally bound to report.

Informal Sector

Tracer technique has been used in the study area to fix E-waste trade value chain in the informal sector.

E-waste is collected & dismantled in informal sector in the study area. Further, its major fractions are transported outside the state mainly to Delhi through informal sector traders. An inventory location of major scrap vendor / dismantler, temporary stockpile site / informal collection centre & landfill site is given in **Annexure 6**.

In **Raipur division** it has been found that Raipur, Arang, Abhanpur, Sabji mandi Baloda Bazar, Mandi road, Gandhi chowk, Sadar Bazar bhatapara, New bus stand, Mahasati Mandir road, Ram saptah chowk, Jai stambh chowk, Main road simga, Bilaspur road, Bemetra chowk, Sadar road, Main road kasdol, Dhamtari, Tehsil Dhamtari, Nagri, Magarlod rajim, Chhura, Gariaband city has a strong metal, and electronics scrap market. In these areas, defunct electrical and electronic equipment are generated and sold to scrap dealers. Together with this the market also sells, components from PCs like mother boards, floppy drives, components from the mother boards, printers, monitors etc. Scrap dealers come from Delhi and collected scrap from different areas of Raipur Division and then transported to Delhi. They used to come twice/thrice in a year especially at the time of Bishwakarma Puja and Diwali. The motherboards and floppy drives are removed from the machines by scrap vendors and sold by weight and mobile phone sold as individual pieces to scrap dealers.

In **Bilaspur division** it has been found that Jarha bhata, Gaura Path road, Masanganj Imali Para, Old Bustand area in Bilaspur District, Bustand Area, Raja Bada, Mungeli road, Hira laa road, Phokat para in Mungeli District, Indira Nagar, Sunday Market, Mudapur Bypass, Machali Markent etc in Korba District, Station Road, Kera road, Birghani Chowk, Idgah Complex etc of janjgir Champa District and Chakradhar Nagar, Chhata Mura,kedwabadi Bustand, Guru Ghasi Das Chow etc In Raigarh District has a strong metal, and electronics scrap market. In these areas, defunct electrical and electronic equipment are generated and sold to scrap dealers. Together with this the market also sells, components from PCs like mother boards, floppy drives, components from the mother boards, printers, monitors etc. Scrap dealers come from Delhi and collected scrap from different areas of Bilaspur Division and then transported to Delhi. They used to come twice/thrice in a year especially at the time of Bishwakarma Puja and Diwali. The motherboards and floppy drives are removed from the machines by scrap vendors and sold by weight and mobile phone sold as individual pieces to scrap dealers

In **Durg division** it has been found that Durg, Motinpur road, Muslim Para, Satwani Mohalla, Ward NO_9, nagar panchayat Road, green Chowk, naurani Chowk, ward no 2, naya Para, Bajar para, Bharat pur, Jama Masjid, Kawardha, Adarsh Nagar, Chetan Chowk, Mossinpur Pandariya, Bajar para Khandara para, Kalimandir Road, Rani durgavati Chowk, Fuhara chowk, Bodhi Tola, Mahavir Para, Puranaganj CDhowk and Kanchan Bag area in Durg division has a strong metal, and electronics scrap market. In these areas, defunct electrical and electronic equipment are generated and sold to scrap dealers. Together with this the market also sells, components from PCs like mother boards, floppy drives, components from the mother boards, printers, monitors etc. These components are collected in bulk from Mechanic shops / scrap vendors shops then taken to crushing areas. Scrap dealers come from Delhi and collected scrap from different areas of Durg Division and then transport them to Delhi. They use to come twice/thrice in a year especially at the time of Bishwakarma Puja and Diwali. The motherboards and floppy drives are removed from the machines by scrap vendors and sold by weight and mobile phone sold as individual pieces to scrap dealers.

In **Surguja division** it has been found that Chando Road, Mission Road, Shanti para, Jail road, Wardaf nagar in Balrampur District, Jyoti Niwas Road, Pathargaon Road, Abikapur Road in Jashpur District, Jabri para, Rai baba tiraha, Rai Mahal, Arab baba Sahdol road area in Koriya District, Old Bustand, Kharsia road, Nawa garh, Chandni Cowk area in Surguja District and Sunday market area, Bisharpur, Mahgawa, Bhaiyathan road and government hospital area in Surajpur Area has a strong metal and electronic scrap market. These waste and scrap items are then transported to Ghaziabad, Gwalior, Etawah & Delhi. They used to come twice/thrice in a year. The motherboards and floppy drives are removed from the machines by scrap vendors and sold by weight and mobile phone sold as individual pieces to scrap dealers. None of these scrap vendors have the ability to identify the condition of these components.

In **Bastar Division** it has been found that Bastar Sukma, Patnapara, Aurabhata, Ward no 6, Ward no 5, Banglapura, Masjid pura, DNK Colony, Dharampura, Rautpura, Jagdevpur, Oeedam road, Jagdalpur, Motitalab, Dabrapara, Marketing society, Madhav waraKesh kai road, Sanjaypura, Jamkotipura, Bazarpura, Albeda, Pharas gaon has a strong metal, and electronics scrap market. In these areas, defunct electrical and electronic equipment are generated and sold to scrap dealers. Together with this the market also sells, components from PCs like mother boards, floppy drives, components from the mother boards, printers, monitors etc. These components are collected in bulk from Mechanic shops / scrap vendors shops then taken to crushing areas. Scrap dealers come from Delhi and collected scrap from different areas of Bastar Division and then transport them to Delhi. They used to come twice/thrice in a year. The motherboards and floppy drives are removed from the machines by scrap vendors and sold by weight and mobile phone sold as individual pieces to scrap dealers.

Inventory of hotspots, identified in the study area have been geographically shown & also mapped in **Annexure 7**. Summary of major findings at these hotspots are given below.

Some of the major findings of Chhattisgarh are given below.

- Electronic items go to mechanic shops from households for repairing, and mechanic replaces damaged / defunct parts / components from it and then they sell it to scrap dealers.
- Mechanics sell E-waste to scrap dealer by weight / Pcs. mainly of ICT items (IT as per Schedule 1); The average costs are; TV circuit Rs. 15-45/kg; Compressor Rs. 300-400/Pcs.; Washing Machine Motor Rs. 200/Pcs.; Copper Rs. 200-350/kg; DVD Circuit Rs. 20-25/kg; Mobile kit Rs. 1000-2000/kg; SMPS Rs. 50/Pcs, Mother Board Rs. 90/Pcs.; Hard disk Rs. 120/Pcs.; CD Writer Rs. 35-40/Pcs.
- Small scrap vendors sell E-waste to big scrap dealer by weight / Pcs, at an average cost of; TV Circuit Rs. 20-50/kg & TV 250-300/Pcs.; Compressor Rs. 400-450/Pcs.; Copper Rs. 350-450/kg; Refrigerator Rs. 500-1200/Pcs.; Washing Machine Rs. 700-800/Pcs; CFL Rs. 300/kg and Mobile kit Rs. 30-50/Pcs.
- Scrap dealers comes from Ghaziabad, Gwalior, Etawah & Delhi yearly twice / thrice for collection of E-waste.
- There is no organized mechanism for collection, transportation and disposal of E-Waste in Chhattisgarh.
- No mechanism exists in the state to monitor and track its inventory, collection, transportation and disposal.

<u>Market Features</u>

E-waste Market concentration is mainly in Raipur, Bilaspur, Durg, Surguja and Bastar. This is due to higher penetration of EEE because of population concentration in this area. The EEE markets have been found to be small and price sensitive. Major brands, which have been observed, are Nokia, LG, Sony, Samsung, Panasonic, Philips, Videocon, Godrej, Onida, Whirlpool, Kelvinator, Haier, Hitachi, Voltas, Blue Star, Dell, HP, HCL and Lenovo. The new items after active life gets repaired and reused by the owner of the item. In case it becomes useless, it is left at repair centre, where it is cannibalized & finally its fractions are thrown in the dust bin.

Majority of material/ E-waste is transported to Delhi with scattered temporary storage at different places of different towns.

<u>Dump Sites (E-waste tracers)</u>

Only Plastic and Glass parts of E-waste were found in Dump Site. Mixed waste was found in all dump sites. A summary of the process observed is shown in **Figure 3.5**.



Figure 3.5: Processes observed at dumpsite

Collection, Transportation & Processing (scrap dealers)

Small scrap dealer purchase waste from Household / Commercial Area / Institution, etc. At first stage, they segregate the waste than break the item and collect valuable items like Aluminum, Copper, Iron & Steel, Compressor, motor, etc. from E-waste. They sell their collected item to the large scrap dealer. They visit nearby area on daily/weekly basis and purchase the waste. These scrap dealers are not licensed by the municipalities but are part of the networks of large scrap dealers. A summary of the process observed is illustrated in **Figure 3.6**.



Figure 3.6: Processes observed at scrap dealers / junkyards

Repair Shops (AC/WM/REF)

One person repairs one of these items every day. E-waste fractions/ waste Parts, like plastic body of these items, etc. is dumped into community bin and valuable item sold to nearby scrap dealer. Some of the respondent informed that Item which is not in repairable condition is returned to the owner of the product who in turn sells to the scrap dealer. Majority of the product are in repairable condition. A summary of the process observed is shown in **Figure 3.7**



Figure 3.7: Processes observed at AC, Washing Machine, and Refrigerator Repair Shop

Repair Shops (TV / PC / Mobile Phone)

Majority of mobile phones, TV & computers repair shop owners are local citizens. Waste Parts, like plastic body of these items, etc. are dumped into community bin and valuable item sold to

nearby scrap dealer. They also store valuable item and use it to repair other EEE. Majority of the product are in repairable condition. A summary of the process observed is shown in **Figure 3.8**.



Figure 3.8: Processes observed at TV, Computer, and Mobile Phone Repair Shop

Summary E-Waste Process Study in Raipur, Bilaspur, Durg, Surguja and Bastar Divisions of Chhattisgarh

There are various processes involved for recycling / reusing of electronic waste. The major process for different types of electronic items in Raipur, Bilaspur, Durg, Surguja and Bastar are mentioned in Table 3.5.

Sr No	Processes	Raipur	Bilaspur	Durg	Surguja	Bastar
1	IC's Extraction from PCB	No	No	No	No	No
2	Surface Heating of PCB and Extraction of components	No	No	No	No	No
3	Dissembling of Monitor & TV and extraction of components	Yes	Yes	Yes	Yes	Yes
4	Yoke core and Copper	No	No	No	No	No
5	Metallic Core of Transformer and Copper	Yes	Yes	Yes	Yes	Yes
6	Rare Earth Core of Transformer and Copper	No	No	No	No	No
7	Rare Earth Core of Static Transformer	No	No	No	No	No
8	Wire PVC and Copper	Yes	Yes	Yes	Yes	Yes
9	Plastic Shredder	No	No	No	No	No
10	Dismantling of Refrigerator and Compressor	Yes	Yes	Yes	Yes	Yes
11	Gold Extractions from Pins and Comb	No	No	No	No	No
12	Acid Bath for PCB	No	No	No	No	No
13	Regunning CRT's	No	No	No	No	No
14	Glass Recovery from CRT	No	No	No	No	No
15	Gold Recovery	No	No	No	No	No

Table 3.5: Processes involved for E-waste recycling in different towns

The process details of fifteen processes are given in **Table 3.5**. The analysis of this table shows that there is dismantling activity occurring in Raipur, Bilaspur, Durg, Surguja and Bastar divisions of Chhattisgarh. The entire amount of E-waste from these towns is transported to Delhi for dismantling and further supply to Delhi market. Photo documentation captured in Raipur, Bilaspur, Durg, Surguja and Bastar divisions of Chhattisgarh is given in **Annexure 8**.

3.4 Conclusions Raipur, Bilaspur, Durg, Surguja and Bastar Divisions of Chhattisgarh

Major conclusions, which can be derived, include growing market of EEE in Riapur, Bilaspur, Durg, Surguja and Bastar divisions of Chhattisgarh. This growth may lead to increasing E-waste generation, which may further lead to higher pollution loads, health impacts and loss of recoverable items.

Chapter 4: Methodology for E-waste Inventory

4.0 Introduction

E-waste inventory forms the backbone of its E-waste management in a geographical area. There are, five methods, which have been used to determine E-waste inventory in both developed and developing countries. Each of these methods use "Material Flow" model. Therefore, the selection of E-waste inventory assessment methodology in five divisions of Chhattisgarh. Raipur, Bilaspur, Durg, Surguja and Bastar divisions is based on the availability, reliability and analysis of data along the material flow chain within their geographical boundary. The following sections describe each of these methods, their application, constraints, advantages, data requirements and sources of data in the context of Chhattisgarh.

4.1 Methods for Inventory Assessment

Different methods of E-waste inventory assessment as per UNEP's Manual 1 on E-waste Inventory Assessment are given below.

- 1. The Time Step Method.
- 2. The Market Supply Method.
- 3. The Carnegie Mellon Method.
- 4. Approximation Method 1.
- 5. Approximation Method 2.

The description of each of these methods is given in **Annexure 9**. **Annexure 9** also describes constraints and advantages of each of these methods. The data requirement for each methodology based on mathematical expressions is also given in **Annexure 9**. The extent of data required depends on the extent of geographical boundary, which could be national, regional or city boundary. Conceptually, the source of data can be identified by understanding the "material flow chain" within the given geographical boundary.

The E-waste material flow chain in Chhattisgarh as described in **Figure 3.4** of Chapter 3 is again shown in **Figure 4.1** in the context of inventory assessment. **Figure 4.1** shows that in all the five divisions of the study area, the material flows from an organized / formal sector starting from production / manufacture till consumption phase, where major percentage of material enters into unorganized / informal sector. Therefore, the major constraints are related to availability, reliability, amount and range and completeness of the data along the chain.

Analysis of transfer of E-waste flow chain from formal to informal sector shows that the data for EEE in Chhattisgarh needs to be collected from secondary sources & primary survey. Therefore, E-waste inventory assessment in Chhattisgarh requires collection of available secondary data from the formal sector & its strengthening by primary survey in the informal sector followed by trend analysis.

4.2 Material Flow Chain, Data Sources and Data Gaps in Study Area

Figure 4.1 indicates that stakeholders existing in the study area are EEE retailers, consumers, service centres, E-waste collectors (to a limited extent) and two dismantlers in formal sector & other E-waste collectors (majority), & dismantlers in the informal sector in the study area. Therefore, secondary data related to stakeholders in the flow chain in the formal sector at

temporal level was identified, collected and collated for quantification, while primary survey was carried out covering stakeholders in the informal sector in the study area. The detailed findings of the primary survey are given in Chapter 3.



Figure 4.1: E-waste material flow chain in Study Area

A list of sources of data in study area, which was required for application of inventory assessment methodology as per **Annexure 10** has been prepared and summarized in **Table 4.1**. Consultants visited the agencies identified in **Table 4.1** for collection of secondary data. Major observations related to data availability are given below.

- Saturation Level National census data was obtained from office of the Registrar General & Census Operation, Govt. of India, National Sample Survey Organization (NSSO), Department of Statistics, Government of India, State Statistics from Department of Statistics, Government of Chhattisgarh, Telecom Regulatory Authority of India (TRAI), Ministry of Communications & Information Technology (MOCIT), Government of India, Industry Association like Manufacturers Association for Information Technology (MAIT), Electronic Industries Association of India (ELCINA), Telecom Equipment Manufacturers Association of India (TEMA) & Research Institutions e.g. National Council for Applied Economic Research (NCAER).
- 2. Number of Households Available with national census data (1991, 2001 & 2011).
- 3. Stock Data Stock levels at private/households, industry, commercial & sectors with Industry Association.
- 4. Data related to average life time, storage data, reuse, recycling & disposal at landfill site is not available from secondary sources & so primary survey was carried out in the study area.

Data Source/ Item	National/ Local Government Agencies	Industry/ Trade/ Recyclers/ Waste Disposal Operator's Association (Reports/ Published Data/ Field Work)	Market Research Agencies (Reports/ Published Data)
Saturation Level (Household Industry)	National Census Data, &(1991, 2001 & 2011)	Major Trading Agencies, (Retailers)	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
Number of Household	National Census Data,		
Export Data	Not required		
Import Data	Not required		

 Table 4.1: Tentative sources of data in Study Area

Data Source/ Item	National/ Local Government Agencies	Industry/ Trade/ Recyclers/ Waste Disposal Operator's Association (Reports/ Published Data/ Field Work)	Market Research Agencies (Reports/ Published Data)
Stock Data Private (Rural & Urban)	eNSSO (1994 – 2010)	Industry Association, Scrap Dealers, Recyclers, EEE Retailers	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
Stock Data Industry	TRAI, MOCIT, Govt India.	ofIndustry Association, Scrap Dealers, Recyclers, EEE Retailers	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
Average Life Time Technology Change	,TRAI, MOCIT, Govt India.	ofMajor Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications, Annual Reports of Major Brands
Storage Data		Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications, Newspapers
Reuse		Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications
Recycle		Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	
Disposal in Landfill	City Municipalities	Scrap Dealers, Recyclers, EEE Retailers	

A matrix describing inventory methodology versus data availability has been prepared after assessing the data obtained as per Table 4.1 (based on data requirement methodology given in Annexure 11) and summarized in Table 4.2. The major inferences, which can be drawn from Table 4.2, are given below.

		Table 4	l.2: Data M	latrix V	s Meth	odology						
	Saturation	Level		Calcula	ated Sal	les	Stock	Data	-		` .	
Methodology / Data Requirement	Househol d	Industr y	Number of Househol d	Expor t Data	Impor t Data	Manufacturin g / Production	Privat e	Industr y	Average Lifetime Storage data	Reuse	Necycle diemantlinø	Landfill
Time Step Method	Х		\checkmark	Х	Х	\checkmark	Х	Х	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			
Market Supply Method	T			Х	Х	\checkmark			\checkmark			
Carnegie Mellon				Х	Х	\checkmark			$\sqrt{}$	\checkmark		

Methodology / Data Requirement	Saturation Househol d	Level Industr y	Number of Househol d	Calcula Expor t Data	ated Sal Impor t Data	es Manufacturin g / Production	Stock Privat e	Data Industr y	Average Lifetime Storage data	Reuse Kecycle / dismantlino Landfill
Method										
Approximation 1	n X	Х	\checkmark			\checkmark	Х	Х	\checkmark	
Approximation 2	1			Х	Х	\checkmark				

Note: √ means 'Available'/"Can be Derived"; X means 'Not Available'; NV means 'No value'

Since E-waste market in Chhattisgarh is a continuously growing market, which has not reached saturation levels, therefore Time Step Method, Approximation 1 & Approximation 2 Method have not been used. Further, market supply method can be applied since it requires at least one set of data related to EEE penetration & one set of data after E-waste generation. Carnegie Mellon method appears to give better estimates than Market Supply Method since data related to reuse and storage can be estimated while assessing, average life time based on primary & secondary data analysis. Further, only E-waste fractions of no economic value have been found in landfill sites in the study area.

Some of the findings of the secondary & primary data survey, which have been observed, are given below. These findings have been used for carrying out inventory assessment of E-waste from items mentioned in Schedule 1 of E-waste rules 2011.

- 1. The office automation industry has undergone radical shift around 2006-07. The differentiation or gap between "Copier" and "Printer" segment of the Office Automation Industry had been bridged around the year 2006-07. The multi Functions Products (MFPs), which is Printer / Scanner / Fax / Copier, (including color MFPs) are the key drivers of this industry. Therefore, for E-waste inventory assessment, items Printers including cartridges, Copying Equipment, & Facsimile mentioned in Schedule 1 of E-waste rules, have been clubbed under one head of **"Printers including Cartridges"** for inventory assessment.
- 2. It is pertinent to state that Bharat Sanchar Nigam Limited is the only Telecom. Service Provider providing Telegraph Services to the citizens of the country across the length and breadth of the nation. As per BSNL there has been steep decline in the usage of Telegraph Services due to large scale penetration of Fixed Line Telephony, Mobile Services and Internet Services. SMS and E-mails have gained greater importance in Message Transmission over the years. Realizing the declining usage of Telegraph Services, the Establishment branch of BSNL Corporate Office defined Telegraph Services as diminishing services vide circular No. 19 1/2009/TE-II dated 19-02-2010. BSNL in order to keep pace with technological developments introduced Web Based Telegraph Messaging System in all circles by 31-03-2010. Further no Telex machines had been encountered at any of the scrap dealer in all the cities in the study area.
- 3. Typewriter production stopped in India in 2010. Godrej & Boyce was the only typewriter producing company in the world. Although primary survey in all the five divisions, district wise of the study area, indicated presence of mechanical typewriters in courts premises & few government offices. Further, primary survey at the scrap dealer also did not indicate any presence of electric or electronic typewriter coming into the dismantling or recycling chain.
- 4. NSSO data, Census data & data from research institution indicate temporal data compilation at national, state & district level for all types of TV (CRT, LCD & LED) clubbed together. Therefore, all the three items under consumer Electrical & Electronics under schedule 1 of E-waste rules have been clubbed under the head TV for E-waste inventory assessment.
- 5. Temporal data from Census, NSSO, MOCIT, TRAI, TEMA market research institutions &

telecom operators is classified under fixed line and cellular subscribers at national, state & district level. Further, cellular subscribers consist of GSM & WLL categories. Therefore, Pay telephones, Cordless telephones and Answering systems have been considered as subsegments under fixed line subscriber segment since the consumers choice of instrument cannot be accomplished without subscription to a telephone connection. Therefore, E-waste inventory assessment has been carried out based on temporal fixed line and cellular telephone subscription at district level consisting of both rural & urban consumers.

- 6. Temporal data from Census, NSSO, MOCIT, MAIT market research institutions & telecom operators is classified under Desktop, PC, Notebooks & servers at national, state & district level. Further, Notebook consumers consist of netbooks & notpad computers, servers have also been considered consisting of mainframes & minicomputers subscribers consist of GSM & WLL categories. Therefore, E-waste inventory assessment has been carried out under the head of "computers".
- 7. Among the white goods both households and commercial segments drive the air conditioner market, while households drive the refrigerator, washing machine and TV market.

4.4 Methodology / Approach & Instruments Used

Carnegie Mellon method has been identified for E-waste inventory assessment in study area. Major data requirements in order to use this method are given below.

- 1. Information about stakeholders i.e. recycler / dismantler, scrap dealer, consumer etc.
- 2. Stock and generation of E-waste
- 3. Origin of new electrical and electronic equipment i.e. mode of procurement
- 4. Life time of electrical and electronic equipment
- 5. End of life management of electrical and electronic equipment
- 6. Process involved during dismantling
- 7. Final destination of E-waste fractions

In order to get the required data, two approaches have been adopted. These approaches are depicted in **Figure 4.2** and cover all the identified stakeholders in study area. Salient features of these approaches are given below.

Approach 1: Combination of primary and secondary data collection

Different types of data required has been identified collected, Collated & analyzed from the sources given in **Table 4.1**.

Approach 2: E-waste tracer tracking

In this approach, E-waste tracers are identified at dumpsites, which lead to identification of stakeholders further up on the upstream side of the material flow chain as given in **Figure 4.2**. These stakeholders include dismantlers, junkyard owners, repair shops and retail shops. Different processes carried out by stakeholders are identified, photo-documented and quantified. A list of dismantlers / recyclers, scrap dealers, trading agents, landfill sites and other agencies surveyed is given in chapter 3 and related annexures.



area

4.5 Conclusion

Data matrix versus methodology used for E-waste inventory assessment indicates "Market Supply" method and "Carnegie Mellon" method can be applied for WEEE / E-waste inventory assessment in five divisions of the study area. However, a combination of Carnegie Mellon method & tracer tracking has been selected for inventory assessment since it covers all the aspects of material flow chain. Assessment of data from these stakeholders through tracer tracking has resulted in assessment of obsolescence rate or average life of equipment described in chapter 5.

Chapter 5: E-waste Inventory Assessment

5.1 Introduction

This chapter describes the E-waste inventory and market scenario for the E-waste management system in the study area. Since E-waste inventory forms the basis of planning for E-waste management system, an effort has been made to assess the E- waste inventory and market potential in the country. Following sections describe each of these items followed by pollution potential and risk profiling.

5.2 Market Size Assessment of Electrical and Electronic Equipment (EEE) in Raipur, Bilaspur, Durg, Surguja and Bastar divisions of Chhattisgarh

The time series data related to market size of each of the EEE items has been computed from data obtained from different agencies as well as from trend analysis. This data was compiled from data sources described in chapter 4. Division wise EEE market size for Air Conditioners, refrigerator, washing machine, personal computers, cellular telephones, TVs and other items as per schedule 1 is shown in **Table 5.1** to **Table 5.9**. District wise and item wise breakup of EEE installed base of all divisions for Air Conditioners, refrigerator, washing machine, personal computers, cellular telephones, TVs and other items as per schedule 1 market size is given in **Annexure15**.

Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
2006	22911	20852	17215	11826	9605	82409
2007	140634	127150	104753	71569	57835	501941
2008	212922	191187	157217	106819	85886	754030
2009	284208	253375	208017	140547	112429	998575
2010	343482	303764	249045	167321	133160	1196772
2011	366901	328450	268233	182025	145359	1290968
2012	409719	364184	296895	200473	159708	1430979
2013	450890	397840	323846	217585	172905	1563066
2014	491185	430108	349681	233780	185286	1690040
2015	531153	461461	374823	249351	197079	1813867
2016	571206	492242	399585	264514	208453	1936000
2017	611668	522708	424218	279439	219535	2057568
2018	652809	553061	448927	294263	230426	2179487
2019	694858	583463	473895	309104	241208	2302529
2020	738023	614049	499285	324065	251951	2427373

Table 5.1: Installed base for Cellular Telephone in Study Area (in Numbers)

Source: Census 1991, 2001 & 2011, Telecom Regulatory Authority of India (TRAI), Department of Telecommunications (DOT)



Figure 5.1: Installed base for Cellular Phone in Study Area

Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
2006	97960	89154	73604	50564	41066	352347
2007	83028	75068	61845	42253	34145	296339
2008 *	96861	86973	71520	48593	39070	343018
2009	89201	79524	65288	44112	35287	313412
2010	82554	73052	59893	40239	32023	287761
2011	78947	70693	57732	39177	31286	277834
2012	76860	68337	55711	37618	29968	268493
2013	74855	66067	53779	36133	28714	259549
2014	72930	63880	51935	34721	27519	250985
2015	71080	61772	50175	33379	26382	242788
2016	69303	59741	48496	32103	25299	234942
2017	67596	57783	46895	30891	24269	227434
2018	65956	55896	45371	29740	23288	220252
2019	64380	54076	43921	28648	22356	213382
2020	62866	52322	42544	27613	21468	206814

Table 5.2: Installed base for Fixed Line Telephone in Study Area (in Numbers)

Source: Census 1991, 2001 & 2011, Telecom Regulatory Authority of India (TRAI), Department of Telecommunications (DOT)

* → Private Telecom Operators were allowed in 2008



Figure 5.2: Installed base for Fixed Line Phone in Study Area

Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
2006	13702	12470	11096	5482	3229	45979
2007	22060	20077	17865	8825	5199	74026
2008	37060	33729	30013	14826	8734	124363
2009	63373	57676	51323	25353	14936	212661
2010	102347	93147	82886	40946	24122	343447
2011	161708	147172	130960	64694	38112	542646
2012	257116	234003	208226	102863	60598	862808
2013	419100	381426	339409	167667	98775	1406377
2014	662741	606493	536723	265142	156725	2227825
2015	1065325	974909	862758	426203	252167	3581361
2016	1712460	1567120	1386842	685102	405731	5757254
2017	2752698	2519071	2229283	1101268	652813	9255135
2018	4424832	4049288	3583467	1770237	1050367	14878191
2019	7112709	6509039	5760255	2845572	1690026	23917601
2020	11433343	10462973	9259337	4574123	2719234	38449010

Table 5.3: Installed base for Computers in Study Area (in Numbers)



Figure 5.3: Installed base for Computer in Study Area

Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
2006	2055	1870	1664	822	484	6897
2007	3309	3011	2680	1324	737	11061
2008	4818	4385	3902	1927	1454	16486
2009	12041	10958	9751	4817	2794	40362
2010	24563	22355	19893	9827	3916	80555
2011	29108	26491	23573	11645	5717	96533
2012	38567	35101	31234	15430	8840	129172
2013	58674	53400	47517	23473	12627	195691
2014	65715	59808	53219	26290	14142	219174
2015	73601	66984	59606	29445	15839	245475
2016	82433	75023	66758	32978	17740	274932
2017	92325	84025	74769	36936	19868	307924
2018	103404	94108	83742	41368	22253	344874
2019	115812	105401	93791	46332	24923	386259
2020	129709	118049	105046	51892	27914	432610

Table 5.4: Installed base for Printers in Study Area (in Numbers)



Figure 5.4: Installed base for Printers in Study Area

Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
2006	388939	341586	312865	163726	128574	1335691
2007	420744	365069	331266	176878	137286	1431244
2008	454361	389528	350502	190885	146276	1531552
2009	489902	415005	370641	205869	155557	1636973
2010	490924	426059	377284	220612	163639	1678518
2011	527389	452742	397883	237941	173807	1789762
2012	565872	480532	419444	256787	184349	1906984
2013	606488	509473	442041	277418	195286	2030706
2014	649362	539614	465754	300162	206636	2161529
2015	694622	571004	490674	325424	218424	2300148
2016	742407	603693	516900	353701	230673	2447374
2017	792863	637735	544539	385613	243410	2604159
2018	830341	658851	562835	413634	250115	2715776
2019	902416	710097	604562	463588	270459	2951122
2020	961852	748535	637231	511783	284836	3144238

Table 5.5: Installed base for TV in Study Area (in Numbers)



Figure 5.5: Installed base for TV in Study Area

Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
2006	2922	2475	2599	845	642	9483
2007	3242	2687	2790	946	701	10365
2008	3588	2910	2990	1060	763	11312
2009	3963	3145	3201	1190	830	12331
2010	3914	3223	3265	1085	887	12374
2011	4301	3471	3478	1202	963	13414
2012	4718	3732	3702	1333	1045	14530
2013	5169	4007	3940	1482	1132	15730
2014	5656	4297	4191	1652	1226	17023
2015	6181	4603	4458	1847	1327	18417
2016	6748	4926	4743	2071	1436	19924
2017	7359	5266	5047	2332	1554	21558
2018	8017	5625	5374	2637	1680	23333
2019	8728	6003	5725	2995	1817	25267
2020	9493	6401	6104	3418	1964	27381

Table 5.6: Installed base for AC in Study Area (in Numbers)



Figure 5.6: Installed base for AC in Study Area

Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
2006	3261	2735	2765	1108	833	10702
2007	3627	2989	2997	1229	907	11748
2008	4015	3249	3233	1360	983	12841
2009	4426	3517	3475	1504	1061	13984
2010	4415	3620	3560	1427	1127	14149
2011	4824	3888	3794	1554	1211	15271
2012	5255	4164	4032	1692	1298	16442
2013	5710	4447	4277	1844	1390	17667
2014	6189	4736	4528	2012	1484	18951
2015	6694	5034	4788	2199	1583	20298
2016	7225	5338	5056	2409	1687	21715
2017	7784	5650	5334	2647	1795	23209
2018	8371	5968	5623	2917	1908	24788
2019	8988	6294	5925	3228	2026	26462
2020	9634	6626	6242	3588	2150	28241

Table 5.7: Installed base for Washing Machine in Study Area (in Numbers)



Figure 5.7: Installed base for Washing Machine in Study Area

Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
2006	5847	4908	5083	1834	1373	19045
2007	6746	5549	5698	2111	1545	21650
2008	7744	6242	6358	2427	1733	24504
2009	8853	6989	7068	2789	1936	27636
2010	9077	7421	7473	2674	2124	28769
2011	10283	8245	8231	3025	2363	32145
2012	11615	9132	9042	3424	2623	35836
2013	13087	10087	9914	3881	2906	39876
2014	14712	11115	10853	4408	3217	44304
2015	16504	12220	11865	5018	3556	49163
2016	18480	13409	12958	5729	3927	54503
2017	20657	14686	14143	6565	4333	60383
2018	23053	16058	15429	7552	4779	66871
2019	25690	17531	16830	8726	5268	74044
2020	28590	19112	18360	10130	5804	81997

Table 5.8: Installed base for Refrigerator in Study Area (in Numbers)



Figure 5.8: Installed base for Refrigerator in Study Area

Table 5.9: Division wise Installed base for all	Electronic items in Chhattisgarh (in
Numbers)

Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
2006	537597	476050	426891	236208	185807	1862553
2007	683390	601600	529894	305135	238355	2358374
2008	821370	718203	625736	367898	284900	2818106
2009	955967	830190	718764	426181	324831	3255933
2010	1061276	932640	803299	484130	360998	3642343
2011	1183459	1041151	893882	541263	398818	4058573
2012	1369723	1199184	1028287	619621	448429	4665244
2013	1633974	1426747	1224723	729485	513734	5528663
2014	1968490	1720052	1476886	868168	600334	6633929
2015	2465161	2157988	1859146	1072865	727737	8282897
2016	3210262	2821491	2441338	1378608	918624	10770323
2017	4352950	3846924	3344228	1845691	1211699	14601491
2018	6116784	5438855	4750769	2562348	1720117	20588874
2019	8933581	7991905	7004903	3708194	2486664	30125247
2020	13373512	12028068	10574148	5506614	3695294	45177635

Source: Compiled by IRGSSA



Figure 5.9: Division wise Installed base Projection for all Electronic items in Chhattisgarh

Analysis of Table 5.9 and Figure 5.9 shows that Raipur has the highest installed base of all electronic items followed by Bilaspur, Durg, Surguja and Bastar divisions of Chhattisgarh.

5.3 Obsolescence Rate / Average Life

Obsolescence rate / Average life for electrical and electronic equipment (EEE) has been calculated based on results of the sampling carried out for consumers, dismantlers, retailers and dumpsites along the E-waste "trade value chain" described in chapter 3 & chapter 4 and summarized in **Table 5.10**. The storage time takes into account storage at owner's premises, collection agency (scrap dealer) & dismantler's premises.

,	Table 5.10: Average Life and Storage	of E-waste
EEE Item	Average Life & Reuse (Years)	Storage (Years)
Cellular Phone	2	0.5 - 1
Computer	4 to 6	0.5 - 1
Printer	4 to 5	0.5 - 1.0
Washing Machine	8 to 10	0.5 - 12
TV	9 to 10	1
Refrigerator	10 to 11	0.5 - 1
Air Conditioners	8 to 10	1 - 2
Fixed Line Telephone	4 to 5	0.5 - 1

A conservative estimate of the average life of each EEE item has been prepared by considering highest values of average life and storage time considering the consumer behavior in the study area. This estimate has been summarized in **Table 5.11**.

		Descence Rate of Tracer EEE
Sr. No.	EEE	Average Life (Years)
1	Cellular Phone	3
2	Computer	7
3	Printer	6
4	Washing Machine	12
5	TV	11

Table 5.11: Obsolescence Rate of Tracer EEE
Sr. No.	EEE	Average Life (Years)
6	Refrigerator	12
7	Air Conditioner	12
8	Fixed Line Telephone	6

The average weights of each of the six items considered for computing E-waste inventory is given in Table 5.12.

Table 5.12: Average weight of EEE						
Item	Average Weight (Kg)					
Cellular Phone	0.100					
Computer / Laptop / Server	27.2 / 2.5 to 3 / 650					
Printer (MFP)	6.5 - 7					
Washing Machine	55					
TV (CRT) / LCD / LED	31.6 (CRT) / 12 – 15 (LCD / LED)					
Refrigerator	35					
Air Conditioner	55					
Fixed Line Telephone	0.5 – 1.5					

Table 5 12: Average weight of EEE

5.4 E-waste inventory for Raipur Bilaspur, Durg, Surguja and Bastar Dividions of Chhattisgarh

The projected division wise E-waste inventory estimates in weights for Raipur, Bilaspur, Durg, Surguja and Bastar divisions of Chhattisgarh starting from 2011 till 2020 have been described in Table 5.13 to Table 5.20 and presented in Figure 5.10 to Figure 5.18.

Table 5.13: Division wise E-waste Inventory	of for Cellular Phones in Chhattisgarh (in
Tons	s)

			10115)			
Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
2011	31.94	28.68	23.58	16.02	12.88	113.10
2012	42.63	38.01	31.20	21.08	16.86	149.79
2013	51.52	45.56	37.36	25.10	19.97	179.52
2014	55.04	49.27	40.23	27.30	21.80	193.65
2015	61.46	54.63	44.53	30.07	23.96	214.65
2016	67.63	59.68	48.58	32.64	25.94	234.46
2017	73.68	64.52	52.45	35.07	27.79	253.51
2018	79.67	69.22	56.22	37.40	29.56	272.08
2019	85.68	73.84	59.94	39.68	31.27	290.40
2020	91.75	78.41	63.63	41.92	32.93	308.64



Figure 5.10: Division wise E-waste Inventory for Cellular Phones in Chhattisgarh

			Tons)			C X
Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
2011	97.96	89.15	73.60	50.56	41.07	352.35
2012	83.03	75.07	61.84	42.25	34.14	296.34
2013	96.86	86.97	71.52	48.59	39.07	343.02
2014	89.20	79.52	65.29	44.11	35.29	313.41
2015	82.55	73.05	59.89	40.24	32.02	287.76
2016	78.95	70.69	57.73	39.18	31.29	277.83
2017	76.86	68.34	55.71	37.62	29.97	268.49
2018	74.86	66.07	53.78	36.13	28.71	259.55
2019	72.93	63.88	51.94	34.72	27.52	250.99
2020	71.08	61.77	50.17	33.38	26.38	242.79

Table 5.14: Division wise E-waste Inventory for Fixed Line Phones in Chhattisgarh (in



Figure 5.11: Division wise E-waste Inventory for Fixed Line Phones in Chhattisgarh

I able 5	.15: Division w	ise E-waste I	nventory for	Computers i	n Chhattisga	rh (in Ions)
Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
2011	135.59	123.40	109.81	54.24	31.41	454.45
2012	192.54	175.23	155.93	77.03	45.38	646.09
2013	286.88	261.09	232.33	114.77	67.61	962.68
2014	461.87	420.35	374.05	184.78	108.86	1549.91
2015	775.95	706.19	628.40	310.43	182.88	2603.85
2016	1326.87	1207.59	1074.57	530.83	312.72	4452.58
2017	2142.89	1950.26	1735.43	857.30	505.04	7190.92
2018	3385.77	3081.41	2741.98	1354.53	797.97	11361.66
2019	5383.38	4899.45	4359.74	2153.70	1268.77	18065.04
2020	8774.90	7986.10	7106.38	3510.54	2068.10	29446.01



Figure 5.12: Division wise E-waste Inventory for Computers in Chhattisgarh

Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
2011	14.39	13.09	11.65	5.76	3.39	48.28
2012	23.16	21.08	18.76	9.27	5.16	77.43
2013	33.72	30.69	27.31	13.49	10.18	115.40
2014	84.29	76.71	68.26	33.72	19.56	282.53
2015	171.94	156.49	139.25	68.79	27.41	563.88
2016	203.75	185.44	165.01	81.51	40.02	675.73
2017	269.97	245.70	218.64	108.01	61.88	904.20
2018	410.72	373.80	332.62	164.31	88.39	1369.84
2019	460.00	418.65	372.54	184.03	127.68	1562.91
2020	515.20	468.89	417.24	206.12	190.54	1797.99

Source: Compiled by IRGSSA



Figure 5.13: Division wise E-waste Inventory for Printers in Chhattisgarh

Table 5.17: Division wise E-waste Inventory for Televisions in Chhattisgarh (in Tons)								
Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh		
2011	7841.21	7339.20	7150.59	3333.29	2743.59	28407.88		
2012	8589.35	7932.92	7617.51	3645.07	2975.63	30760.47		
2013	9379.04	8550.66	8101.51	3972.10	3214.45	33217.75		
2014	10212.88	9193.64	8604.18	4315.93	3460.37	35787.00		
2015	11093.59	9863.06	9127.18	4678.38	3713.73	38475.94		
2016	12024.05	10560.14	9672.21	5061.60	3974.88	41292.88		
2017	13007.30	11286.12	10241.09	5468.18	4244.21	44246.90		
2018	14046.58	12042.26	10835.77	5901.21	4522.12	47347.94		
2019	15145.32	12829.87	11458.36	6364.43	4809.04	50607.02		
2020	15176.91	13171.62	11840.17	6773.30	5058.90	52020.89		



Figure 5.14: Division wise E-waste Inventory for Televisions in Chhattisgarh

				Lons)			
Ŋ	lear	Raipur	Bilaspur	Durg	Surguja	Bastar C	hhattisgarh
2	2011	79.28	76.37	90.49	23.53	20.30	289.95
2	2012	85.63	82.61	94.17	24.74	20.72	307.87
2	2013	97.16	91.71	102.99	27.91	23.07	342.84
2	2014	109.65	101.27	112.10	31.39	25.56	379.97
2	2015	123.20	111.32	121.54	35.21	28.20	419.47
2	2016	129.54	114.58	123.33	37.10	29.47	434.02
2	2017	144.50	125.07	132.92	41.53	32.30	476.32
2	2018	160.72	136.13	142.94	46.47	35.32	521.58
2	2019	178.29	147.78	153.44	52.02	38.55	570.08
2	2020	197.34	160.05	164.46	58.31	41.99	622.15

 $Table \ 5.18: Division \ wise \ E-waste \ Inventory \ for \ Air \ Conditioners \ in \ Chhattisgarh \ (in$



Figure 5.15: Division wise E-waste Inventory for Air Conditioners in Chhattisgarh

Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
2011	49.16	47.21	56.62	14.45	12.38	179.82
2012	79.53	73.92	79.54	28.55	23.12	284.66
2013	94.02	85.92	91.32	33.39	26.79	331.45
2014	109.27	98.19	103.19	38.38	30.49	379.51
2015	125.36	110.75	115.16	43.57	34.22	429.06
2016	142.35	123.64	127.29	49.01	38.01	480.29
2017	160.32	136.86	139.58	54.77	41.87	533.41
2018	179.35	150.44	152.08	60.93	45.82	588.62
2019	199.49	164.39	164.82	67.57	49.88	646.15
2020	220.83	178.72	177.82	74.80	54.05	706.23

Table 5.19: Division wise E-waste	Inventory for	Washing N	Machines in	Chhattisgarh	(in
	7				

Source: Compiled by IRGSSA



Figure 5.16: Division wise E-waste Inventory for Washing Machines in Chhattisgarh

I able 5.20	: Division wi	se E-waste In	iventory for	Refrigerators	in Chhattisg	garh (in Tons)
Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
2011	46.73	44.88	53.83	13.74	11.77	170.95
2012	72.34	67.95	74.76	24.37	19.86	259.27
2013	88.99	82.11	89.33	29.49	23.80	313.72
2014	107.49	97.39	104.84	35.09	27.99	372.79
2015	128.05	113.89	121.35	41.23	32.47	437.00
2016	150.93	131.72	138.97	48.05	37.28	506.94
2017	176.37	150.98	157.78	55.65	42.46	583.23
2018	204.66	171.77	177.90	64.20	48.05	666.58
2019	236.11	194.23	199.44	73.89	54.09	757.76
2020	271.06	218.47	222.55	84.94	60.64	857.65
c c .	ULL DCCC	1				

Table 5.20: Division wise E-waste Inventory for Refrigerators in C	Chhattisgarh (in Tons)
--	------------------------



Figure 5.17: Division wise E-waste Inventory for Refrigerators in Chhattisgarh

			Tonsj			
Yea	r Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
201	8296.25	7761.99	7570.17	3511.59	2876.78	30016.78
2012	2 9168.20	8466.78	8133.70	3872.35	3140.87	32781.91
2013	3 10128.20	9234.72	8753.67	4264.86	3424.94	35806.38
2014	4 11229.69	10116.34	9472.14	4710.70	3729.91	39258.78
201	5 12562.10	11189.39	10357.31	5247.92	4074.89	43431.61
2010	5 14124.07	12453.47	11407.68	5879.93	4489.59	48354.75
201	7 16051.90	14027.84	12733.61	6658.12	4985.53	54456.99
2018	18542.32	16091.10	14493.29	7665.19	5595.95	62387.85
2019	21761.20	18792.08	16820.20	8970.05	6406.81	72750.34
2020	25319.07	22324.03	20042.42	10783.29	7533.54	86002.35
6	a	a .				

Table 5.21: Division wise E-waste Inventory for All Electronic Items in Chhattisgarh (in



Figure 5.18: Division wise E-waste Inventory Projection for All Electronic Items in Chhattisgarh

Inventory estimates in Chattisgarh indicate that E-waste generation ranges from 30016.78 tons in 2011 to **86002.35** tons in 2020.

Raipur Division

The results of E-waste inventory estimates in (Tons) for Raipur division is given in **Table 5.21**. Major inferences, which can be drawn from E-waste inventory results, are given below.

- 1. Inventory estimates in Raipur division indicate that E-waste generation ranges from **8296.25** tons in 2011 to **25319.07** tons in 2020.
- In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 88% of the total inventory followed by refrigerator (1%), Washing machine (1%), Air conditioner (1%), Cellular phone (1%), Computer (6%), Fixed Line Phone (1%) & Printer (1%). shown in Figure 5.19.

3. In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (60%), computer will constitute about 35% of the total inventory followed by Refrigerator (1%), Air conditioner (1%), Washing machine (1%), Cellular phone (0%), Printer (2%) & Fixed Line Phone (0%) as shown in **Figure 5.20**.



Figure 5.19: Item-wise E-waste in Percent for Raipur Division in 2015



Figure 5.20: Item-wise E-waste in Percent for Raipur Division in 2020

Bilspur Division

The results of E-waste inventory estimates in (Tons) for Bilaspur division is given in **Table 5.21**. Major inferences, which can be drawn from E-waste inventory results, are given below.

- 1. Inventory estimates in Bilaspur division indicate that E-waste generation ranges from **7761.99** tons in 2011 to **22324.03** tons in 2020.
- In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 88% of the total inventory followed by Computer (6%), Washing machine (1%), Air conditioner (1%), Cellular phone (1%), Refrigerator (1%), Fixed Line Phone (1%) & Printer (1%) as shown in Fig 5.21.

3. In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (59%), computer will constitute about 36% of the total inventory followed by Printer (2%), Air conditioner (1%), Washing machine (1%), Cellular phone (0%), Refrigerator (1%) & Fixed Line Phone (0%) as shown in Fig **5.22**.



Figure 5.21: Item-wise E-waste in Percent for Bilaspur Division in 2015



Figure 5.22: Item-wise E-waste in Percent for Bilaspur Division in 2020

<u>Durg Division</u>

The results of E-waste inventory estimates in (Tons) for Durg division is given in **Table 5.21**. Major inferences, which can be drawn from E-waste inventory results, are given below.

- 1. Inventory estimates in Durg division indicate that E-waste generation ranges from **7570.17** tons in 2011 to **20042.42** tons in 2020.
- In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 88% of the total inventory followed by refrigerator (1%), Washing machine (1%), Air conditioner (1%), Cellular phone (1%), Computer (6%), Fixed Line Phone (1%) & Printer (1%) as shown in Figure 5.23.

3. In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (59%), computer will constitute about 36% of the total inventory followed by Refrigerator (1%), Air conditioner (1%), Washing machine (1%), Cellular phone (0%), Printer (2%) & Fixed Line Phone (0%) as shown in **Figure 5.24**.



Figure 5.23: Item-wise Percentage of E-waste for Durg Division in 2015



Figure 5.24: Item-wise Percentage of E-waste for Durg Division in 2020 Surguja Division

The results of E-waste inventory estimates in (Tons) for Surguja division is given in **Table 5.21**. Major inferences, which can be drawn from E-waste inventory results, are given below.

- 1. Inventory estimates in Surguja division indicate that E-waste generation ranges from **3511.59** tons in 2011 to **10783.29** tons in 2020.
- In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 89% of the total inventory followed by Computers (6%), Printer (1%), Washing machine (1%), Refrigerator (1%), Fixed Line Phone (1%), AC (1%) & Cellular Phone)% as shown in Figure 5.25.

3. In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (63%), computer will constitute about 33% of the total inventory followed by Printer (2%), Refrigerator (1%), Washing machine (1%), Air conditioner (0%), Cellular phone (0%), & Fixed Line Phone (0%) as shown in **Figure 5.26**.



Figure 5.25: Item-wise E-waste in Percent for Surguja Division in 2015



Figure 5.26: Item-wise E-waste in Percent for Surguja Division in 2020 Bastar Division

The results of E-waste inventory estimates in (Tons) for Bastar division is given in **Table 5.21**. Major inferences, which can be drawn from E-waste inventory results, are given below.

- 1. Inventory estimates in Bastar division indicate that E-waste generation ranges from **2876.78** tons in 2011 to **7533.54** tons in 2020.
- In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 91% of the total inventory followed by Computer (4%), refrigerator (1%), Washing machine (1%), Air conditioner (1%), Printer (1%), Fixed Line Phone (1%) & Cellular phone (0%) as shown in Figure 5.27

3. In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (67%), computer will constitute about 27% of the total inventory followed by Printer (3%), Refrigerator (1%), Air conditioner (1%), Washing machine (1%), Cellular phone (0%) & Fixed Line Phone (0%) as shown in **Figure 5.28**.



Figure 5.27: Item-wise E-waste in Percent for Bastar Division in 2015



Figure 5.28: Item-wise E-waste in Percent for Bastar Division in 2020

Analysis of **Table 5.21** and **Figure 5.18** shows that Raipur has the highest E-waste inventory of all electronic items followed by Bilaspur, Durg, Surguja and Bastar Divisions.

5.5 E-waste Processing in the Study Area

There are various processes involved for dismantling, recycling / reuse of E-waste in Raipur, Bilaspur, Durg, Surguja and Bastar divisions. These processes for different types of electronic items are given in **Table 5.22**. The photo-documentation of some of these processes observed is given in **Annexure 8**. An analysis of the different processes observed to recover metals indicates that no chemical process is occurring in study area. Only physical processes, which prepare raw material for recycling industry is observed in the study area. Iron recovered from E-waste is recycled through induction arc furnace route in the study area.

Sr No	Process Name	Raipur	Bilaspur	Durg	Surguja	Bastar
1	IC's Extraction from PCB	No	No	No	No	No
2	Surface Heating of PCB and Extraction of components	No	No	No	No	No
3	Dissembling of Monitor & TV and extraction of components	Yes	Yes	Yes	Yes	Yes
4	Yoke core and Copper	No	No	No	No	No
5	Metallic Core of Transformer and Copper	Yes	Yes	Yes	Yes	Yes
6	Rare Earth Core of Transformer and Copper	No	No	No	No	No
7	Rare Earth Core of Static Transformer	No	No	No	No	No
8	Wire PVC and Copper	Yes	Yes	Yes	Yes	Yes
9	Plastic Shredder	No	No	No	No	No
10	Dismantling of Refrigerator and Compressor	Yes	Yes	Yes	Yes	Yes
11	Gold Extractions from Pins and Comb	No	No	No	No	No
12	Acid Bath for PCB	No	No	No	No	No
13	Regunning CRT's	No	No	No	No	No
14	Glass Recovery from CRT	No	No	No	No	No
15	Gold Recovery	No	No	No	No	No
5.6	Trade Economics in	the Study A	rea			

Table 5.22: E-waste dismantling process occurring in the study area

Trade economics has been studied in terms of various processes, which occur along the trade value chain. Each stakeholder in the processes studied is linked to the other and the trade

value chain. Each stakeholder in the processes studied is linked to the other and the trade between the two takes place based on value added. The fundamental parameters governing this trade are same as that of any other trade. These parameters are described below.

- 1. Input cost
- 2. Profitability
- 3. Selling price

Input costs have been classified into the following costs.

- 1. Raw material cost
- 2. Labour cost

Selling price is the price at which the products are sold. The difference between the selling price and the input costs gives the operating margin. Operating margin is an indicator of the profit and has been computed in terms of operating margin per kg of raw material. The entire trade economics of each of the processes is summarized below. It does not include capital, depreciation, taxation and transportation cost. Labour refers to workers involved in e-waste extraction industry only and only 300 working days in a year.

Item	Rate / piece	Input Cost per Kg.	Labour Cost per Kg.	Output Price per Kg.	Profitability	⁰∕₀
TV	600	20.00	0.39	20.83	0.44	2.18
Ref	1000	22.22	0.39	34.07	11.46	50.69
WM	750	18.75	0.39	32.17	13.03	68.06
AC	3000	54.55	0.39	73.33	18.40	33.49
PC	1100	35.48	0.39	42.85	6.98	19.45
Mobile	38	38.00	0.39	62.59	24.20	63.04

Table 5.23: Trade economics of Chhattisgarh E-waste market

Some major observations from Table 5.23 are as follows:

- 1. Operating margin for Television waste per kilogram is Rs. 0.44
- 2. Operating margin for waste refrigerator is Rs. 11.46 per kilogram
- 3. For that of Washing Machine is Rs. 13.03 per kilogram
- 4. For that of Air Conditioners is Rs. 18.40 per kilogram
- 5. For scrap old Personal Computer is Rs. 6.98 per kg and
- 6. For waste cellular phones is Rs. 24.20 per kg
- 7. The operating margin ranges from Rs. 0.44 to Rs. 24.20 per kilogram. Scrap of Mobile / cellular phones gives the maximum operating margin of Rs. 24.20 while scrap from television gives the minimum profit of Rs. 0.44 per kilogram. This indicates that informal sector if brought into formal sector considering taxation involved will only dismantle / recycle cellular phones followed by ACs and WMs to some extent. Therefore, there is a need to formulate financial instrument for making dismantling / recycling of white goods viable.

5.7 Market Risks

Market risks based on the assessment of demand, supply, collection and transportation primarily address availability (quantity) of raw material as E-waste. These risks have been assessed and described below based on duration (short term, long term) along with their intensities.

- 1. Risks of availability of raw material (E-waste)
- 2. Risk associated with collection
- 3. Risk associated with transportation

Risk profiling giving the intensities as part of market assessment has been highlighted in **Table** 5.24 given below.

Risks/ intensities		High	Medium	Low
Risks of availability	Short term		✓	
of raw material	Long term		✓	
Risk associated with	Short term	✓		
collection	Long term		✓	
Risk associated with	Short term			✓
transportation	Long term			✓
	Long term		✓	

The intensities have been fixed as per following analysis.

- 1. Risks of availability of raw material has been assessed as medium since enough Ewaste potential exists in Chhattisgarh to be processed both in the short term and long term especially after 2014. This will depend on the implementation of regulatory regime, which will enable the E-waste generators to send the waste to dismantling / recycling facility.
- 2. Risk associated with collection is expected to be high in the short term as there is no formal collection mechanism in place in the study area. In this situation, the recycling facility will face the risk of collecting E-waste from the source, which could be geographically dispersed. In the long term this risks expected to be medium as collection and transportation mechanism is expected to be institutionalized. In the short term, the recycling facility is expected to be making their own arrangements for collection from vendors.
- 3. Risk associated with transportation is expected to be low in both short and long term as there is transportation mechanism in place both at the local and national level to carry hazardous waste. Since some E-waste is already being transported outside study area, therefore transportation risk is expected to be of low intensity

5.8 Conclusions

Market risks matrix highlight the availability of raw material, its collection and transportation as risks of high & medium intensities. Collection mechanism directly impacts the availability of raw material. Therefore, there is a need for both strict implementations of regulations as well as financial instrument for diverting E-waste inventory in to the formal sector.

Chapter 6: Conclusions

Major conclusions & recommendations, which have been arrived after assessment of E-waste regulations, E-waste material flow chain and inventory estimates are given below.

- Since no mechanism exist for tracking purchase of EEE by bulk consumers and producers are not required to declare quantity of EEE placed in the market since 2012, E-waste inventory assessment has to rely on available historical market research data as well as data from collectors, dismantlers / recyclers.
- Major conclusions, which can be derived, include growing market of EEE in the study area. This growth may lead to increasing E-waste generation, which may further lead to higher pollution loads, health impacts and loss of recoverable items.
- A majority of producers use call centre as well as dealer's network for collection of Ewaste.
- Electronic items go to mechanic shops from households for repairing, and mechanic replace damaged / defunct parts/components from it and then they sold it to scrap dealers.
- Mechanics sell E-waste to scrap dealer by weight mainly of ICT items (IT as per Schedule 1) at Rs. 200-250 per kg
- Scrap vendors sold E-waste to scrap dealer by weight at Rs. 150-250 per kg
- Scrap vendors sold damage mobile phone to scrap dealer as individual piece at Rs. 20-25 per piece
- Scrap dealer comes from Delhi yearly twice/thrice usually at the time of Bishwakarma Puja and Diwali for collecting of E-waste
- There is no organized mechanism for collection, transportation and disposal of E-Waste in Chhattisgarh.
- No mechanism exists in the state to monitor and track its inventory, collection, transportation and disposal.
- Data matrix versus methodology used for E-waste inventory assessment indicates "Market Supply" method and "Carnegie Mellon" method can be applied for WEEE / E-waste inventory assessment in five divisions coverd all the districts of the state of Chhattisgarh. However, a combination of Carnegie Mellon method & tracer tracking has been selected for inventory assessment since it covers all the aspects of material flow chain.
- In <u>Raipur Division</u> data analysis shows that TV have the highest installed base followed by Cellphones, Computers, fixed line telephone, Printers, refrigerators, washing machines and Air Conditioners. Raipur has the highest installed base of all the items followed by Baloda Bazar & other districts of Raipur division.
- In <u>Bilaspur Division</u> data analysis shows that TV have the highest installed base followed by Cellphones, Computers, fixed line telephone, Printers, refrigerators, washing machines and Air Conditioners. Bilaspur has the highest installed base of all the items followed by Korba, Janjgir Champa, Raigarh and Mungeli districts of Bilaspur division.
- In **<u>Durg Division</u>** data analysis shows that TV have the highest installed base followed by Computers, Cell phones, fixed line telephone, Printers, refrigerators, A C and washing machines. Durg has the highest installed base of all the items followed by, Rajnandgaon, Bemtara, Kabeerdham and Balod districts of Durg division.
- In <u>Surguja Division</u> data analysis shows that TV have the highest installed base followed by Cellphones, Computers, fixed line telephone, Printers, refrigerators,

washing machines and Air Conditioners. Surguja has the highest installed base of all the items followed by Koriya, Surajpur, Jashpur and Balrampur districts of Surguja division.

- In <u>Bastar Division</u> data analysis shows that TV have the highest installed base followed by Cellphones, Computers, fixed line telephone, Printers, refrigerators, washing machines and Air Conditioners. Bastar has the highest installed base of all the items followed by Bastar, Kanker, Kondagaon and other districts of Bastar division.
- Inventory estimates in **Chattisgarh** indicate that E-waste generation ranges from **30016.78** tons in 2011 to **86002.35** tons in 2020.
- Inventory estimates in <u>Raipur division</u> indicate that E-waste generation ranges from 8296.25 tons in 2011 to 25319.07 tons in 2020. In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 88% of the total inventory followed by refrigerator (1%), Washing machine (1%), Air conditioner (1%), Cellular phone (1%), , Computer (6%), Fixed Line Phone (1%) & Printer (1%). In 2023, it is expected that E-waste from TV (CRT/LCD/LED) (60%), computer will constitute about 35% of the total inventory followed by Refrigerator (1%), Air conditioner (1%), Washing machine (1%), Cellular phone (0%), Printer (2%) & Fixed Line Phone (0%).
- <u>Bilaspur division</u> indicates that E-waste generation ranges from 7761.99 tons in 2011 to 22324.03 tons in 2020. In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 88% of the total inventory followed by Computer (6%), Washing machine (1%), Air conditioner (1%), Cellular phone (1%), Refrigerator (1%), Fixed Line Phone (1%) & Printer (1%). In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (59%), computer will constitute about 36% of the total inventory followed by Printer (2%), Air conditioner (1%), Washing machine (1%), Cellular phone (0%), Refrigerator (1%) & Fixed Line Phone (0%).
- <u>Durg division</u> indicates that E-waste generation ranges from **7570.17** tons in 2011 to **20042.42** tons in 2020. In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 88% of the total inventory followed by refrigerator (1%), Washing machine (1%), Air conditioner (1%), Cellular phone (1%), Computer (6%), Fixed Line Phone (1%) & Printer (1%). In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (59%), computer will constitute about 36% of the total inventory followed by Refrigerator (1%), Air conditioner (1%), Washing machine (1%), Cellular phone (0%), Printer (2%) & Fixed Line Phone (0%).
- <u>Surguja division</u> indicates that E-waste generation ranges from **3511.59** tons in 2011 to **10783.29** tons in 2020. In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 89% of the total inventory followed by Computers (6%), Printer (1%), Washing machine (1%), Refrigerator (1%), Fixed Line Phone (1%), AC (1%) & Cellular Phone)%. In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (63%), computer will constitute about 33% of the total inventory followed by Printer (2%), Refrigerator (1%), Washing machine (1%), Air conditioner (1%), Cellular phone (0%), & Fixed Line Phone (0%).
- <u>Bastar division</u> indicates that E-waste generation ranges from 2876.78 tons in 2011 to 7533.54 tons in 2020. In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 63% of the total inventory followed by refrigerator (12%), Washing machine (8%), Air conditioner (8%), Cellular phone (3%), , Computer (5%), Fixed Line Phone (1%) & Printer (0%). In 2023, it is expected that E-waste from TV (CRT/LCD/LED) (46%), computer will constitute about 27% of the total inventory followed by Refrigerator (10%), Air conditioner (5%), Washing machine (6%), Cellular phone (5%), Printer (1%) & Fixed Line Phone (0%).
- An analysis of the different processes observed to recover metals indicates that no chemical process is occurring in study area. Only physical processes, which prepare raw

material for recycling industry is observed in the study area. Iron recovered from E-waste is recycled through induction arc furnace route in the study area.

• Market risks matrix highlight the availability of raw material, its collection and transportation as risks of high & medium intensities. Collection mechanism directly impacts the availability of raw material. Therefore, there is a need for both strict implementations of regulations as well as financial instrument for diverting E-waste inventory into the formal sector.

Inventory of Producers- Annexure 1

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
No.		Category	210110	
				Address Not Available Customer
	Television	LCD	BPL	Care Number 1800 – 425 – 1800,
				1800 - 425 - 2355
				A-30 & 31, Hosiery Complex,
			Deepwy	Noida 201305
			Daenyx	Inolda - 201505
				Ph. No. $\pm 91-120-3042721$
				B-1/A-14. Mohan Co-operative
				Industrial Estate, Mathura Road, New
			Haier	Delhi-110044
				Ph. No. 011-39496000/30674000
				Toll Free No. 1800-200-9999 (24X7)
				Hitachi India Pvt. Ltd.
				Units 802A and 802B, Tower 2, 8th
				Floor, Konnectus Building,
		Branch Offices	Hitachi	Bhavbhuti Marg, Near Minto Bridge,
				Connaught Place,
				New Delhi $- 110001$
-				Hitachi India Byt I to Bangalara
				Branch Office
				Unit 103 1st Floor Shah Sultan
				Complex. No 17. Cunningham Road.
				Bangalore 560 052, India
				Ph. No. +91 (80) 2238 6986 / 987 /
				984
				Hitachi India Pvt. Ltd. Mumbai
				Branch Office
				508, Ascot Center, Next to Hilton
				hotel, Sahar Koad, Andheri East,
				Mumbai 400099, India Dh. No. $\pm 01.22, 28215625$
				Hitachi India Pyt I td Chennai
				Branch Office
				206. Apeeiav House, No.12.
				Haddows Road, Nungambakkam,
				Chennai 600 006, India
				Ph. No. +91 (44) 2821 3108 / 3109
				Hitachi Ltd. Infrastructure
				Systems Company Mumbai
				Branch Office
				707, Trade Centre, Opp. to MINL
				Bandra-Kuria Complex,
				Mumbai 400 098
				Ph. No. $+91+22-2650-0031$
				Allied IB Friction Private Limited
				A-12, Site IV, Industrial Area.
		Group		Sahibabad – 201010, Dist. Ghaziabad
		Companies		(UP), India.
				Ph. No. 0120 4539600 – 700

S.,		Product		Address / Contact Details
No	Product Name	Sub	Brand	
140.		Category		
				Aloka Trivitron Medical
				Technologies Pvt. Ltd.
				Plot # A5, Sipcot Industrial Park,
				Irrungattukottai Sri Perambudur
				Taluk, Kanchipuram – 602117,
				TAMIL NADU
				Ph. No. 044-37183750
				Flyjac Logistics Pvt. Ltd.
				B – 1, 205, 2nd Fl, Boomerang,
				Chandivali Farm Road, Near Powai
				Andheri East, Mumbai 400 072
				Ph. No. 022 – 3359 5900
				Hitachi Chemical India Private
				708, 7th Floor, 1ime Tower, M G
				Koad, Gurgaon $- 122\ 002\ Ph.\ No.$
				0124 - 4246498
				Hitachi Consulting Software
				Services India Private Limited
				Plot No 9, Gachibowii, Hyderadad –
				500032, India DL NL 040 4024 2000
				Ph. No. 040 - 4034 3000
				Hitachi Consulting India Private
				Limited
				SEZ Hadapser Pood
				Dupo 411013
				Ph No 020 $6511 \ 1001/2$
				Hitachi Data Systems India Pyt
				I td
				#278/23 Trident Towers 3rd floor
				10th Main T Marianna Road
				Javnagar 2nd Block.
				Bangalore 560 011. India
				Ph. No. $+91$ (80) 2657 6295
				Hitachi Hi-Rel Power Electronics
				Pvt. Ltd.
				B-52, 5th Floor, "Corporate House",
				Near Judges Bungalow, Bodakdey,
				Ahmedabad – 380 054
				Gujarat – India
				Ph. No. +91 79 – 4900 2300
				Hitachi High Technologies
				(Singapore) Pte. Ltd.
				#602, 6th floor,
				Eros Corporate Towers, Nehru Place,
				New Delhi 110 019, India
				Ph. No. +91 (11) 4651 8450
				Hitachi Home and Life Solutions
				(India) Ltd.
				10th floor, Abhijeet,
				Mithakhali Six Road,
				Ahmedabad 380 006 Gujarat,
				Ph. No. +91 (79) 3041 4800

Sr		Product		Address / Contact Details
No.	Product Name	Sub	Brand	
		Category		
				Hitachi Koki India Ltd.
				Flot No. 9A, 1st Flase, Feelya
				Industrial Area, Dangalore 500 056,
				Ph. No. ± 91 (80) 4117 0777
				Hitachi Lift India Pyt Ltd
				Upits 304 306 3rd Floor ABW
				Elegance Tower Jasola District
				Centre New Delhi 110 025 India
				Ph. No. +91 (11) 4060 5290
				Hitachi Maxell, Ltd. Chennai
				Liaison Office
				DBS Office Business Center Room
				No. 103, 31A Cathedral Garden
				Road, Near Palmgrove Hotel,
				Nungambakkam, Chennai, India
				Ph. No. +91 (44) 4264 9495
				Hitachi Maxell, Ltd. Mumbai
				Liaison Office
				No.401, 4th Floor "BANARASI
				HERITAGE" Mind Space, Link
				Road, Malad (West), Mumbai, India
				Ph. No. +91 (22) 3212 8193
				Hitachi Metals (India) Pvt. Ltd.
				Plot No. 94 & 95, Sector 8, IMT
				Manesar, Gurgaon - 122050 (HR)
				Ph. No. +91 (124) 4124800 /
-				4812300 / 4812400
				Hitachi Metgias (India) Pvt. Ltd.
				Mapsar Gurgann 122050 (HR)
				Ph. No. ± 91 (124) ± 4124800 /
				4812300 / 4812400
				Hitachi NeST Control Systems
				Pvt. Ltd.
				No.103. First Floor. Shah Sultan
				Complex No.17, Cunningham Road,
				Bangalore -560 052
				Karnataka. India
				Ph. No. 080 - 6789 8700
				Hitachi Plant Technologies India
				Pvt. Ltd.
				DPC 101, 102 and 103, First Floor,
				Block No. 4A, DLF Corporate Park,
				MG Road, Phase - III, DLF City,
				Gurgaon,
				Haryana
				Pn. No. +91+12-4455-2344
				Hitachi I ransport System India
				Pvt. Ltd.
				110 & 11/, 1st floor, Kectangle -1, D-
				4, District Centre, Saket,
				$\frac{110017}{1001}, \frac{110017}{1001}, \frac{11001}{1000}$
1	1	1		111. INO. 191 (II) 4032 3200

S.,		Product		Address / Contact Details
Sr. No	Product Name	Sub	Brand	
140.		Category		
				Tata Hitachi Construction
				Machinery Co. Ltd.
				Jubilee Building, 44 Museum Road,
				Bangalore – 560 025
				Ph. No. 080 – 6695 3301 ~ 03
				Toyo Machinery & Metal Co., Ltd.
				(India Liason Office)
				Units 304-306, 3rd Floor, ABW
				Elegance Tower, Jasola District
				De Nie 011 4000 5252
				Ph. No. 011 – 4000 5252
				Det No. 51 Udyog Viber Surgiour
			IC	Kaspa Road
			10	Greater Noida: 201306
				Uttar Pradesh
				SCV Industries
				Plot No 41 & 42
				Sector-6A Sidcul Indl Area Haridwar
				(Uttrakhand)
				Pin Code - 249401
		Manufacturing		Ph. 01334-239662/63/64
		Facilities	Markson	Fax No. 01334- 239661
				Email Id - store@sgvindustries.com
				Contact - Mr. Sunil Jain (Vice
				President) Mob. 9212669498
				Mr. Rajender Sharma (Facility
				Incharge) Mob. 9212669503
				SNR Industries
				Plot No.6A & 6B,
				Gabriel Road, Sector-2,
				Parwanoo, (H.P.)
				Pin Code - 173220
				Ph. 01792- 232711
				Contact- Mr. Alok Kumar (Facility
				Incharge) Mob. 9212669513
				SNR Electronics Ltd.
				Plot No.2, HPISDC Indl. Area,
				Baddı, Tehsil Nalagarh,
				Dist. Solan,(H.P.).
				Pin Code - 1/3205
				Pn.01/95-244/03
				Fax - 01/95- 244/05
				Looharto Mah. 0212660513
				DI OT No. 279 ETE
				DATDADCANI DELLI 110002
		Head Office		$\begin{array}{c} 1 & \text{AIFARGANJ, DERLI-110092} \\ \text{Dh} & \text{No} + 91 \ 11 \ 43086501 \ 502 \end{array}$
				22157662 63
				43B Okhla Industrial Estato
				New Delbi - 110020 India
		Corporate ở	Moser Baer	Tel $+91 \ 11 \ 40594444 \ 91 \ 11$
		Head Office	THUGH DALL	26911570 - 74
				Fax +91 11 41635211, 26911860

Sr		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
		81		Chennai
				Moser Baer India Ltd.
				81, IInd Floor
		Branch Offices		Valluvarkottam High Road
				Nungambakkam,
				Chennai - 600 034
				Tel: Ph.+91-44-42664358-59
				M & ES Office
				Moser Baer India Ltd.
				167-169, IInd Floor, Anna Salai,
				Saidapet, Chennai - 600 015
				Tel: +91-44-45050041-42-43
				Chennai Project Office
				Moser Baer Solar Limited
				OZ-2,OZ-3,OZ-4
				Hi-TECH-SEZ, Sipcot Industrial
				Part-3
				Oragadam, Sriperampudur Taluk
				Kancheepuram District
				Tamil Nadu - 602105
				Mumbai
				Moser Baer Entertainment Ltd
				Mukti Foundation Building,
				A Wing, 1st Floor,
				141- A, Model Town, Village
				Ambivali,
				Behind Kokilaben Dhirubhai Ambani
				Hospital,
				Four Bungalows, Andheri-West,
				Mumbai - 400053
				Domestic Marketing & CE
				Moser Baer India Ltd.
				510- Maker Chambers V
				5th Floor, Nariman Point
				Mumbai-400 021
				Telefax: +91-22-66157930-31
				Bangalore
				Moser Baer India Ltd.
				Raheja Plaza, Unit No.103
				17 Commissariat Road
				Bangalore - 560025
				Telefax : 080-41649712
				Kolkata
				Moserbaer Entertainment Limited
				1st Floor, 13 FLT. LT.
				Tapan Chowdhury Avenue,
				Mudiali,
				Kolkata - 700026
				Tel: +91-33-65419945-54
				Delhi
				235, Okhla Industrial Estate
				Phase III
				New Delhi -110 020
				Tel: +91-11-47624100

S.,		Product		Address / Contact Details
No	Product Name	Sub	Brand	
110.		Category		
				Pune
				Moser Baer Photo Voltaic Ltd.
				311, IIIrd Floor
				Connaught Place
				28 Bund Garden Road
				Pune - 411 001
				USA Distributor
				Media Masters LLC
				#440, 2601 S. Minnesota Ave., Ste
		Representative		105 Sioux Falls,
		& Distributor		SD 57105-4750 USA
				Phone: +1-(888)-243-4465
				Fax: +1-(877) 835-2834
				E-mail: sales@mediamastersdisc .com
				BOM & M& ES
		Manufacturino		66. Udvog Vihar
		Facilities		Greater Noida (U.P.) - 201 306
		1 00000005		Tel: 0120-4386000
-				Solid State Media
				A-164 Sector - 80
				Phase II Noida (UP)
				T_{el} : 0120 4307000
				MRDV & MR Soler
				66B SEZ Udvog Viber
				Creater Noide (UD) 201206 Tel
				Greater Noida (0.P.) = 201500 Tel:
				0120-4038000
				A 164 Sector 20
				A-104, Sector - 80,
				Phase - II, Noida (UP) - 201 305
				Tel: 0120-4307000
				PV Technologies India Ltd.
				0z-2, 0z-3, 0z-4
				Hi-Techsez, Sipcot Industrial Park-3
				Oragadam, Sriperampudur Taluk
				Kancheepuram District
				Tamilnadu - 602105
				MIRC Electronics Ltd.
				Onida House, G-1, M.I.D.C,
				Mahakalı Caves Road, Andheri (E),
		Corporate		Mumbai - 400 093.
		Address	Onida	Tel: 022 - 28200435 / 66975777.
				Email: response@onida.com
				For Institutional Sales:
				corporate.sales@onida.com
				For Service: service@onida.com
			Panasonic	Ph. No. 1800 108 1333 / 1860 425
				1860 / 1800 103 1333
				Samsung India Electronics
				6th, 7th & 8th Floors, Ifci Tower, 61,
			Samsung	Nehru Place,
				New Delhi,
				Tel: 011 3030 8282
				Samsung Corporation
				Room No 355, Hotel Taj Palace,

Sr		Product		Address / Contact Details
No.	Product Name	Sub	Brand	
		Category		
				Chanakyapuri
				New Deini, DL
				Dhiling Flasternian India Limited
				Oth Electronics India Limited
				DIF Cyber City
			Philips	DLF Cyber City, Sector 25 DI E Dhase - 3
				Gurgeon 122002 India
				Tel \cdot +91 - 124 - 4606000
				Philips Electronics India Limited
				7 Justice Chapdra Madhab Road
				Kolkata - 700020 India
				Tel : +91 - 33 - 24753621 / 27
				Philips Electronics India Limited
				The Estate 4th floor (North Wing)
				(Next to Manipal Centre).
				121. Dickenson Road.
				Bangalore - 560042, India
				Tel: +91 - 80 - 66929898
				Philips Electronics India Limited
				MFAR Manyata Tech Park,
				Nagavara, Bangalore - 560045, India
				Tel: +91 - 80 - 41890000
				Philips Electronics India Limited
				Temple Towers, 5th Floor,
				Old No : 476, New No : 672,
				Anna Salai, Nandanam,
				Chennai - 600035, India
				Tel : +91 - 44 - 66501000
				Philips Electronics India Limited
				6-3-1109/1/P/103, 3rd Floor,
				Jewel Pawani Towers,
				Raj Bhavan Road, Somajiguda,
				Hyderabad - 500082, India
-				Tel: +91 - 40 - 66467676
				Philips Electronics India Limited
				Technopolis Knowledge Park,
				Mahakali Caves Road,
				Chakala, Andheri (E), Marahai 400002 Judia
				$T_{a1} \pm 01$ 22 66012000
-				$D_{12}/4$ Okbla Industrial Area
			Salara	D-15/4, Okina industrial Area, Dhasa II New Delhi 110 020 India
			Salota	Phone: $\pm 91, 11, 49207100 / 101$
				Adheshwar Arcade Ist Floor
				Andheri Kurla Road
			Sansui	Andheri Fast
				Mumbai: 400 093
				No 62 3rd floor 1st main
				3rd cross. 2nd stage
				Yeshwantpur Industrial Area.
				Bangalore – 560022

Sr		Product		Address / Contact Details
No.	Product Name	Sub	Brand	
		Category		Plot No. 296
				I lot 100. 200, I ldvog Vibar Phase -2
				Gurggon = 122015
				Sharp India Limited
				Gat No. 686/4
			Sharp	Koregoon Bhima Tal: Shirur
			Sharp	Dist: Pupe Pip 412216
				Phone: 02137-252417 02137-666520
				Sony India Registered Office
				A - 31 Mohan Co-operative
				Industrial Estate Mathura Road
			Sony	New Delbi - 110044
				Ph No : 66006600
				Fax No : 26959141
				Sony India Branch Offices
				City Center 3rd Floor
				Plot A-5/1 Unit-IX
				Sachivalava Marg
				Bhubapeswar
				Pin = 751022
				3rd Floor NH Center Point Building
				Opposite Bora Service G S Road
				Guwahati
				Ph No $: 0.361-2462858$ 2462859
				White House 2nd Floor
				Block 2D 119 Park Street
				Kolkata - 700016
				Ph No \cdot 033-40071751/52/53/
				54/55
				Eax No : 033 - 40071763
				4th Floor Block-B
				Sai Corporate Park.
				Rukanpura Bailey Road
				Patna - 800 014
				Phone No : 0612-3269866
				3rd Floor, Adarsh Mall, Plot No
				50. Industrial and Business Park.
				Phase-2, Chandigarh - 160002
				Ph No : 0172-66 555 55.
				Fax No : 0172-66 555 66
				Unit # 405 - 407, 4th Floor,
				Copia Corporate Suites,
				Jasola District Centre,
				New Delhi – 110010
				Contact : 1800-103-7799 (Toll
				Free) Fax No : 011-42458844
				SCO 38-39 G, 1st Floor,
				BRS Nagar, Ludhiana -141 012
				Ph No : 0161-463 2222,
				24 Advocate Chambers,
				2nd Floor, RDC Raj Nagar
				Ghaziabad, Uttar Pradesh
				Ph No : 0120 - 4940150
				Fax No : 0120 - 4940180

No. Product Name Sub Category Brand Image: Construct of Category C-7, Sultan House, 1st floor, Sawa Ja Singh Highway, Bani Pack, Japur - 302016 Ph No: 0141-4041894 Auth897 Pax No: 0141-4041894 Image: Construct of Construct of Category C-7, Sultan House, 1st floor, Sawa Ja Singh Highway, Bani Pack, Japur - 302016 Image: Construct of Construct of Category C-7, Sultan House, 1st floor, Sawa Ja Singh Highway, Bani Pack, Japur - 302016 Image: Construct of Category C-7, Sultan House, 1st floor, Fax No: 0141-4041894 Image: Construct of Category C-7, Sultan House, 1st floor, Fax No: 0141-4041894 Image: Construct of Category C-7, Sultan House, 1st floor, Fax No: 0141-4041894 Image: Construct of Category C-7, Sultan House, 1st floor, Fax No: 0147-4041894 Image: Construct of Category Construct of Category	S.		Product		Address / Contact Details
C.7, Sultan House, 1st floor, Sawai Jai Singh Highway, Bani Park, Japur - 302016 Ph No: 0141-4041896, 4041897 Fax No: 0141-4041896, 4041897 Fax No: 0141-4041894 4th floor, Eldeco Corporate Chambers, Vibbuti Khand Opposite Kisan Mandi Bhawan, Pfase 1 Gomit Nagar Lucknow Ph No: 0522- 4041231/32/33/34/35 U & T: VR1 Centre, Ind Floor Plot No. 83, Sector 29, City Centre, Gurgaon, Haryana - 122002 Ph No: 0124 - 48962200, Fax: 0124 - 4896220, Fax: No: 0146-02555 Fax No: 0146-02555 Fax No: 1080-605555 Fax No: 1080-25294987 #21-12/6(2), First Floor, Hill Groove, Chilmbi Hills, 2nd Cross, Mangalore - 575006 Thor, Harneedia Centre, No 14/43, Haldows Road, Nungambakkam, Chennai - 600006 Ph No: 044 - 2824551 Fax No: 0484-2318616, 2318618, 2318619, Fax No: 0484-2318616, 2318618, 2318619, Fax No: 0484-2318616, 2318618, 2318619, Fax No: 0484-2318616, 2318618, 2318619, Fax No: 0484-2318616, 2318629 III Floor, 1022/1 Skanda Square, Arimash Road Coimbatore - 641018 Ph No: 042-4334856 G-3-676/A/2/3/4, Punjagutax A Koads, Punjagutat Hyderabad - 500082 Ph No: 040-66115000 Fax No: 040-26115000 Fax No: 040-2640014 Door No: 59-101/A, Matha Towerer, 4b Floor, Ring Roa	No.	Product Name	Sub Category	Brand	
Sawai Jai Singh Highway, Bani Park, Jaipur - 302016 Ph. No : 1014-4041896, 4041897 Fax No : 1014-4041894 4th Floor, Fildeco Corporate Chambers, Vibbuti Khand Opposite Kisan Mandi Bhawan, Phase 1 Gomit Nagar Lucknow Ph. No : 0522- 4041231/32/33/4/35 U & 1: VR 1 Center, Hand Floor Plo No : 88, Sector 29, City Centre, Gurgaon, Haryana - 122002 Ph. No : 102-44806200, Fax: 0124 - 4896220 Ph. No : 102-44806200, Fax: 0124 - 4896200, Fax: 0124 - 4896200, Ph. No : 080-660555 Image: Physicial Control (Phot) Image: Physicial Control (Phot) <td></td> <td></td> <td></td> <td></td> <td>C-7, Sultan House, 1st floor,</td>					C-7, Sultan House, 1st floor,
japur - 302016 Ph Ph No : 0141-4041896, 4041897 Pax No : 0141-4041894 4th Floor, Ekleco Corporate Chambers, Vibhuit Khand Opposite Kisan Mandi Bhawan, Phase I Gomti Nagar Lacknow Ph No : 0522- 4041231/32/33/34/35 U. & 1: VR1 / Centre, Thd Floor Plot No. 83, Sector 29, City Centre, Gurgaon, Haryana - 122002 Ph No : 0124 - 48962200, Pax: 0124 - 4896220 Pax: 0124 - 4896220, Pax: 0124 - 4896221 Pax: 0124 - 4896220, Pax: 0124 - 4896221 Pax: 01					Sawai Jai Singh Highway, Bani Park,
Ph No : 0141-4041897 Fax No : 10141-4041894 4th Floor, Eldeco Corporate Chambers, Vibbut Shand Opposite Kisan Mandi Bhawan, Phase 1 Gomti Nagar Lucknow Ph No : 0522. 4041231/32/33/34/35 U & I : WR 1 Centre, Illed Floor Plot No. 35, Sector 29, City Centre, Gurgaon, Haryana : 12002 Ph No : 0124 - 4896200, Fax: No : 080-26204987 Haryana : 12002 Ph No : 080-6605555 Fax No : 080-25204987 Hill Groove, Chilimbri Hills, 2nd Cross, Magalore - 540038 Ph No : 080-26204987 Hill Groove, Chilimbri Hills, 2nd Cross, Magalore - 575006 Cornai - 600006 Ph No : 044 - 28248571 Fax No : 044 - 28248571 Fax No : 044 - 28248571 Fax No : 044 - 2824853 Cochin - 682 020 Ph No : 0422-4334455 Fax No : 0442-2318616					Jaipur - 302016
Image: Strain					Ph No : 0141-4041896, 4041897
4th Floor, Eldeo: Corporate Chambers, Vibluti Khand Opposite Kisan Mandi Bhawan, Phase 1 Gomti Nagar Lucknow Ph No : 0522- 4041231/32/33/34/35 U & 1: VR 1 Centre, Ilnd Floor Plot No. 83, Sector 29, City Centre, Gurgaon, Haryana - 122002 Ph No: 1024 - 4896200, Fax: 0124 - 4896200, Fax: 0124 - 4896220 No.708, 100 Feet Main Road HAL, Ilnd Stage, 12th Main, Indira Nagar, Bangalore - 560038 Ph No: 080-25204987 #2-1-2/62), First Floor, Hill Groove, Chilmbi Hills, 2nd Cross, Mangalore 573066 2002 2014 4th 21, 2/2(2), First Floor, Hall Groove, Chilmbi Hills, 2nd Cross, Mangalore 573066 2015 2016 2017 2018 2019 2019 2019 2010 2010 2011 2012 2013 2014 2015 2014 2015 2016 2016 2017 2018 2019 2019 2010 2010 2010 2010 2010 2010 2011 2011 2011 </td <td></td> <td></td> <td></td> <td></td> <td>Fax No: 0141-4041894</td>					Fax No: 0141-4041894
Chambers, Vibluit Khand Opposite Kisan Mandi Bhawan, Phase I Gonti Nagar Lucknow Ph No: 0522- 4041231/32/33/34/35 U & 1: VR 1 Centre, Hnd Floor Plot No. 83, Sector 29, City Centre, Gurgaon, Haryana - 122002 Ph No: 0124 - 4896200, Fax: 0124 - 4894800, Fax: 0134 - 4894897 Hill Grouxe, Chilimbi Hills, 2nd Cross, Mangalore - 575006 2nd Floor, Hameedia Centre, No: 14/43, Haldows Road, Nungambakkam, Chennai - 600006 Ph No: 044 - 28242571 Fax: No: 044 - 282455 Fax: No: 042 - 4334455 Fax: No: 0422 - 4334455 Fax: No: 0402 - 4304455 Fax: No: 0402 - 4304455					4th Floor, Eldeco Corporate
Opposite Kisan Madi Bhawan, Phase 1 Gomti Nagar Lucknow Ph No : 0522- 4041231/32/33/34/35 U & 1/20/33/34/35 U & 1/20/33/34/35 U & 1/20/33/35 U & 1/20/33/35 U & 1/20/33/35 U & 1/20/33/35 U & 1/20/33/34/35 U & 1/20/33/34/35 U & 1/20/33/34/35 U & 1/20/34/35 U & 1/20/34/34/35 Haman - 122002 Ph No : 0124 - 4896220 No.768, 100 Feet Main Road HAI, Ind Stage, 12h Main, Indiran Nagar, Bangalore - 560038 Ph No : 080-6605555 Fax No : 080-2529487 21/21/20/21, First Floor, Hill Groove, Chilimbi Hills, 2nd Cross, Mangalore - 55006 2nd Floor, Harcedia Centre, No 14/43, Haddows Road, Nungambakkan, Chennai - 60006 Ph No : 044-2824853 2nd Floor, Muscat Tower S.A.Road, Kadavanthara Cochin - 682 020 Ph No : 042-4334455 Eax No : 042-4334455 </td <td></td> <td></td> <td></td> <td></td> <td>Chambers, Vibhuti Khand</td>					Chambers, Vibhuti Khand
Phase 1 Gomi Nagar Lucknow Ph No : 0522- 4041231/32/33/34/35 U & I : VR 1 Centre, Ind Floor Plot No. 83, Sector 29, City Centre, Gurgaon, Haryana - 122002 Ph No : 0124 - 4896200, Fax: 0124 - 4896200, Fax: 0124 - 4896200 Fax: 0124 - 4896200, Fax: 0180 - 55006 U No.768, 100 Feet Main Road HAL, Ind Stage, 12th Main, Indira Nagar, Bangalore - 575006 U #2-1-2/6(2), First Floor, Hill Groove, Chilimbi Hills, 2nd Cross, Mangalore - 575006 2nd Floor, Handeweila Centre, No 14/43, Haddows Road, Nungambakkam, Chennai - 600006 Ph No : 044 - 28242571 Fax No : 044 - 2818616, 2318618, 2318619, Fax No : 0484 - 2318612, 2318618, 2318619, Fax No : 0484 - 2318612, 2318618, 2318619, Fax No : 0484 - 2318612, 2318618, 2318619, Fax No : 0422-4334455 Fax No : 0422-4334456 U III Floor, 1025/1 Skanda Square, Avinashi Road Combatore - 641018 Ph No : 0422-4334456 Hill Groov, 59-101/A, Matha Towers, 4th Floor, Ring Road, Patimatlanka, Vijajawada-520 010 Wohans Arcade, 1st Floor, 47-11-					Opposite Kisan Mandi Bhawan,
Lucknow Ph No: 0522- 4041231/32/33/34/35 U & L: VR 1 Centre, Ind Floor Plot No: 83, Sector 29, City Centre, Gurgaon, Haryana - 122002 Ph No: 0124 - 4896200, Fax: 0124 - 4896200 Part No: 0124 - 4896200 Ph No: 080 - 650555 Ph No: 080 - 650555 Ph No: 080 - 6509497 #21-12/6(2), First Floor, Hill Groove, Chilmbi Hills, 2nd Cross, Mangalore - 57006 2nd Floor, Harcedia Centre, No 14/43, Iladdows Road, Nungambakam, Chennai - 600006 Ph No: 042-4824853 2nd Floor, Muscat Tower SA.Road, Kadavanthara Cochin - 682 02 Ph No: 042-484561 Ph No: 0422-4334456					Phase 1 Gomti Nagar
4041231/32/33/34/35 U&1:VR1 Centre, JInd Floor Plot No. 83, Sector 29, Gity Centre, Gurgaon, Haryana - 122002 Ph No: 0124 - 4896200, Fax: 0124 - 4896200 Pax: 0126 - 575006 Pax: 01080-25294987 #21-2/6(2), Pix: Floor, 47, Hall Pax: 01080-25294987 #21-2/6(2), Pix: Floor, 47, Hall Pax: 01080-0 Pax: 01080-0 Pax: 01080-0 Pax: 01080-0 Pax: 01080-0 Pax: 0108000 Pax: 0108000 Pax: 01080000 Pax: 01080000 Pax: 01080000 Pax: 01080000 Pax: 01080000 Pax:					Lucknow Ph No : 0522-
U&I: VR 1 Centre, IInd Floor Plot No. 83, Sector 29, City Centre, Gurgaon, Haryana - 122002 Ph No : 0124 - 4896200, Fax: 0124 - 4896200 No.768, 100 Feet Main Road HAL, IInd Stage, 12th Main, Indira Nagar, Bangalore - 550003 Ph No : 080-66605555 Fax No : 080-25294987 #21-12/6(2), First Floor, Hill Groove, Chilimbi Hills, 2nd Cross, Mangalore - 550006 2nd Floor, Hameedia Centre, No 14/43, Haddows Road, Nungambakkam, Chennai - 600006 Ph No : 044 - 28242571 Fax No : 044 - 28242571 Fax No : 044 - 28242571 Fax No : 044 - 2824853 2nd Floor, Muscat Tower S.A.Road, Kadavanthara Cochin - 682 020 Ph No : 0484-2318616, 2318618, 2318619, Fax No : 0484-2318629 III Floor, 1025/1 Skanda Square, Avinashi Road Coimbatore - 641018 Ph No : 0422-4334455 Fax No : 0422-4334456 6-3-676/A/2/3/4, Punjagutta X Roads, Punjagutta Hyderabad - 500082 Ph No : 040-66115000 Fax No : 040-23400014 Door No. 59-10-1/A, Matha Towers, 4th Floor, Ring Road, Patamatalanka, Vijayawada-520 010 Mohana Arcade, 1st Floor, 47-11-					4041231/32/33/34/35
Plot No. 83, Sector 29, City Centre, Cgurgaon, Haryana - 122002 Ph No : 0124 - 4896220 No. 768, 100 Feet Main Road HAL, Hnd Stage, 12th Main, Indira Nagar, Bangalore - 560038 Ph No : 080-6605555 Fax: 0124 - 4896200 With The Stage Physical Control of Stage Physical Control (Control of Stage) With The Stage Physical Control of Stage)	-				U & I : VR 1 Centre, IInd Floor
City Centre, Gurgaon, Haryana - 122002 Ph No: 0124 - 4896200, Fax: 0124 - 4896200 Fax: 0124 - 4896200 Fax: 0124 - 4896200 Fax: 0124 - 4896200 HAL, Ihd Stage, 12th Main, Indira Nagar, Bangalore - 560038 Ph No: 080-6605555 Fax No: 080-25294987 #2-1-2/6(2), First Floor, Hill Groove, Chilimbi Hills, 2nd Cross, Mangalore - 575006 2nd Floor, Hameedia Centre, No 14/43, Haddows Road, Nungambakkam, Chennai - 600006 Ph No: 044-2824853 2nd Floor, Mazcat Tower S.A.Road, Kadavanthara Cochin - 682 020 Ph No: 044-2818616, 2318618, 2318619, Fax No: 0448-2318629 III Floor, 102571 Skanda Square, Avinashi Road Combatore - 641018 Ph No: 0422-4334455 Fax No: 0422-4334456 - 6376/A/2/3/4, Punjagutta X Roads, Punjagutta Hyderabad - 500082 Ph No: 040-66115000 Fax No: 0402-4314455 Fax No: 0402-6115000 Fax No: 0402-61015004					Plot No. 83, Sector 29,
Haryana - 122002 Ph No: 1124 - 4896200, Fax: 0124 - 489620 No.768, 100 Feet Main Road HAL, IInd Stage, 12th Main, Indira Nagar, Bangalore - 560038 Ph No: 080-6605555 Fax No: 080-6605555 Fax No: 080-6605555 Fax No: 080-6605555 Fax No: 080-6605555 Fax No: 080-6600555 Fax No: 080-6600555 Fax No: 080-6600555 Fax No: 080-6600555 Fax No: 080-6600555 Fax No: 080-6600555 Fax No: 080-6600555 Fax No: 041/25, First Floor, Hill Groove, Chilmbi Hills, 2nd Cross, Mangalore - 575006 2nd Floor, Hamcedia Centre, No 14/43, Haddows Road, Nungambakkam, Chennai - 60006 Ph No: 044 - 28242571 Fax No: 044-28234853 2nd Floor, Muscat Tower S.A. Road, Kadavanthara Cochin - 682 020 Ph No: 0484-2318616, 2318618, 2318618, 2318618, 2318619, Fax No: 0484-2318629 218619, Fax No: 0424-4334455 Groimbatore - 641018 Ph No: 042-4334456 G-3-676/A/2/3/4, Punjaguita Xadas, Punjaguita Hyderabad - 500082 Ph No: 040-6115000 Fax No: 040-6315000 Fax No: 040-6315000 Fax No: 040-6315000 Fax No: 040-6315000 Fax No: 040-6315000					City Centre, Gurgaon,
Ph No : 0124 - 4896200, Fax: 0124 - 4896220 Fax: 0124 - 4896220 No.768, 100 Feet Main Road HAL, Ilnd Stage, 12th Main, Indira Nagar, Bangalore - 560038 Ph No : 080-6605555 Fax No : 080-25294987 #2-1-2/6(2), First Floor, Hill Groove, Chilmbi Hills, 2nd Cross, Mangalore - 575006 2nd Floor, Hameedia Centre, No 14/43, Haddows Road, Nungambakkam, Chennai - 600006 Ph No : 044 - 28242571 Fax No : 044-28234853 2nd Floor, Muscat Tower S.A.Road, Kadavanthara Cochin - 682 020 Ph No : 0484-2318616, 2318618, 218619, Fax No : 0484-2318629 III Floor, 1025/1 Skanda Square, Avinashi Road Coimbatore - 641018 Ph No : 0422-4334455 Fax No : 0422-4334455 Fax No : 042-24334455 Fax No : 040-6115000 Ph No : 040-6115000 </td <td></td> <td></td> <td></td> <td></td> <td>Haryana - 122002</td>					Haryana - 122002
Image: Section of the sectio					Ph No : 0124 - 4896200,
No.768, 100 Feet Main Road HAL, Had Stage, 12th Main, Indira Nagar, Bangalore - 560038 Ph No : 080-66005555 Fax No : 080-25294987 #21-2/6(2), First Floor, Hill Groove, Chilmbi Hills, 2nd Cross, Mangalore - 575006 2nd Floor, Hameedia Centre, No 1/4/43, Haddows Road, Nungambakkam, Chennai - 600006 Ph No : 044-28242571 Fax No : 044-2824853 2nd Floor, Muscat Tower S.A. Road, Kadavanthara Cochina - 682 020 Ph No : 0484-2318616, 2318618, 2318619, Fax No : 0484-2318629 III Floor, 1025/1 Skanda Square, Avinashi Road Coimbator - 641018 Ph No : 0422-4334455 Fax No : 0422-4334456 6-5-76/A/2/3/4, Punjagutta X Roads, Punjagutta Hyderabad - 500082 Ph No : 040-6315000 Fax No : 040-23400014 Door No. 59-10-1/A, Matha Towers, 4th Floor, Ring Road, Patamatalanka, Vijagawada-520 010					Fax: 0124 - 4896220
HAL, Ind Stage, 12th Main, Indira Nagar, Bangalore - 500038 Ph No: 080-6605555 Fax No: 080-25294987 #2-1-2/6(2), First Floor, Hill Groove, Chilmbi Hills, 2nd Cross, Mangalore - 575006 2nd Floor, Hameedia Centre, No 14/43, Haddows Road, Nugambakkam, Chennai - 600006 Ph No: 044 - 28242571 Fax No: 044-28242571 Fax No: 044-28243853 2nd Floor, Muscat Tower S.A.Road, Kadavanthara Cochin - 682 020 Ph No: 0484-2318616, 2318618, 2318619, Fax No: 0484-2318629 III Floor, 1025/1 Skanda Square, Avinashi Road Combatore - 641018 Ph No: 0422-4334455 Fax No: 040-24304014 Obor No. 59-10-1/A, Matha Towers, 4th Floor, Floor, Ring Road, Patamatalanka, Vijajawada-520010					No.768, 100 Feet Main Road
Nagar, Bangalore - 560038 Ph No: 080-66005555 Fax No: 080-25294987#2-1-2/6(2), First Floor, Hill Groove, Chilimbi Hills, 2nd Cross, Mangalore - 5750062nd Floor, Hameedia Centre, No 14/43, Haddows Road, Nungambakkam, Chennai - 600006 Ph No: 044 - 28242571 Fax No: 044-28248532nd Floor, Muscat Tower S.A.Road, Kadavanthara Cochin - 682 020 Ph No: 0484-2318616, 2318618, 2318619, Fax No: 0484-2318629111 Floor, 1025/1 Skanda Square, Avinashi Road Coimbatore - 641018 Ph No: 0422-43344566-3-676/A/2/3/4, Punjagutta X Roads, Punjagutta Hyderabad - 500082 Ph No: 040-23400014Door No. 59-10-1/A, Matha Towers, 4th Floor, Ring Road, Patamatlanka, Vijayawada-520 010Mohans Arcade, 1st Floor, 47-11- Cohans Arcade, 1st Floor, 47-11-					HAL, IInd Stage, 12th Main, Indira
Ph No : 080-66605555 Fax No : 080-25294987 #2.1-2/6(2), First Floor, Hill Groove, Chilimbi Hills, 2nd Cross, Mangalore - 575006 2nd Floor, Hameedia Centre, No 14/43, Haddows Road, Nungambakkam, Chennai - 600006 Ph No : 044 - 28242571 Fax No : 044 - 2824853 2nd Floor, Muscat Tower S.A.Road, Kadavanthara Cochin - 682 020 Ph No : 0484-2318619, 2318618, 2318618, 2318618, 2318618, 2318618, 2318618, 2318619, Fax No : 0422-4334455 Fax No : 0422-4334455 Fax No : 0422-4334455 Fax No : 0422-4334456 6-3-676/A/2/3/4, Punjagutta X Roads, Punjagutta Hyderaba - 500082 Ph No : 040-66115000 Fax No : 040-23400014 Door No. 59-10-1/A, Math Towers , 4th Floor, Ring Road, Patamatalanka, Vijayawada-520 010 <					Nagar, Bangalore - 560038
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Cross, Mangalore - 575006 2nd Floor, Hameedia Centre, No 14/43, Haddows Road, Nungambakkam, Chennai - 600006 Ph No : 044 - 28242571 Fax No : 044-28234853 2nd Floor, Muscat Tower S.A.Road, Kadavanthara Cochin - 682 020 Ph No : 0484-2318616, 2318618, 2318619, Fax No : 0484-2318629 III Floor, 1025/1 Skanda Square, Avinashi Road Combatore - 641018 Ph No : 0422-4334455 Fax No : 0442-2334456 6-3-676/A/2/3/4, Punjagutta X Roads, Punjagutta Hyderabad - 500082 Ph No : 040-23400014 Door No. 59-10-1/A, Matha Towers , 4th Floor, Ring Road, Patamatalanka, Vijayawada-520 010					Hill Groove, Chilimbi Hills, 2nd
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Nungambakkam, Nungambakkam, Chennai - 600006 Ph No : 044 - 28242571 Fax No : 044 - 28242571 Fax No : 044-28234853 2nd Floor, Muscat Tower S.A.Road, Kadavanthara Cochin - 682 020 Ph No : 0484-2318616, 2318618, 2318619, Fax No : 0484-2318629 III Floor, 1025/1 Skanda Square, Avinashi Road Coimbatore - 641018 Ph No : 0422-4334455 Fax No : 0422-4334455 Fax No : 0422-4334456 6-3-676/A/2/3/4, Punjagutta X Roads, Punjagutta Hyderabad - 500082 Ph No : 040-66115000 Fax No : 040-23400014 Door No. 59-10-1/A, Matha Towers, 4th Floor, Ring Road, Patamatalanka, Vijayawada-520 010 Mohans Arcade, 1st Floor, 47-11-					No 14/43. Haddows Road.
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Ph No: 044 - 28242571 Fax No: 044-28234853 2nd Floor, Muscat Tower S.A.Road, Kadavanthara Cochin - 682 020 Ph No: 0484-2318616, 2318618, 2318619, Fax No: 0484-2318629 III Floor, 1025/1 Skanda Square, Avinashi Road Coimbatore - 641018 Ph No: 0422-4334455 Fax No: 0422-4334456 6-3-676/A/2/3/4, Punjagutta X Roads, Punjagutta Hyderabad - 500082 Ph No: 040-23400014 Door No. 59-10-1/A, Matha Towers , 4th Floor, Ring Road, Patamatalanka, Vijayawada-520 010 Mohans Arcade, 1st Floor, 47-11-					Chennai - 600006
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Vijayawada-520 010 Mohans Arcade, 1st Floor, 47-11-					Ring Road Patamatalanka
Mohans Arcade, 1st Floor, 47-11-					Vijavawada-520.010
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b Divisionaliza Naciona					5 Dwarka Nacar
Uishabhapatnam 530016					Vishakhanatnam - 530016

Sr		Product		Address / Contact Details
No.	Product Name	Sub	Brand	
		Category		
				floor Swartik Cross Road
				Navranopura
				Abmedabad - 380009
				Ph No : 079-26441040 26441041
				Fax No : 26460839
				25/1 Ground Floor
				Yashwant Niwas Road.
				Shirish Chamber
				Indore - 452003
				Ph No: 0731-4055762, 4042013,
				4042033
-				2nd floor, Crimpage Corporation,
				Plot No. 57, Street No.17, MIDC,
				Andheri East,
				Mumbai - 400093
				Ph No : 022-6128 8000
				Fax No : 28312935
				Office No.2, 3rd floor
				G.O.Square, Aundh-Hinjewadi
				Road, Near Mankar Square
				Wakad, Pune - 411057
				Ph No : 020-67917200
				Fax No : 020-67917299
				Office - 18 A, 04th Floor, Empress
				Mall,
				Behind Raman Science Centre,
				Sır Bezonji Mehta Marg,
				Nagpur – 440018
				Ph No: 0/12-64/1533-55/
				ICL India Holding Pvt. Ltd.
			TCL	Sco 254, 2nd Floor, Sector 44 C
				$T_{\rm all}$ 0172 464 6211
				TCL Ladia Halding Det Ltd
				R 8/2 Uppel Industrial Area Uppel
				Hyderabad AD
				Tel: 040 2344 9350
				TCL India Holding Pvt I td
				302. Vidhvapati 17 Race Course
				Road. Race Course Road
				Indore, MP
				Tel: 0731 400 3365
				TCL India Holding Pvt. Ltd.
				82, Phase 3, Okhla Industrial Estate.
				New Delhi, DL
				011 3082 3011
				Laxbro Manufacturing Company
			T-Series	W-53, MIDC Area, Bhosari Indl.
				Estate, PMC – 411026, Maharashtra
				TOSHIBA INDIA PVT. LTD. 3rd
			Toshiba	Floor, Building No. 10 Tower - B,
			1 051110a	Phase - II
				DLF Cyber City,

S .,		Product		Address / Contact Details
No	Product Name	Sub	Brand	
110.		Category		
				Gurgaon - 122 002,
				Haryana, India
				Board No. + 91-124-4996600
				TOSHIBA INDIA PVT. LTD.
				C&B Square Building , 6th Floor,
				Plot No 601, 127, Andheri Kurla
				Road, Chakla Andheri, (East),
				Mumbai 400059
				Tel: + 91-22-61911500
				TOSHIBA INDIA PVT. LTD. 284
				Hothur Square, 2nd Floor,
				100 Feet Road Indiranagar,
				Bangalore - 560038,
				Karnataka, India
				Tel: + 91-80-25190800
				Toshiba India Pvt. Ltd.,
				Business Communication Centre
				Chiramel Chambers, Kurisupally
				Road, Ravipuram, Kochi-682 015
				Tel: + 91-484-2357107
				Toshiba India Pvt. Ltd.,
				Plot No 1-4, Vatika Business center,
				3rd Floor, NSL Icon, Road No 12,
				Banjara Hills, Hyderabad-500034
				Tel: + 91-40-44311152
				Toshiba India Pvt. Ltd.,
				219, Regus Centre, 3rd Floor,
				Altius Olympia Technology
				Park, Sidco Industrial Estate,
				Guindy, Chennai - 600032, India
				Tel: + 91-44-42994353
				Videocon Industries Ltd.
				14 Kms Stone, Aurangabad-Paithan
			Videocon	Road,
				Chitegaon, Tq. Paithan,
				Dist. Aurangabad - 431 105 (India)
				Corporate Office
				Fort House, 2nd Floor,
				221,Dr. DN Road, Fort, Mumbai-
				400 001(INDIA)
				Corporate Office (Marketing,
				Service & Support):
				296, Udyog Vihar Phase-II,
				Gurgaon, Haryana. Phone No.: 0124-
				3273091
				Westway Electronics Limited
				B-102, Phase – II, Noida – 201305
			Weston	(U.P)
				Phone: 0120 4543114
				Fax: 0120 4543115
				Westway Electronics Limited
				C-189, Naraina Industrial Area Phase-
				Ι
				New Delhi 110028

Sr		Product		Address / Contact Details
No.	Product Name	Sub	Brand	
· · · · · · · · · · · · · · · · · · ·		Category		DI 044 45025000
				Phone: 011 45035222
		LED	IC	Civen Above
			LG	Given Above
			Danasonia	Given Above
			Tailasoine	Given Above
			Opida	Given Above
			Ollida	Corporate office
				Clobal Brands Enterprise
				Solutions Pyt Ltd
			A.1 ·	Solutions I vi. Liu.
			AKai	Plot No. 97, Sector-44, Gurgaon -
				122 002, INDIA
				Phone No: 0124-4305000, Fax No.:
				0124-4305020
				Global Brands Enterprise
				Solutions Pvt. Ltd.
				Flat No. 51, 3rd Floor,
				Path East Paring Canal Road
				Path, East Dornig Canal Road,
				Tal No: 0612 2524302
			Hojer	Given Above
			Hitachi	Given Above
			Philips	Given Above
			Sony	Given Above
			T-series	Given Above
			Salora	Given Above
			Videocon	Given Above
		Plasma and	Videocon	Given Above
		HDTV	Hitachi	
			LG	Given Above
			Panasonic	Given Above
			Samsung	Given Above
			Sansui	Given Above
		Flat	BPL	Given Above
			Daenyx	Given Above
			Haier	Given Above
			LG	Given Above
				Next Retail India Limited,
				3rd Floor, Aadeshwar Arcade
				Above Loop Gallary,
			Next	Opp. Sangam Cinema,
				Andheri Kurla Road,
				Mumbai 400 102
				Phone: +91-/498218860
			Unida	Given Above
			Panasonic	Given Above
			Samsung	Given Above
			Philips	Given Above
			Salora	Given Above
			Sansui	Given Above
		1	Sharp	Given Above

S .,		Product		Address / Contact Details
No	Product Name	Sub	Brand	
140.		Category		
				SANYO India Pvt. Ltd.,
				'Jubilee Building', 2nd Floor,
			Sanvo	45, Museum Road,
			Sallyo	Bangalore 560025, India,
				Tel: +91-80-43418200,
				Fax: +91-80-43418222
			TCL	Given Above
			T-Series	Given Above
				TEXLA ELETROVISION
				A-72, OKHLA INDUSTRIAL
			Texla	AREA, PHASE-II, New Delhi -
				110020, India
				91-11-26384589/26387153
			Videocon	Given Above
			Weston	Given Above
		CTV	Daenyx	Given Above
			Haier	Given Above
			LG	Given Above
			Markson	Given Above
			Moser Baer	Given Above
			Panasonic	Given Above
				Next Retail India Limited
				3rd Floor Aadeshwar Arcade
				Above Loop Gallary
			Next	Opp Sangam Cinema
			INCAL	Andheri Kurla Road
				Mumbai 400 102
				Phone: +91-7498218860
			Philips	Given Above
			Salora	Given Above
			TCI	Given Above
			T Series	Civen Above
			Videogen	Given Above
			Wester	Given Above
		<u> </u>	weston	Given Above
	Washing Machine	Semi	BPL	Given Above
	0	Automatic		
				BELIEK INDIA LID. D. 90 SEC 5 201201
			Beltek	B-89 SEC-5 201301
				NOIDA - UTTAK PRADESH
			D	Phone No.:- 0091 95 1202421676
			Daenyx	Given Above
				PE Electronics Ltd.
				Corporate Centre, 5th Floor, Andheri
			Electrolux	Kurla Koad, Andheri (East), Mumbai
				= 400059 $= 101.22 (1171000)$
				Com Equipments D-t 1 t-1
				SE No. 102 Arran-1: Dec.
			Gem	5.F. INO. 105, Avanashi Koad, Arasur
				Connotione $- 041407$
				Pii. NO. +91 422 2303800
			Calut	Binsishansen Est
			Godrej	Pirojshanagar, Eastern Express
				Highway,

St. No.Product NameSub CategoryBrandVikhroli, Mumbai - 400079, INDIA. Tel: +91-22-2518 8010 / 2518 8020 / 2518 8030 Fax: +91-22-2518 8074Vikhroli, Mumbai - 400079, INDIA. Tel: +91-22-2518 8074Godrej & Boyce Manufacturing Company Limited. Pirojshanagar, Vikhroli, Mumbai - 400079, INDIA. Tel: +91-22-6796 5656 / 5959HaierGiven Above
Category Vikhroli, Mumbai - 400079, INDIA. Tel: +91-22-2518 8010 / 2518 8020 / 2518 8030 Fax: +91-22-2518 8074 Godrej & Boyce Manufacturing Company Limited. Pirojshanagar, Vikhroli, Mumbai - 400079, INDIA. Tel: +91-22-6796 5656 / 5959 Haier Given Above
Vikhroli, Mumbai - 400079, INDIA. Tel: +91-22-2518 8010 / 2518 8020 / 2518 8030 Fax: +91-22-2518 8074 Godrej & Boyce Manufacturing Company Limited. Pirojshanagar, Vikhroli, Mumbai - 400079, INDIA. Tel: +91-22-6796 5656 / 5959 Haier
Tel: +91-22-2518 8010 / 2518 8020 / 2518 8030 Fax: +91-22-2518 8074 Godrej & Boyce Manufacturing Company Limited. Pirojshanagar, Vikhroli, Mumbai - 400079, INDIA. Tel: +91-22-6796 5656 / 5959 Haier
2518 8030 Fax: +91-22-2518 8074 Godrej & Boyce Manufacturing Company Limited. Pirojshanagar, Vikhroli, Mumbai - 400079, INDIA. Tel: +91-22-6796 5656 / 5959 Haier
Fax: +91-22-2518 8074 Godrej & Boyce Manufacturing Company Limited. Pirojshanagar, Vikhroli, Mumbai - 400079, INDIA. Tel: +91-22-6796 5656 / 5959 Haier
Godrej & Boyce Manufacturing Company Limited. Pirojshanagar, Vikhroli, Mumbai - 400079, INDIA. Tel: +91-22-6796 5656 / 5959 Haier
Company Limited. Pirojshanagar, Vikhroli, Mumbai - 400079, INDIA. Tel: +91-22-6796 5656 / 5959 Haier Given Above
Pirojshanagar, Vikhroli, Mumbai - 400079, INDIA. Tel: +91-22-6796 5656 / 5959 Haier Given Above
Mumbai - 400079, INDIA. Tel: +91-22-6796 5656 / 5959 Haier Given Above
Tel: +91-22-6796 5656 / 5959 Haier Given Above
Haier Given Above
Kelvinator
Kenstar
LG Given Above
Onida Given Above
Samsung Given Above
TCL Given Above
T-Series Given Above
Videocon Given Above
Weston Given Above
Whirlpool Given Above
Fully Given Above
Automatic
Daenyx Given Above
Electrolux
Godrei Given Above
Haier Given Above
Corporate Address: IFB Industries
Limited
Corporate Off.: Flat No.IND-5
IFB Sector-1.East Kolkata Township.
Kolkata – 700 107
Ph: $+91$ 33 39849524/39849475
Fax: +91.33.39849676
Kolkata Factory IFB Industries
Limited
No:14 Taratolla Road, Kolkata - 700
088
Ph: +91 33 30489299
Fax: +91.33.30489230
Bangalore Eactory: IFB Industries
Limited
16/17 Visveswarajah Indl. Estate
Off. Whitefield road Bangalore -
560048.
Ph: + 91 80 30589620
GM: +91 80 30589604
MKTG: +91 80 30589641
Fax:+91 80 30589611
Kelvinator
LG Given Above
Kenstar
Onida Given Above
Panasonic Given Above

Sr		Product		Address / Contact Details
No.	Product Name	Sub	Brand	
		Category		
			Samsung	Given Above
			Toshiba	Given Above
			Videocon	Given Above
			Whirlpool	Given Above
				Corporate Headquarters
				Kasturi Buildings,
		1177 1	DI	Mohan T Advani Chowk,
	Air Conditioner	Window	Blue star	Jamshedji Tata Road,
				Mumbai - $400\ 020$
				I el: $(91)(22)66654000$
				Fax: (91) (22) 66654151
				Divisional Headquarters
				O Republich Road
				9 Dazullari Koau
				Chappai 600.017
				Tel : $(91) (44) 4344 4000$
				Fax: (91) (44) 28158015 / 43444072
				Mumbai
				Bandbox House
				4th Flr 254 D
				Dr Annie Besant Road
				Worli
				Mumbai - 400 030
				Tel: (91) (22) 66544000
				Fax: (91) (22) 66544001
				Regional Headquarters
				Chennai
				No.104, Old No. 46,
				Garuda Buildings, Cathedral Road,
				Chennai - 600 086
				Tel: (91) (44) 42444000
				Fax: (91) (44) 42444190
				Mumbai
				Blue Star House
				9A, Ghatkopar
				Link Koad
				Sakinaka Marahai 400.072
				$\mathbf{T}_{a1} (01) (22) (6684000)$
				Fax: $(91)(22) 66684000$
				Kolkata
				7 Hare Street
				Kolkata - 700 001
				Tel: (91) (33) 22134000
				Fax: (91) (33) 22134102
				New Delhi
				Block 2-A, DLF Corporate Park
				DLF Outab Enclave
				Phase III
				Gurgaon - 122 002 (Haryana)
				Tel: (91) (124) 4094000
				Fax: (91) (124) 4094004

C		Product		Address / Contact Details
Sr.	Product Name	Sub	Brand	
10.		Category		
				Manufacturing Facilities
				Ahmedabad
				501/3, 503/2, Teipur Road
				Sarkhei Baula Highway
				Changodar
				Ahmedabad- 382213
				Tel \cdot (91) (2717) 294490
				Bharuch
				Diatuch Diet Ness 4 and 5
				CIDC Industrial Estata
				GIDC Industrial Estate
				Narmada Nagar post
				Bharuch - 392 015
				Tel: (91) (2642) 246116
				Fax: (91) (2642) 246026
				Dadra
				Survey No. 265/2
				Demni Road
				Dadra 396 191
				U.T. Of Dadra & Nagar Haveli
				Tel: (91) (0260) 2668617 / 2668618
				Fax: (91) (0260) 2668503
				Kala Amb
				Nahan Road
				Rannur Lattan
				Kala Amb
				District Sirmour
				Live al al Dradach 172020
				Himachai Pradesh $1/5050$
				$\mathbf{Ier}: (91) (01702) 238760$
				Fax: (91) (01702) 238461
				Kala Amb
				Nahan Road
				Village Ogli
				Kala Amb
				District Sirmour
				Himachal Pradesh 173030
				Tel : (91) 98160 13443
				Fax: (91) (01702) 238761
				Thane
				IInd Pokhran Road
				Majiwada
				Thane - 400 601
				Tel: (91) (22) 67924000
				Fax: $(91)(22)(67924020)$
				Wada
				Willago Voguri Klaurd
				v mage- v asuri Kilufu,
				Knanivali Koad,
				PO - Khupari,
				Taluka - Wada,
				Dist - Thane, 421312
				India
				Sales and Service Offices
				Ahmedabad

S.		Product		Address / Contact Details
No.	Product Name	Sub	Brand	
		Category		
				Abhishree Avenue,
				3rd Floor, Near Nehru
				Nagar Cross Roads,
				Ambawadi Koad,
				Ahmedabad - $380\ 006$
				Tel: (91) (79) 4022 4000
				Bengaluru
				Ozone Manay Technology Park,
				Sy. NO 50/16 & 55/9
				Begur Hobli
				Garyabhayipalya
				Bangalore 560.068
				Tel : (91) (80) 41854000
				Bhubaneswar
				3A Satva Nagar
				2nd Eloor
				Bhubapeswar 751 007
				Tel: (91) (674) 2572403 / 2573670 /
				2570024
				Eax: (91) (674) 2570544
-				Chandigarh
				Adarsh Mall
				4th Floor Plot No. 50
				Industrial & Business Park
				Phase - II.
				Chandigarh - 160 002
				Tel: (91) (172) 5024000
				Fax: (91) (172) 5004007
				Chennai
				Blue Star Limited
				620, Anna Salai,
				Modern School Road,
				Chennai - 600006
				Tel: (91) (44) 40444000
				Fax: (91) (44) 40444001
				Ghaziabad
				C 53A, Third Floor,
				Raj Nagar District Center
				(RDC), Raj Nagar,
				Ghaziabad - 201001.
				Uttar Pradesh
				Tel: (91) (120) 2821400
				Guwahati
				2nd Floor, New Star Freeze
				Bldg., Opp. Kunjalata Bibah
				Bhawan, G S Road,
				Guwahati - 781005
				Tel: (91) (361) 2340620
				Indore
				1st Floor, Shri Krishna
				Classic, 139,
				Fadnis Colony, A B Road,
				Indore - 452 010

S.		Product		Address / Contact Details
No	Product Name	Sub	Brand	
110.		Category		
				Tel: (91) (731) 4001211/
				4001311
				Jaipur
				A-19, First Floor,
				Main Sahakar Path,
				Nr. Sahakar Bhavan,
				Jaipur
				Tel: (91) (141) 4141100/
				2744033/35
				Kochi
				Millenium Plaza
				Alinchuvadu
				MKK Nair Road
				Near Palarivattom Junction
				Kochi - 682024
				Tel: (91) (484) 4499000
				Fax: (91) (484) 4499190
				Lucknow
				177/4,Faizabad Road
				Lucknow 226 007
				Tel: (91) (522) 4034000
				Fax: (91) (522) 4034004
				Mumbai
				59 Forbes Street
				Mumbai 400 001
				Tel: (91) (22) 22844660
-				Mumbai
				Unit G-2
				Shalimar Ind. Estate
				Dharavi Road
				Matunga
				Mumbai - 400 019
				Tel: (91) (22) 24042098
				Mumbai
				Unit 1 Prabhadevi
				Industrial Estate
				Prabhadevi.
				Mumbai - 400025
				Tel: (91) (22) 24227305
				Fax: (91) (22) 24376041
				Nagpur
				219 Bajaj Nagar, 1st Floor, South
				Ambazari Road, Nagpur - 440010
				Tel: (91) (712) 6624000
				Fax: (91) (712) 6624002
				New Delhi
				E-44/12, Okhla Industrial
				Area. Phase II.
				New Delhi - 110 020
				Tel: (91) (11) 41494000
				Fax: (91) (11) 41494001
<u> </u>				Paniim (Goa)
				First Floor, Buddhaseth
				Apts Tonca Caranzalem
1			1	Tipto, Tonca, Catalizatelli,
S.		Product		Address / Contact Details
------	--------------	----------	---------	---
Sr.	Product Name	Sub	Brand	
110.		Category		
				Goa - 403 002.
				Tel: (91) (832) 2462789
				Pune
				201/A, Nityanand Complex
				247/A Bund Garden Road
				Pune - 411011
				Tel: (91) (20) 4104 4000
				Fax:(91) (20) 4104 4001
				Raipur
				Alaska Corporates,
				3rd Floor, Opp VIP Road,
				Jivan Vihar Colony,
				G E Road. Raipur.
				Chattisgarh - 492 006
				Tel: (91) (771) 6544000
				Secunderabad
				207 Sikh Road
				Bantia Estate
				Secunderabad - 500 003
				Tel: (91) (40) 4400 4000
				Fax: (91) (40) 4400 4001 / 4190
				Thane
				Und Pokhran Road
				Mainwada
				There 400601
				$T_{all} = 400001$ $T_{all} = (01) (22) (7154500)$
				Ferr (91) (22) 67134300
				Fax: (91) (22) 07924020
				Thiruvananthapuram
				$1C_{1V}/962$, Chandrika,
				Sree Chitra Nagar,
				Pipe line Road, Kawdiar,
				Thiruvananthapuram - 695 003
				1 el: (91) (4/1) 2435025
				Fax: (91) (4/1) 2434065
				Vadodara
				Ramkrishna Chambers
				Productivity Road
				Alkapuri
				Vadodara
L				Tel: (91) (265) 6614000
				Visakhapatnam
				D. No. 49-24-65/1,
				Resapuvani Palem Village,
				Madhura Nagar Mandal,
				Near Sankarmattam Road,
				Vishakapatnam 530 016
				Tel: (91) (891) 274 8405
				Fax: (91) (891) 270 1041
				INDIAN HEADQUARTERS :
				Carrier Airconditioning &
			Carrier	Refrigeration Limited
				Delhi Jalour History Marsinger
				Denn - Jaipur Highway, Narsingpur,
1				Gurgaon,

Sr		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
				Haryana, 122 004, India
				Ph. No. +91-124-4825500
				Fax No. +91- 124- 2373 241
				Carrier Airconditioning &
				Refrigeration Ltd
				U & I Building,Plot No-83,
				Sector-29,
				Near Bikaner Sweets
				Gurgaon 122 002 (Haryana)
				Tel:- 0124 - 4707333
				Fax:- 0124 - 2565050
				Carrier Airconditioning &
				Refrigeration Ltd
				Carrier Complex
				Vill. Narsinghpur, Kherki Daula Post,
				Gurgaon – 122 004
				Tel:- 0124 - 482 5500
				Fax:- 0124 - 237 2230
				Carrier Airconditioning &
				Refrigeration Ltd
				Shop No # 201 E, 2nd Floor,
				Mahagun Metro Mall,
				Near Ansal Plaza, Vaishali,
				Ghaziabad (Uttar Pradesh)
				Tel:- 0120-4183260
				Fax:- 0120 - 4183266
				Carrier Airconditioning &
				Refrigeration Ltd
				Unit No.402 B & 403,
				4th floor, Shalimar Square,
				126/3 B B.N.Road,Lalbagh,
				Lucknow - 226001
				Tel:- 0522 - 2202346, 2230598
				Fax:- 0522 - 2230050
				Carrier Airconditioning &
				Refrigeration Ltd
				SCO 301/302, 1st Floor ,
				Sector – 38 D, Chandigarh - 160 036
				Tel:- 0172 - 500 7548/ 50
				Fax:- 0172 - 5007160
				Carrier Airconditioning &
				Refrigeration Ltd
				1st Floor, S.S.Tower, New Colony
				Behind Jyanti Market,
				Jaipur - 302 001
				Tel Nos :- 0141 - 511 3444, 511 3999
				Carrier Airconditioning &

Sr		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
				Refrigeration Ltd
				C/o Bhairav Distributors,
				Shop No:- 5 & 6, Victor Bldg
				Cujira - St Cruz
				Panaii - Margao Highway,
				Paniim. Goa - 403 005
				Tel:- 0832 - 244 7028
				Fax:- 0832 - 244 7027
				Carrier Airconditioning &
				Refrigeration Ltd
				605A Lokmat Building
				Lokmat Square, Vardha Road
				Ramdas Peth Nagour
				Tel:- 0712 - 663 0214 645 3790
				$Fax:= 0.712 = 645 \ 3790$
				Carrier Airconditioning &
				Refrigeration Ltd
				C/o Suman Enterprises
				C/O Suman Enterprises
				Beinne 402.006
				Kaipur $- 492000$ Tal. 0771 401 3245
				$\frac{1}{10000000000000000000000000000000000$
				Carrier Airconditioning &
				Retrigeration Ltd
				Ist Floor, Milestone, Drive In Road
				Thaltej, Ahmedabad – 380 052
				Tel:- 0/9 - 4026 7777
				Fax:- 0/9 - 4026 7/99
				Carrier Airconditioning &
				Retrigeration Ltd
				Shreeprasad, Office No.4, 4th floor
				Plot No. 74, Sheela vihar colony
				Opp. Planet ford, Paud Road
				Pune -411 038
				Tel:- 020 - 41051000/ 02025437741
				Fax:- 020-25437742
				Carrier Air-conditioning &
				Keingeration Ltd., Unit No.4. 3rd Floor
				Phoenix Market City
				15 L.B.S. Marg. Kurla (West)
				MUMBAI – 400 070.
				Telephone: 022-61700700
				Carrier Airconditioning &
				Refrigeration Ltd
				315-316, Shagun tower,
				7 Commercial Sector PU 4, Scheme
				No 54,
				Vijay Nagar Square, A.B. Road,

S.,		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
				Indore – 452010
				Tel:- 0731-4070378
				Fax:- 0731 - 252 6365
				Carrier Airconditioning &
				Refrigeration Ltd
				C/o Om Sai Enterprises,
				Pushpanjali Complex,
				Second Floor, Lake Road,
				Ranchi – 834 001
				Tel:- 0651 –645 2488
				Fax:- 0651 – 246 1818
				Carrier Airconditioning &
				Refrigeration Ltd
				C/o, Candida Enterprises
				R.G. Baruha Raod, Sunderpur
				Guwahati - 781 005
				Tel:- 0361 - 259 5003
				Fax:- 0361 - 220 3508
				Carrier Airconditioning &
				Refrigeration Ltd
				204, Adarshila Complex
				South Gandhi Maidan
				Patna - 800 001
				Tel:- 0612 - 232 3517
				Telefax:- 0612 - 266 8591
				Carrier Airconditioning &
				Refrigeration Ltd
				P-339/1, CIT Road, Scheme VI-M,
				Phulbagan, Kolkatta – 700 054
				Tel:- 033 - 4020 1300
				Fax:- 033 - 2364 9766
				Carrier Airconditioning &
				Refrigeration Ltd
				Flat No:- 201, Shanti Niwas Housing
				Plot No:- 33/1747, Rasulgarh
				Bhuvaneshwar – 751010
				Tel:- 0674 - 258 7178/ 258 5893
				Fax:- 0674 - 258 7178
				Carrier Airconditioning &
				Refrigeration Ltd
				6-2-976, Raj Bhawan Road
				Khairatabad,
				Hyderabad – 500 004
				Tel:- 040 - 4546 2888
				Fax:- 040 - 4011 8146
				Carrier Airconditioning &
				Refrigeration Limited

S.,		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
				3rd Floor, Block-III,
				Prestige Blue Chip, No.9, Hosur
				Road,
				Bangalore – 560 029
				Tel :- +91 80 43442000
				Fax:- +91 80 41321222
				Carrier Airconditioning &
				Refrigeration Ltd
				Shivas Complex
				263/5. Mettupalayam Road
				Combatore $- 641.043$
				Tel:- 0422 - 438 4151 438 5403
				Fax:- 0422 - 2436485
				Carrier Airconditioning &
				Refrigeration Ltd
				39/6641 Perumanoor
				M.G. Road (Opp. Cochin Shipyard)
				Cochin $= 682.015$
				Tel:- 0484 - 402 9001 / 0
				$F_{ax:-} 0484 - 235 9214$
				Carrier Airconditioning &
				Refrigeration Ltd
				GRR Zone
				271/2 Maraimalai Adigal Salai
				Pondicherry 605 001
				Tel: 0413 222 5853 2226 676
				Fax: 0413 234 4695
				Carrier Airconditioning &
				Refrigeration Ltd
				Old No. 248 New No. 114
				Powerettah High Poad
				Royapettan Fign Road,
				$\frac{1}{2}$
			Daenux	Given Above
				ETA General Pvt Ltd
				ETA House ,3rd Floor
			C = 1/ETA	#71/63,Opp.Loyola College
			General (ETA)	Sterling Road, Nungambakkam,
				Chennai.6000034 . Tamilnadu
				044- 43402345
				ETA General Pvt. Ltd.
				Flat no -642 D, Kam Appartments
				Opp. Laksini Mills Papanaicken Palavam
				Combatore - 641 037
				Tel. #:0422 - 2554732
				ETA General Pvt Ltd
				ETA House, Behind Green Park
				Hotel

Sr		Product		Address / Contact Details
No.	Product Name	Sub	Brand	
		Category		7.4.07/5 DL (NL 0
				/-1-2//5, Plot No:9,
				Greenlands, Ameerpet
				HYDERABAD - 500 016 T-1#:040 ((102520 / 21
				ETA Canaval Data Ltd
				D NO 40 1 110 Old DATA Cadara
				Opp. Justhi Mahal
				Bong Circle
				$\frac{1}{2} \frac{1}{2} \frac{1}$
				T_{1} , 0866 6460278 / 2074020
				ETA Canoral Dat 1 td
				DL at No 153 and Eleon Oth Main
				Road
				3rd Block Javapagar
				BANGALORE 560.011
				Tal: $0.80 \ 4.0026531 \ / \ 4.0026538$
				ETA Canaval Dat. 1 td
				ETA General Pvt. Ltd. Pldna #:20/2001 D. 'Atham'
				1 + E
				Dennumuni Read
				Polinurunin Koad
				Cochine (82.010
				$T_{-1} = 0.02019$
				$E^{TA} = \frac{10484 - 4011625}{1000000000000000000000000000000000000$
				101 102 1 to Elegen Constant Haritage
				One Orlan Church Marya Road
				Malad West
				Marad – West,
				Mumbai - 400064
				Tel: 022 - 42455500 / 02
				ETA General Pvt. Ltd.
				Name Complete Transla
				Duine Le De d
				Drive In Koad
				T-1, 070 274(7001 40059001
				ETA C ID + 1+1
				ETA General Pvt. Ltd.
				SCO 24/5 - 76, Sector 22, C, 2nd Elecar
				Sector 22 - C, 2nd Floor
				CHANDIGARH - 100022
				ETA Canaval Dat. 1 tel
				C 10 Sector I
				C - 19, Sector - J
				$\frac{1}{1}$
				$T_{2} + 0522 = 4006870$
				ETA Coporal Drivata Limitad
				Suprise Mell 2nd Floor
				Sector 11 Vasundhara 201 012
				Tel: 0120 /201121
				ETA Coporal Dut I td
				221 Ist floor
				221, IST HOOF, Olthia Indi Area
				Narra Dalla: 110020
				H 011 42127777
1		1		# 011-4312////

S.		Product		Address / Contact Details
Sr.	Product Name	Sub	Brand	
110.		Category		
				ETA General Pvt. Ltd.
				203, 2nd Floor
				Krishna Enclave, Plotno-SB-52
				Opp.SMS Stadium, Tonk Road,
				JAIPUR - 302015(Rajasthan)
				Ph. No: 0141-4012684
				ETA General Pvt. Ltd.
				1st Floor,Unit 1 F
				"Sree Ganesh Centre",
				216, AJC Bose Road
				KOLKATA - 700 017
				Tel: 033 - 40602006
			Godrej	Given Above
			Haier	Given Above
			Hitachi	Given Above
			LG	Given Above
			Onida	Given Above
			Samsung	Given Above
			Videocon	Given Above
			TCL	Given Above
				Voltas Limited
				Voltas House
	Corporate			'A' Block
	Headquarters		Voltas	Dr. Babasaheb Ambedkar Road
				Chinchpokli
				Mumbai 400 033
				Tel: 022-66656 666
	Factories			2nd, Pokhran Road,
	I uctorico			Thane - 400 601
				Tel: 022-67920111
				Dadra Plant (EM&RBG)
				Shreenath Industrial Estate, C
				Building
				Survey NO.197, Nr. Dadra Check
				Post Pin -396230
				Tel: 0260-6619999 / 2669648
				Uttarakhand Plant (EM&RBG)
				Plot No.1, Sector 8
				D' LLS N D 1
				Dist U.S. Nagar, Rudrapur
				$T_{11} = 203143$ $T_{21} = 05044, 250006, 7, 8$
				Itteral-bard Plant (UPPC)
				Diat NO 2.5 Sector 9
				LIE Dapt Nagar Industrial Area
				Dist U.S. Nagar Budragur
				Din 263153
				$T_{\rm m} = 203133$ Tel: 05944 250009
			Whirloool	Civen Above
		C = 1:4	Plue star	Civen Above
		Split	Contrion	Civen Above
			Decrement	Given Above
			Daenyx	Given Above
			General (ETA)	Given Above

Sr.		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
			Godrej	Given Above
			Haier	Given Above
			Hitachi	Given Above
			LG	Given Above
			Onida	Given Above
				Gurgaon Head Office
				2nd Floor, Tower A & B, DLF Cyber
				Greens, Dlf Cyber City, DLF Phase -
			Mitsubishi	III,Gurgaon-122002, India
				Phone: +91 (124) 463-0300 +91 (124)
				673-9300 Fax: +91 (124) 463-0399 /
				398
				Delhi Registered Office
				M-38/1, Middle Circle, Connaught
				Place, New Delhi-11000, India
				Please contact Gurgaon head office
				for Delhi inquiries.
				Drostigo Emorald (th Elect
				Municipal No. 2 Madras Bank Boad
				(Lavelle Road) Bangalore 560001
				India
				Phone: ± 91 (80) 4020-1600 Fax: ± 91
				(80) 4020-1699
				Pune FAID Head Office
				Emerald House, EL-3, J block
				M.I.D.C Bhosari, Pune -411026,
				India
				Phone: +91 (20) 2710-2000 Fax: +91
				(20) 2710-2100
				Pune Sales Office
				301-302, Lunkad sky Station, near
				HDFC Bank, Viman Nagar, Pune-
				411 014, India
				Phone: +91 (20) 4131-4868 Fax: +91
				(20) 4131-4851
				Fune Sales Unice
				1-2, Gurulej Danadur, Housing
				411003 India
				Phone: $\pm 91 (20) 2582 0447 / 448 /$
				449 Fax: +91 (20) 2582-0450
				Mumbai Sales Office
				305-306 3rd Floor "Windfall" Sahar
				Plaza Complex, Next to Kohinoor
				Hotel, Andheri Kurla Road, J. B.
				Nagar, Andheri (E.) Mumbai-400
				059, India
				Phone: +91 (22) 6611-6200 Fax: +91
				(22) 6611-6299
				Chennai Sales Office
				Citilights Corporate Centre No.1,
				Vivekananda Road, Srinivasa Nagar,

S.		Product		Address / Contact Details
No	Product Name	Sub	Brand	
110.		Category		
				Chepet, Chennai-600 031, Tamilnadu,
				India
				Phone: +91 (44) 4923-2222 Fax: +91
				(44) 4923-2249
				Hyderabad Sales Office
				4th Floor, Unit No.407, Ashok
				Bhopal Chamber S.P. Road,
				Secunderabad, A.P-500 005, Andhra
				Pratesh, India Dhono: $\pm 01 (40) 4343 8888 Eave \pm 01$
				(40) 4343 8800
				Chandigarh Sales Office
				SCO 176 First Floor Sector 38 C
				Chandigarh = 160036 India
				Phone: +91 (172) 460-1645
				Jaipur Sales Office
				111. Ground Floor. Apex Mall. Tonk
				Road, Jaipur, India
				Phone: +91 (141) 401-1109
				Ahmedabad Sales Office
				303 / A, 3rd Floor, Primate, Judges
				Bungalow Cross Road, Bodakdev ,
				Ahmedabad Gujarat – 380054, India
				Coimbatore Sales Office
				No 551A, West Lokmanya Street, DB
				Road, RS Puram, Coimbtore -
				641002, India
				Phone: +91 (422) 438-3600
				A 1/2 and Eleor Status Plaza Opp
				Relish Resort Aksar Square O.P.
				Road Vadodara - 390020 India
				Phone: +91 (265) 231-4699/ 235-
				8137 Fax: +91 (265) 233-3307
				Kochi Sales Office
				Room No G9, Building Door No
				CC: 39/5102-A-6, Netage Arcade
				Church Landing Road Ernaculum,
				Kochi-682016, India
				Phone: +91-9846013451 / +91-
				8129445670
				Mitsubishi Elevator ETA India Pvt.
				Ltd.
				Chennai Citi Centre, 5th Floor, 10 &
				- 600004, India
				Phone: +91 (44) 2847-7370 Fax: +91 (44) 2847-7374
			Panasonic	Given Above
			Samsung	Given Above
			Sanyo	Given Above
			TCL	Given Above
			Toshiba	Given Above

Sr		Product		Address / Contact Details
No.	Product Name	Sub	Brand	
		Category	x x' 1	
			Videocon	Given Above
			Voltas	Given Above
	D (I	D' C 1	Whirlpool	Given Above
	Refrigerators	Direct Cool	BPL	Given Above
			Electrolux	Given Above
			Gem	Given Above
			Godrej	Given Above
			Haier	Given Above
			Kelvinator	
			LG	Given Above
			Panasonic	Given Above
			Samsung	Given Above
			Videocon	Given Above
			Whirlpool	Given Above
		Frost Free	BPL	Given Above
			Electrolux	
			Godrej	Given Above
			Haier	Given Above
			Hitachi	Given Above
			Kelvinator	
			LG	Given Above
			Panasonic	Given Above
			Samsung	Given Above
			Videocon	Given Above
			Whirlpool	Given Above
			Toshiba	Given Above
			Sharp	Given Above
				Registered & Corporate Office
				130, Pandurang Budhkar Marg, Worli,
			Siemens	Maharashtra,
				Mumbai 400 018. $T_{-1} + 01 22 2077 7000$
				Tel: +91 22 3967 7000
				Fax: +91 22 3967 7500
			1.000	Acer India Private Limited
	Mobile Phones		Atei	I New Delbi 110020 Delbi India
				Tel: $+(91)_{-}(11)_{-}40568000$
				India Office
				TCT Mobile International Limited
			Alcatel	Elegance Tower Regus Business
				Centre, 2nd Floor, Room No.252B
				Jasola, New Delhi-110025
				Distributors
				Encon Impex Private Limited, Super
				Distributor
				Encon Impex Private Limited, No.45,
				2nd Floor, Vinayaka Electronic Plaza,
				1st Cross, S.P Road, Bangalore - 560
				002
				Kochi,Kerala
				Talktime Telesystems,Super
				Distributor
				Talktime Telesystems, 48/425B, Main

No. Product Name Sub Category Brand Image: Control of Category road, Elamakkara, Kochi-682026. Tirunelveli, Tamil Nalu KM Enterprises, Super Distributor KM Enterprises, Super Distributor KM Enterprises, Super Distributor KM Enterprises, No 41 E/3, Vasanthpuran, South Bye-Pass road, Tirunelveli-627005 Image: Control of C	S.		Product		Address / Contact Details
Total Category road, Elamakkara, Kochi-682026. Immediation Immediation Immediation Immediation Immediation </th <th>No</th> <th>Product Name</th> <th>Sub</th> <th>Brand</th> <th></th>	No	Product Name	Sub	Brand	
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Image: Super Distributor Firamelveli, Tamil Nadu KM Eaterprises, Super Distributor KM Eaterprises, Super Distributor KM Eaterprises, Not H E/3, Vasanthapuran, South Hy/3, Vasanthapuran, South Hy/3, Vasanthapuran, South Hy/3, Vasanthapuran, South Super Super Distributor SR Technologies, Micro Distributor Mazon Amazon Amazon Bevelopment Center India Pvi Ltd Q-city, 2nd Floor-Block A & Block B Seringamplay Mandal, Ranga Reddy Dist. Hydenbad - 500032 Ph: 040 39921111 Divyshree Building, Ground Floor, Pito No: 6 Hydenbad - 500031 Ph: 040 43451000 Ph: 040 43451000 Ph: 040 43451000 Ph: 040 43451000 Ph: 040 4305100 Ph: 040 4305100 Ph: 040 4305100 Ph: 040 4305100 Ph: 040 4305111 Ph: 040 4306111					road, Elamakkara,Kochi-682026.
KM Enterprises, Super Distributor KM Enterprises, No 41 E/3, Vasanthapuram, South Bye-Pass road, Tiranelveli-627005 Karimmagar, Andhra Pradesh SR Technologies, Micro Distributor SR Technologies, No 15-89, Aravindh Nagar, Jagital, Karimnagar, Andhra Pradesh. Amazon Development Center India Pruladesh. Amazon Development Center India Pruladesh. Amazon Amazon Unitary, Mandal, Ranga Reddy, Dist. Hyderabal - 500032 Pi: 040 39921111 Virgener Dist. Hyderabal - 500032 Pi: 040 39921111 Virgener Dist. Hyderabal - 500031 Pi: 040 3922111 Virgener Dist. Hyderabal - 500031 Pi: 040 43921111 Virgener Dist. Hyderabal - 500031 Pi: 040 43451000 Pi: 040 43451000 Pi: 040 43451000 Pi: 040 43451000 Pi: 040 4345100 Pi: 040 40005111 Pi: 040 40005111 Pi: 040 40005111 Pi: 04					Tirunelveli,Tamil Nadu
KM Enterprises, No 41 By/5, Vasanthapuran, South By/5, Ka Firethrologies, No 1-5-89, Arawindh Nagr, Jagtial, Karimnagar, Andra Pradesh Armazon Armazon Development Center India Per Lud Q-city, 2nd Floor-Block A & Block B Survey Number-109,110,111/2, Armazon Armazon <t< td=""><td></td><td></td><td></td><td></td><td>KM Enterprises,Super Distributor</td></t<>					KM Enterprises,Super Distributor
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Image: State of the state					Vasanthapuram, South Bye-Pass road,
Karinnagar, Andhra Pradesh SR Technologies, Micro Distributor SR Technologies, No 1-5-89, Aravindh Nagar, Jagatial, Karinnagar, Andhra Pradesh. Andra Pradesh. Andra Pradesh. Amazon Development Center India Pvt Ltd Q-city, 2nd Floor-Block A & Block B Survey, Number-109,110,111/2, Nanakranguda Village Serlingamplay Mandal, Ranga Reddy Dist. Hyderabad - 500032 Ph: 040 39921111 Divayshree Building, Ground Floor, Plot No: 6 Hi-Tech City Layout, Survey No. 64(Part), Madhapur Village Serlingampally Mandal Hyderabad - 500081 Ph: 040 3451000 9th & 10th Floor, Plot No: 6 Hi-Tech City Layout, Survey No. 64(Part), Madhapur Village Serlingampally Mandal Hyderabad - 500081 Ph: 040 4005111 Ph: 040 4005111 #40,3rd Floor, Suffact Devestor Ph: 040 4005111 #40,3rd Floor, Suffact Devestor Ph: 044 308808 2nd Floor, Safina Toroity Male Sufface And Promate Road Bangalore - 560052 Ph - 080 41970000 Ph: 044 3088308 Ph: 040 3273000 Ph: 040 3273000 Ph: 080 41970000 Prigade Cateway 6t					Tirunelveli-627005
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Aravindh Nagar, Jagtial, Karimnagar, Andhra Pradesh. Andra Pradesh. Amazon Development Center India Pvt Ltd Qcity, 2nd Floor-Block A & Block B Survey Number-109,110,111/2, Nanakamguda Village Seringamplayy Malag. Seringamplayy Madal, Ranga Reddy Dist. Hyderabad - 500032 Ph: 040 39921111 Divyashree Building, Ground Floor, Plot No: 6 Hi-Tech City Layout, Survey No. 64(Part), Madhapur Village Seringampally Mandal Hyderabad - 500081 Ph: 040 3451000 9th & 10th Floor, Ph: 040 4000511 Hyderabad - 500081 Ph: 040 4308808 Ph: 040 4000511 Hyderabad - 50002 Ph: 040 4308808 Ph: 044 3088080 Ph: 044 3088080 Ph: 044 308800 Ph: 045 430800 Ph: 046 4308800 Ph: 04					SR Technologies, No 1-5-89,
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Hi-Tech City Layout, Survey No. 64(Part), Madhapur Village Serilingampally Mandal Hyderabad - 500081 Ph: 040 43451000 9th & 10th Floor, Bulding #9, Raheja Mindspace Madhapur Hyderabad - 500081 Ph: 040 43451000 9th & 10th Floor, Bulding #9, Raheja Mindspace Madhapur Hyderabad - 500081 Ph: 040 40005111 #40,30t Floor, SP Infocity M G R Salai, Perungudi Kandanchavady Chennai-600096 Ph: 044 30883088 2nd Floor, Safina Towers Opposite J.P. Techno park No.3, Ali Asker Road Bangalore - 560052 Ph- 080 41970000 Brigade Gateway 6th floor 26/1, Dr. Rajkumar Road Malleshwaran(W) Bangalore 560055 Ph: 080 3273000 Apple Apple India Private Limited 19 Floor, Concorde Tower C, UB Floor, S0-001 Bangalore 560-001					Plot No: 6
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Ph- 080 41970000 Brigade Gateway 6th floor 26/1, Dr. Rajkumar Road Malleshwaram(W) Bangalore-560055 Ph: 080 33273000 Apple Apple Benefon Presentec GmbH Große Elbstraße 117 DE DE 2027 TM = 117					Bangalore - 560052
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Bangalore-560055 Ph: 080 33273000 Apple Apple Image: Description of the system Apple Apple Image: Description of the system Benefon Benefon Benefon					Malleshwaram(W)
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Apple UB City No 24 Vittal Mallya Road Bangalore 560-001 Presentec GmbH Benefon Große Elbstraße 117					19 Floor, Concorde Tower C.
Bangalore 560-001 Benefon Große Elbstraße 117 DE 027(7 H = 1				Apple	UB City No 24 Vittal Mallva Road
Bangaore Gol Sol Benefon Presentec GmbH Große Elbstraße 117 DE 20277 H					Bangalore 560-001
Benefon Große Elbstraße 117	<u> </u>				Presentec GmbH
				Benefon	Große Elbstraße 117
DE-22/6/ Hamburg				2 cheron	DE-22767 Hamburg

Sr		Product		Address / Contact Details
No.	Product Name	Sub	Brand	
		Category		
				Phone: $\pm 49 (0)40 300 6683 0$ Eas: $\pm 40 (0)40 300 6683 20$
				Pax: +49 (0)40 300 0083 29
				2 rd Eleon OP Puilding
			BenQ	DI E Cuber City, DI E Dhase 3
			-	DLF Cyber City, DLF Phase 5,
				Gurgaon 122002, Haryana.
				Ningbo Bird Co.,Ltd.
				No.999, Dacheng East Road,
				Pengnua City, Znejiang Province,
			D' 1	P.K.China $T_1 \rightarrow 0.0574$ appendix $T_1 \rightarrow 0.0755$
			Dird	161: +80 5/4 88953405, +80 /55
				508/8280 E
				Fax: +80 5/4 88951025, +80 /55
				308/8284
				$US \propto Latin Americas$
				$101: +80 5/4 88953405$ $M_{0} = 106 12729 470400$
				100011e: +80 13/384/0409
				Corporate Head Office
				BlackBerry B
			D1 1D	2200 University Ave. E
			BlackBerry	Waterloo, ON, Canada
				N2K 0A2
				1el: (519) 888-7405
				Fax: (519) 888-7884
				BlackBerry United States
				BlackBerry
				5000 Riverside Drive,
				$\frac{11}{7}$
				$T_{a} = \frac{1}{2} \frac{7}{2} \frac{1}{2} \frac{1}$
				Eas: (972) 650 2006
				Plask (972) 030-2000
				BlackBerry BlackBerry
				200 Bath Boad
				Slough Berkshire
				United Kingdom SI 1 3VF
				Tel. $+44$ (0)1753 667000
				$F_{ax} + 44 (0)1753 669070$
				Manufacturing Eacility
				BlackBerry
				451 Phillip Street
				Waterloo Ontario
				Canada N2L 3X2
				Tel: (519) 888-7465
				F_{ax} (519) 888-0021
				Ottawa
				BlackBerry
				4000 Innovation Drive
				Kanata Ontario
				Canada K2K 3K1
				Tel: (613) 599-7465
				Fax: (613) 599-1922
				Mississauga

Sr		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
		<u></u>		BlackBerry
				4701 Tahoe Boulevard
				Mississauga, Ontario
				Canada L4W 0B5
				Tel: (905) 629-4746
				Fax: (905) 629-4869
				BLU Products
			BLU	10814 NW 33 rd St# 100
			DLC	Doral, FL 33172
				(305) 715 - 7171
				Bosch Sicherheitssysteme GmbH
				Robert-Bosch-Ring 5
			Bosch	85630 Grasbrunn
				GERMANY
				Tel: +49 (0) 89 6290-0
				Bosch Security Systems
				130 Perinton Parkway
				Fairport, New York, 14450
				Tel: +1 585 223 4060
				Bosch Security Systems Pte Ltd
				11 Bishan Street 21
				Singapore 5/3943
				SINGAPORE
				1el: +65 65/1 2808
				Bosch Security Systems B.V.
				Postfach 80002
				THE NETHERI ANDS
				THE NETHERLANDS $T_{a1} \pm 21$ (0) 40 25 77 284
				1el: +31 (0) 40 25 // 284
				Casio India Co. Private Ltd.
				Estate Dhase III
			Casio	New Delbi 110020
				Tel: 011 66090200
				Fax: 011-41054330
				601 6th Floor Crescent Plaza
				Telly Gulli, Andheri(E)
				Mumbai-69.
				Ph.: 022-60605005
				No.7, Shah Complex, 2nd Floor,
				9th Main, 5th Block Jayanagar,
				Bangalore- 41,
				Ph.: 080-60605005
				3rd Floor, Heera Panna Complex,
				124/1, G.N.Chetty Road,
				T.Nagar, Chennai-17,
				Ph.: 044-60605005
				3rd Floor, 3-4-630,
				Padma Plaza, Opposite Ratna
				College,
				Narayanguds, Hydrabad-29,
				Ph.: 040-60605005

Sr		Product		Address / Contact Details
No.	Product Name	Sub	Brand	
		Category		
				4C, Lansdowne Place,
				2nd Floor, Kolkata-29,
				Ph.: 033-60605005
				CELKON IMPEX PVT LTD.
				3rd floor, 2nd block, MY HOME
			Celkon	HUB,
				Madhapur, Hyderabad - 500081,
				Andhra Pradesh, India.
				Contact : +91 90523 45678
				Spectrum House, Dunstable Road,
			Chea	T 1 04022 202020
				Tel: 01925 585828
				Dell Computer Computing
				Dell Computer Corporation
			Dell	Doubd Pock Toxes 78682
			Den	Tal: (888) 560 8324
				(800) 915-3355
-				FRICSSON INDIA PRIVATE
				LIMITED
				Ericsson Forum DLF Cyberciti
			Ericsson	Sector-25A. Gurgaon Harvana
				Postal code: 122 002
				Phone: +91 124 4080808, +91 124
				2701001
				Shiodome City Center
			E	1-5-2 Higashi-Shimbashi, Minato-ku
			Fujitsu Siemens	Tokyo 105-7123, Japan
				Tel: +81-3-6252-2220
				Gigabyte Technology India Private
			Gigabyte	Limited
				+91-22-40633222
			Haier	Given Above
				Hewlett-Packard India Sales Pvt.Ltd
				24, Salarpuria Arena
			НР	Adugodi
				Hosur Road
				Bangalore - 560 030
-				Phone: (080) 33824000 / 33829000
				Hewlett-Packard India Sales Pvt. Ltd
				Behind Sweeth Building
				Off C C Road Neuroperpure
				Abmedabad 380.001
				Hewlett Packard India Sales Put I td
				24 Salarouria Arena Building
				Adugodi Hosur Road
				Bangalore - 560.030
				HP GR Tech Park Facility
				10th & 11th floor. B wing. Akash
				Block.
				6-9 floor, B wing, Akash Block,
				0-3rd Floor, B wing, Akash Block,

Sr		Product		Address / Contact Details
No	Product Name	Sub	Brand	
110.		Category		
				Salarpuria GR Tech Park,
				Sy No.69/3, Whitefield Road, Next
				to ITPL,
				Bangalore - 560 066. India.
				Hewlett-Packard GlobalSoft Limited
				HP Avenue
				39/40, Electronics City-I
				Hosur Road
				Bangalore - 560 100
				Global e-Business Operations Pvt.
				Ltd.
				Wind Tunnel Road
				Tower I, GVH, Murugeshpalya
				Murugesnpaiya
				$\frac{1}{1} \frac{1}{1} \frac{1}$
				Hewlett-Packard India Sales Pvt. Ltd.
				No. 66/2, Ward No. 83,
				Athe Elegen Wing A
				4th Floor, Wing A,
				Bangaloro 560.003
				Surray No. 102
				Whitefield Read
				Mahadayayara Road
				Bangalore 560.048
				III Eloor Khanija Bhayan
				49 Race Course Road
				Bangalore - 560 001
				Surva Park 2
				No 100 Ring road
				Bangalore - 560 100
				Surva Wave Sy $\#$ 61(p)
				Electronic City Hosur Road
				Bangalore - 560 100
				Prathik Tech Park
				Survey No 93/1. Veerasandra village.
				Attibele Hobli, Anekal Taluk.
				Electronic City Extension
				Bangalore - 560 100
				Hewlett-Packard India Sales Pvt.Ltd
				No.2, KRM Plaza,
				Harrington Road,
				Chetpet,
				Chennai - 600 031
				Plot 1, Olympia Technology park,
				Citius block, SIDCO industrial estate,
				Guindy,
				Chennai - 600 032
				Block 1, 4F - 6F
				Block 1, G - 3F
				First Software Park,
				110 Mount Poonamalle Road, Porur
				Chennai - 600 116

Sr		Product		Address / Contact Details
No.	Product Name	Sub	Brand	
		Category		
				Ground floor, Crowne Plaza,
				New Friends Colony,
				New Delni - 110065.
				No 18 ilaba Contro
				Ath Eleon D. Pleak
				5th Floor C Block
				5th Floor D. Block
				Madhapur
				Hyderabad - 500 081
				Hewlett Packard India Sales Private
				Limited
				Building No:-02. DLF Cybergreen.
				1st to 4th floors. Towers D & E.
				DLF Cyber City, Phase III,
				Gurgaon – 122 022, Haryana, India
				Phone:(0124) 3886000
				Fax: (0124) 3886941
				Hewlett-Packard India Sales Pvt Ltd.
				Plot No. 9-11A & 35-37A, Sector-V
				Integrated Industrial Estate,
				Pantnagar (SIDCUL),
				Rudrapur, US Nagar - 263 153.
				Uttaranchal State, India
				No 08, Major Arteral Road,
				Block -AF New Town 1st Floor,
				Rajarhat,
				Kolkata- 700 156,
				West Bengal.
				Unit No. 16N & 17, 16th & 17th
				Floor,
				Oberoi Commerz, International
				Business Park,
				European Lichway
				Express Fighway,
				Mumbai 400.063
				Maharastra
				Hewlett-Packard India Sales Pyt I td
				Level 6 Pentagon P-2
				Magarpatta City
				Hadapsar
				Pune - 411 028
			НТС	1800 266 3566
				Huawei Telecommunication
				(INDIA) Co. Pvt Ltd.
				7th Floor, Tower A,
			TT ·	Spaze I-Tech Park, Sohna Road,
			Huawei	Sector-49
				Gurgaon, Haryana-122001 India
				Tel: +91-124-4774700
				Fax: +91-124-4774863
				Huawei
				9th Floor, Tower 6, The Gateway,

No. Product Name Sub Category Brand No. 9, Canton Road, Tsim Sha Tsui, Kowloon, Longkong Tet: 00852-2125388 Pas: 00852-21253889 Pas: 00852-2125389 Pas: 00852-2125389 Pas: 0089 Pas: 0089 Pas: 00894888 Very Category Karbonn Mobiles D-170, Okhla Industrial Area, Phase-1 New Delhi - 110020 011 46604660 Very Delhi - 110020 011 46604660 NOCCERA Corporation Cutting Tool Group G Takeda, Tobadono-cho, Fushimi- ku, Kyoto 012-8501, Japan Phone: +81-75-604-3473 Pas: +81-75-604-3473 Pas: +81-75-604-3472 VOCERA Asia Pacific India Pvt. Ld. Ld. 1001A, 1001B, 1002, 100h Floor JMD Rgent Square, M.G. Road Gurgaon-122 002 Haryana, India Phone: +91-124-402-5000 Pas: +91-124-402-5000 Lenovo Lenovo Marthhall Outer Ring Road, Warthkall Boat, K-P Duran Hobli, Banglore-560037 Phone: No. 3083-303300 Lenovo Lenovo India Pvt.Ld Pase Soul-345300 Lenovo Lenovo Soula Pvt.Ld Pase Soul-3453000 Lenovo Lenovo Soula Pvt.Ld Pase Soula Pvt.Ld Pase Soula Pvt.Ld Pase Soula Pvt.Ld Pase Soula Pvt.Ld Pase Pvt.Ld Pase Pvt.Ld Pvt.Ld Pase Pvt.Ld Pvt.Ld Pvt.Ld Pvt.Ld Pvt.Ld Pvt.Ld Pvt.Ld Pvt.Ld Pvt.Ld Pvt.Ld Pvt.Ld Pvt.Ld Pvt.Ld Pvt.Ld Pvt.Ld Pvt.Ld Pvt.Ld Pvt.Ld	Sr		Product		Address / Contact Details
Image: Category No. 9, Canton Road, Tsim Sha Tsui, Kowloon, Hongkong Tel: (0852-2125388) Fax: (0852-2125388) Fax: (0862-912508) Fax: (0852-2125388) Fax: (0862-912508) Fax: (0852-912508) Fax: (086-9126) Fax: (086-9126) Fax: (086-9126) Fax: (086-9126) Fax: (081-7406) Fax: (081-7406) Fax: (081-7406)	No.	Product Name	Sub	Brand	
No. 9, Carton Road, Isam Sha Isau, Kowloon, Hongkong Tel: 00852-21253889 Karbonn Mobiles #39/13, off 7th main, HAL 2nd stage Appareddy Palya, Indiranagar, Bangalore - 500038 Tel: 080-40894888 Constrained and the stage Appareddy Palya, Indiranagar, Bangalore - 500038 Tel: 080-40894888 Constrained and the stage Constrained			Category		
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Iet: 0085-2/125388 Fax: 00852-2/125388 Karbonn Mobiles #39/13, off 7th main, HAL 2nd stage Appareddy Palya, Indiranagar, Bangalore - 500038 Tel: 080-00058 Tel: 080-00058 New Delhi - 110020 011 46004600 Vew Delhi - 110020 011 46004600 Vey Delhi - 110020 1010, 1001B, 1002, 10th Floor JND Regent Square, Marc, R. add Vey Delhi - 110140					Kowloon, Hongkong
Fax: 1083-2/123889 Karbonn Karbonn Stage Appareddy Palya, Indiranagar, Bangalore - 560038 Tel: 080 4098488 Karbonn Mobiles D-170, Okhla Industrial Area, Phase-1 New Delhi - 110020 011 46604660 Kyocera Kyocera Kyote 612.8501, japan Phone: +81-75-604-3473 Fax: +91-12, fold-3473 Fax: +91-12, fold-3473 Fax: +91-124, 402-5001 Fax: +91-124, 402-5000 Fax: +91-124, 402-5001 Fax: +91-124, 402-5003 Fax: +91-124, 402-5003 Fax: +91-124, 402-5004 Fax: +91-124, 402-5003 Fax: +91-124, 402-5003 Fax: +91-124, 402-5003					Tel: 00852-21253888
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Ghatkopar Link Road,					Building No 10 1et Floor Andheri
Offattopat Link Road,					Ghatkonar Link Road
Chakala Andheri (Fast)					Chakala Andheri (East)

S.		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
				Mumbai-400093
				Phone No. : 022- 30847000/100
				Lenovo India Pvt Ltd
				2nd Floor Kuppu Arcade, 4
				Venkatanarayana Road,
				T.Nagar, Chennai 600 017
			1.0	Phone No. : 044-391592/3
			LG	Given Above
				Maxon CIC Europe Ltd
				Maxon House
			Marrow	Cleveland Road
			Maxon	LID2 7EX
				United Kingdom
				Tel: $+44$ (0) 1442 267777
-				Future Technology Enterprise Ltd
				Unit 01-02 19/F Hollywood Plaza
			Meizu	610 Nathan Road, Mongkok
			11201130	Kowloon, Hong Kong
				Tel: (852) 2388 8022
				Micromax House,
				90B,Sector-18,Gurgaon
			Micromax	Pin Code - 122015
				Tel: +91-124-4811000
				Fax: +91-124-4009603
				Micromax House,
				90B,Sector-18,Gurgaon
				Pin Code - 122015
				Tel: +91-124-4811000
				Fax: +91-124-4009603
				Micromax House,
				90B,Sector-18,Gurgaon
				Pin Code - 122015
				Tel: 18605008286
				Fax: +91-124-4009603
				No 234 HDSIDC Laduatrial Area
				Tehsil Nalagarh, Distt Solan (HO)
				173205
-				Microsoft Corporation
			Microsoft	One Microsoft Way
				Redmond, WA 98052-6399
				MiTAC products or general company
			Mitac	enquiries
				Tel: 886-2-26525888
			Mitsubishi	Given Above
				Motorola Mobility, Inc.
			Motorola	600 North U.S. Highway 45
				Libertyville, Illinois 60048 USA

	Raipur Division						
Sl. No.	Address]	Latitud	e	Longitude		
		Deg.	Min.	Sec.	Deg.	Min.	Sec.
	Raipur	1	I	I	1	1	
1.	Trade & Trade, Faradih, Raipur	21	15	52.0	81	38	13.7
2.	Goyal Sales, Khatamtai, Bilaspur Road, Raipur	21	16	28.3	81	38	10.5
3.	Amit Sales, GE Road, Raipur	14	21	14	41.4	81	36
4.	Sony Center, GE Road, Raipur	15	21	14	40.2	81	36
5.	Modern Electronics, GE Road, RK College, Raipur	16	21	14	34.4	81	36
6.	Dhamani Enterprises, GE Road, Raipur	17	21	14	32.4	81	37
7.	Leelas (LG Shoppe), MG Road, Raipur	18	21	14	42.1	81	38
8.	Roop Enterprises, MG Road, Raipur	19	21	14	43.7	81	38
9.	Kailash Raidio TV Center, MG Road, Raipur	20	21	14	44.3	81	38
10.	Sunil Electronics, MG Road, Raipur	21	21	14	44.9	81	38
11.	Vishal Electronics, MG Road, Raipur	22	21	14	45.5	81	38
12.	Subham Electronics (Samsung), MG Road, Raipur	24	21	14	47.0	81	38
13.	BRG Electronics, MG Road, Raipur	21	14	51.9	81	37	59.3
14.	Reliance Digital, CG Center City Mall, Raipur	21	15	15.7	81	38	46.5
15.	Atlani Corporation (LG Shoppe), Near Bus Stand, Pandari, Raipur	21	15	9.2	81	38	54.7
16.	Naresh Marketing (AC Shop), Near Bus Stand, Pandari, Raipur	21	15	8.9	81	38	54.9
17.	Samsung Smart Plaza, Near Bus Stand, Pandari, Raipur	21	14	59.4	81	38	45.0
18.	Sony Center, Near Bus Stand, Pandari, Raipur	21	14	58.3	81	38	43.9
19.	Panasonic, Near Bus Stand, Pandari, Raipur	21	14	57.0	81	38	42.6
20.	Lotus Electronics, Kachori Chowk, Raipur	21	14	51.9	81	38	29.3
21.	Atul Electronics, Indira chowk, Arang, Raipur	21	11	44.1	81	57	45.2
22.	Mukund Electronics, Indira chowk, Arang, Raipur	21	11	43.1	81	57	48.5
23.	Kumkum Enterprises, Indira chowk, Arang, Raipur	21	11	41.8	81	57	51.8

Partial List of Distributers/Retailers/ Traders in Chhattisgarh – Annexure 2

Sl. No.	Address	1	Latitud	e	Longitude		
		Deg.	Min.	Sec.	Deg.	Min.	Sec.
24.	Pankaj Electronics, Mahamaya Para, Arang, Raipur	21	11	39.3	81	57	54.9
25.	Satyam Electronics, Mahamaya Mandir, Arang, Raipur	21	11	38.9	81	57	55.1
26.	Dinesh Electronics, Near Bus stand, Arang, Raipur	21	11	35.8	81	57	58.5
27.	Lilesh Electronics, Near Bus stand, Arang, Raipur	21	11	34.5	81	57	59.3
28.	Dipti Electronics, Near Bus stand, Abhanpur, Raipur	21	3	14.0	81	44	48.2
29.	Chopra Electronics, Main Road, Abhanpur, Raipur	21	3	13.2	81	44	46.3
30.	Astha Electronics, Dhamtari Road, Abhanpur, Raipur	21	3	7.5	81	44	36.2
31.	Hari Om Electronics, Dhamtari Road, Abhanpur, Raipur	21	3	7.9	81	44	35.0
32.	S.S.D Electronics, Dhamtari Road, Abhanpur, Raipur	21	3	7.6	81	44	33.9
	Dhamtari	1	1	1	1	1	
33.	Ganpati Electrical & Electronics, Near Bus Stand, Dhamtari	20	43	6.4	81	33	2.8
34.	Shradhha Enterprises (Samsung), Raipur Road, Dhamtari	20	43	13.7	81	33	5.0
35.	Shree Laxmi Electronics, Gram Arjuni, Dhamtari	20	44	2.0	81	33	31.3
36.	Anil Radio, Sihawa Chowk, Dhamtari	20	43	45.0	81	32	56.9
37.	Vijay Enterprises, Near Amar Takies, Dhamtari	20	42	35.9	81	32	54.7
38.	Rajasthan Enterprises, Bastar Road, Dhamtari	20	42	34.3	81	32	50.3
39.	Lalwan TV, Dev Shree Takies Chowk, Dhamtari	20	42	29.5	81	32	45.3
40.	Guru Nanak Radio, Ratna Bandh, Dhamtari	20	42	32.6	81	32	38.6
41.	Ayush Enterprises, Ratna Bandh, Dhamtari	20	42	32.2	81	32	38.3
42.	Shanti Radio & Electronics, Ratna Bandh, Dhamtari	20	42	32.2	81	32	37.7
43.	Swaroop Enterprises, Ratna Bandh, Dhamtari	20	42	32.9	81	32	36.3
44.	Khatri Radio TV Center, Ratna Bandh, Dhamtari	20	42	33.3	81	32	35.8
45.	Geeta Electronics, Ambedkar Chowk, Dhamtari	20	42	3.8	81	32	8.4
46.	Hazi Electronics & furniture, Bastar Road, Dhamtari	20	42	29.6	81	32	37.2
47.	Sachdev Electronics, Station Road, Dhamtari	20	42	40.2	81	32	56.1
48.	Chitra Palace, Station Road, Dhamtari	20	42	43.1	81	32	56.5

Sl. No.	Address	1	Latitud	e	Longitude		
		Deg.	Min.	Sec.	Deg.	Min.	Sec.
49.	Ashish Electronics, Near Bus Stand, Dhamtari	20	43	3.4	81	33	2.6
50.	Gori Enterprises, Chameli Chowk, Dhamtari	20	42	16.2	81	33	2.1
51.	National Electronics, Chameli Chowk, Dhamtari	20	42	15.5	81	33	1.9
52.	Gautam Furniture & Electronics, Rambagh, Dhamtari	20	41	51.2	81	33	9.9
53.	Novkar Enterprises, Ambedkar Chowk, Dhamtari	20	42	3.2	81	32	16.0
54.	Prakash Radio, Main Road , Nagri	20	20	55.7	81	57	31.1
55.	Jain Electrical & Electronics, Bajrang Chowk , Nagri	20	20	53.0	81	57	33.3
56.	Dipak Electronics, Sakra Road, Nagri	20	20	47.0	81	57	38.1
57.	Mahavir Enterprises, Sakra Road, Nagri	20	20	48.8	81	57	37.0
58.	J.K Electronics, Sakra Road, Nagri	20	20	50.6	81	57	34.5
59.	Nishar Watch & Radio Center, Near Bus Stand, Nagri	20	20	55.7	81	57	30.4
60.	Star Radio, Sakra Road, Nagri	20	20	53.6	81	57	32.1
61.	Sumit Electronics, New Bus Stand, Nagri	20	20	59.7	81	57	25.4
62.	Santosh Electronics, Kurud Road, Magarlod	20	44	59.7	81	51	2.6
	Gariband		I	I	I	I	
63.	Subham Enterprises, Bus stand, Nayapara Rajim, Gariaband	20	57	15.7	81	51	27.8
64.	Shree Vaibhav Laxmi Electronics, Ganj Road, Rajim, Gariaband	20	58	5.3	81	51	31.5
65.	Jagdamba Electronics, Ganj Road, Rajim, Gariaband	20	58	5.8	81	51	31.9
66.	Dev Shree Agency, Ganj Road, Rajim, Gariaband	20	58	4.6	81	51	33.9
67.	Vinay Electricals, Ganj Road, Rajim, Gariaband	20	58	1.5	81	51	41.0
68.	Shailesh Electronics, Ganj Road, Rajim, Gariaband	20	58	1.0	81	51	43.5
69.	Shree Ram Radio Center, Ganj Road, Rajim, Gariaband	20	57	58.7	81	51	48.1
70.	Hari Sales, Sadar Bazar, Rajim, Gariaband	20	58	4.4	81	52	7.1
71.	Jain Radio , Sadar Bazar, Rajim, Gariaband	20	48	6.4	81	52	1.8
72.	Diwangan Radio Center, Sadar Bazar, Rajim, Gariaband	25	58	10.4	81	51	42.6
73.	Unique Electronics, Champaran Chowk, Rajim, Gariaband	20	58	21.3	81	51	42.0

Sl. No.	Address	1	Latitud	e	Longitude		
		Deg.	Min.	Sec.	Deg.	Min.	Sec.
74.	Sunil Electonics, Main Market, Chhura, Gariaband	20	48	35.2	82	12	28.6
75.	Sachdev Traders, Main Market, Chhura, Gariaband	20	48	36.1	82	12	31.1
76.	Raj TV Center, Main Market, Chhura, Gariaband	20	48	41.6	82	12	38.9
77.	Laxmi Enterprises, Main Market, Chhura, Gariaband	20	48	42.0	82	12	39.5
78.	Vrindawan Electronics, Near Bus stand, Gariaband	20	37	52.7	82	3	47.7
79.	Sri Ram Sales, Mainpur Road, Gariaband	20	37	50.5	82	3	50.1
80.	Deep Sales, Deobhog Road, Gariaband	20	37	55.0	82	3	47.0
81.	Nitin Electronics, Tiranga Chowk, Gariaband	20	37	59.5	82	3	42.7
82.	Pravin Electronics, Raipur Road, Gariabad	20	38	1.6	82	3	41.5
83.	Jai Shree Electronics, Raipur Road, Gariabad	20	38	6.5	82	3	38.8
84.	Raja Traders, Raipur Road, Gariabad	20	38	7.4	82	3	37.7
85.	Nisha Electronics, Main Road, Gariabad	20	38	0.1	82	3	45.3
86.	Kanha Telecom, Main Road, Gariabad	20	38	3.0	82	3	49.4
	Baloda Bazar	1	1	1	1	1	I
87.	Neha Enterprises , Sabji Mandi, Baloda Bazar	21	39	22.9	82	9	45.7
88.	Ambika Marketing, Sabji Mandi, Baloda Bazar	21	39	23.5	82	9	43.9
89.	Mittar Furniture & Electronis, Sabji Mandi, Baloda Bazar	21	39	21.1	82	9	44.4
90.	New Chawla Music, Mandi Road, Baloda Bazar	21	39	17.8	82	9	40.5
91.	Kiran Electronics, Mandi Road, Baloda Bazar	21	39	18.1	82	9	40.5
92.	Jai Bajran Electronics , Mandi Road, Baloda Bazar	21	39	16.9	82	9	40.3
93.	Bajrang Farmiture & Electronics, Gandhi Chowk, Baloda Bazar	21	39	17.0	82	9	32.6
94.	Kediya Electronics, Gandhi Chowk, Baloda Bazar	21	39	17.4	82	9	32.8
95.	Shivom Electronics, Gandhi Chowk, Baloda Bazar	21	39	20.1	82	9	36.0
96.	S. Sons Electronics, Gandhi Chowk, Baloda Bazar	21	39	21.3	82	9	36.4
97.	Suresh & Company, Gandhi Chowk, Baloda Bazar	21	39	19.3	82	9	38.1
98.	Guru Kripa Enterprises, Gandhi Chowk, Baloda Bazar	21	39	20.5	82	9	39.9

Sl. No.	Address		Latitude			Longitude		
0111101		Deg.	Min.	Sec.	Deg.	Min.	Sec.	
99.	Kesharwani Electronics, Gandhi Chowk, Baloda Bazar	21	39	21.5	82	9	40.5	
100.	Nikhil Mobile & Electronics, Gandhi Chowk, Baloda Bazar	21	39	22.8	82	9	41.9	
101.	Shree Mobile & Electronics, Gandhi Chowk, Baloda Bazar	21	39	23.1	82	9	41.9	
102.	Rajesh Time center, Gandhi Chowk, Baloda Bazar	21	39	23.6	82	9	42.1	
103.	Amar Electronics, Sadar Bazar, Bhatapara, Baloda Bazar	21	44	12.3	81	56	50.0	
104.	Jagdamba Electronics , Sadar Bazar, Bhatapara, Baloda Bazar	21	44	13.4	81	56	50.0	
105.	Manoj Enterprises, New Bus Stand, Bhatapara, Baloda Bazar	21	44	38.7	81	56	54.4	
106.	Verma Enterprises , Mahasati Mandir Road, Bhatapara, Baloda Bazar	21	44	20.9	81	56	52.9	
107.	Durga Enterprises, Ram Saptah Chowk, Bhatapara, Baloda Bazar	21	44	8.6	81	56	44.9	
108.	Modi Electronics, Ram Saptah Chowk, Bhatapara, Baloda Bazar	21	44	7.1	81	56	41.1	
109.	Kiran Radio , Jai Sthambh Chowk, Bhatapara, Baloda Bazar	21	44	7.7	81	56	38.6	
110.	Chhatisgarh Enterprises, Jai Sthambh Chowk, Bhatapara, Baloda Bazar	21	44	7.2	81	56	38.7	
111.	Manoj Electronics, Main Road, Simga, Baloda Bazar	21	37	46.1	81	42	21.5	
112.	Arun Electronics, Bilaspur Road, Simga, Baloda Bazar	21	37	44.5	81	42	21.6	
113.	Ashok Electronics, Jai Sthambh Chowk, Simga, Baloda Bazar	21	37	40.2	81	42	20.2	
114.	Hari Om Electronics, Bemetra Chowk, Simga, Baloda Bazar	21	37	34.0	81	42	18.1	
115.	Jai Electronics , Sadar Road, Simga, Baloda Bazar	21	37	40.4	81	42	13.0	
116.	Pankaj Electronics, Main Market, Kasdol, Baloda Bazar	21	37	25.9	82	25	20.5	
117.	Shree Shyam Ji Electronics, Main Road, Kasdol, Baloda Bazar	21	37	22.2	82	25	22.1	
118.	Satguru Electronics, Main Road, Kasdol, Baloda Bazar	21	37	16.2	82	25	26.0	
119.	Sunil Cycle & Electronics, Main Road, Kasdol, Baloda Bazar	21	37	12.9	82	25	29.0	
120.	Babloo Electronics, Main Road, Kasdol, Baloda Bazar	21	37	15.1	82	25	35.4	
121.	Sanjay Electronics, Main Road, Kasdol, Baloda Bazar	21	37	15.8	82	25	35.7	
122.	Bajrang Agency, Main Road, Kasdol, Baloda Bazar	21	37	16.5	82	25	38.4	
	Mahasamund							
123.	Ganesh Electronics, Shankar Nagar, Raipur Road, Mahasamund	21	6	53.1	82	5	31.5	

Sl. No.	Address	Latitude Longitude		le			
		Deg.	Min.	Sec.	Deg.	Min.	Sec.
124.	Akanksha Electronics, Nehru Chowk, Mahasamund	21	6	36.3	82	5	45.1
125.	Kishore Radio, Nehru Chowk, Mahasamund	21	6	35.1	82	5	43.3
126.	Kishore Electronics, Nehru Chowk, Mahasamund	21	6	34.4	82	5	43.3
127.	Agarwal Book Stall & Elctronics, Nehru Chowk, Mahasamund	21	6	34.2	82	5	43.2
128.	Chhatisgarh TV Agency, Kachahri Chowk, Mahasamund	21	6	25.1	82	5	42.6
129.	Adilya Communication, Barunda Chowk, Mahasamund	21	6	15.2	82	5	40.5
130.	Dashmesh Enterprises, Indiar Market, Mahasamund	21	6	44.4	82	5	44.6
131.	Kamal Enterprises, Ambedkar Chowk, Mahasamund	21	6	48.2	82	5	43.8
132.	Vijay TV & Refrigration, Near Bus Stand, Mahasamund	21	6	48.2	82	5	42.8
133.	Satyam Electronics, Main Road, Pithora, Mahasamund	21	15	2.7	82	31	4.7
134.	Prince Electronics, Main Road, Pithora, Mahasamund	21	14	59.9	82	31	4.5
135.	Gajanand Satynarayan Elecronics, Main Road, Pithora, Mahasamund	21	14	59.7	82	31	4.4
136.	Jai Mata di Elecronics, Main Road, Pithora, Mahasamund	21	14	56.9	82	31	4.9
137.	Narang Traders, Near Bus Stand, Pithora Mahasamund	21	15	53.1	82	31	5.0
138.	Saket Electronics, Main Market, Pithora, Mahasamund	21	14	51.6	82	31	6.1
139.	Maruti Sales, Rani Mahal, Pithora, Mahasamund	21	14	48.9	82	31	0.5
140.	Agarwal Mobile & Electronics, Rajpoot Marg, Pithora, Mahasamund	21	14	52.6	82	30	59.9
141.	Govind Ram Ashish Electronics, Bagbahra Road, Pithora, Mahasamund	21	14	47.2	82	31	5.3
142.	Sahu Electronics, Main Market, Bagbahra, Mahasamund	21	2	45.0	82	23	8.1
143.	Suresh Electronics, Main Market, Bagbahra, Mahasamund	21	2	46.1	82	23	46.1
144.	Akanksha Electronics, Main Market, Bagbahra, Mahasamund	21	2	47.4	82	23	4.3
145.	Nayak Electronics, Near Police Station, Bagbahra, Mahasamund	21	2	57.2	82	22	52.6
146.	Gori Electonics, Jawahar Chowk, Bagbahra, Mahasamund	21	2	32.4	82	23	23.4
147.	Raj Laxmi Electronics, Jawahar Chowk, Bagbahra, Mahasamund	21	2	32.5	82	23	24.1

01 N	No Name Address]	Latitud	e	Longitude		
SI. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.
		Bilaspur						
1	Sai Kripa Electronics	Karbala Road, Bilaspur	22	4	36.3	82	9	41.6
2	Maya Sales	Hatari Chowk, Juna Bilaspur	22	4	48.3	82	9	47.0
3	Naresh Enterprises	Hatari Chowk, Juna Bilaspur	22	4	57.3	82	9	42.1
4	Kanhaiya Electronics	Hatari Chowk, Juna Bilaspur	22	4	57.7	82	9	40.7
5	Maya Traders	Hatari Chowk, Juna Bilaspur	22	4	58.5	82	9	39.4
6	Electronics Bird	Opp. Manohar Takies, Juna Bilaspur	22	4	58.3	82	9	39.5
7	Shree Sharda Enterprises	Near Kotwali, Telipara Rd, Bilaspur	22	5	2.5	82	9	24.0
8	Maha Maya Enterprises	Telipara, Bilaspur	22	4	50.9	82	9	23.8
9	Shree Leela Electronics	Telipara, Bilaspur	22	4	48.2	82	9	27.5
10	Vijay Electronics	Telipara, Bilaspur	22	4	44.2	82	9	27.8
11	Tuteja Enterprises (LG Shoppe)	Near old Bus stand, Bilaspur	22	4	39.6	82	9	27.7
12	Electronics Bazar	Near old Bus stand, Bilaspur	22	4	35.9	82	9	29.6
13	Rani Sati Electronics	Near old Bus stand, Bilaspur	22	4	35.4	82	9	17.7
14	Amit Sale (Samsung)	Agrasen Chowk, Bilaspur	22	4	36.2	82	9	14.0
15	Raj Electronics	Agrasen Chowk, Bilaspur	22	4	36.5	82	9	14.9
16	Akash Store	Masanganj, Bilaspur	22	4	48.8	82	9	1.0
17	Maha Maya Enterprises	Naka Chowk, Kota, Bilaspur	22	17	21.8	82	0	53.1
18	Har Dev Electronics	Naka Chowk, Kota, Bilaspur	22	17	21.5	82	0	56.8
19	Sri Sai Mobile & TV	Kargi Road, Kota, Bilaspur	22	17	22.2	82	0	56.9
20	Kabilash Enterprises	Kargi Road, Kota, Bilaspur	22	17	21.6	82	0	57.4
21	Sachin Enterprises	Kargi Road, Kota, Bilaspur	22	17	22.1	82	1	2.7
22	Amber Cooler & TV	Kargi Road, Kota, Bilaspur	22	17	23.4	82	1	7.7
23	Shree Ram Music Electronics	Station Road, Kota, Bilaspur	22	17	23.7	82	1	12.2
24	M.K. Electronics	Station Road, Kota, Bilaspur	22	17	24.3	82	1	15.7
25	Jai Ambey Electronics	Near Rly. Station , Kota, Bilaspur	22	17	39.1	82	1	27.7
26	Jaya Enterprises	Near Rly. Station , Kota, Bilaspur	22	17	39.7	82	1	27.7
27	Om Emporiyam	Near Rly. Station , Kota, Bilaspur	22	17	39.9	82	1	27.9
28	Sonu Electronics & Mobile	Near Rly. Crossing, Belha, Bilaspur	21	57	30.6	82	4	24.1
29	Maa Bhawani Enterprises	Bilaspur Road, Belha, Bilaspur	21	57	33.0	82	4	16.3
30	Baba Electronics	Main Market, Belha, Bilaspur	21	57	36.9	82	4	30.8
31	Sanjay Electronics & Mobile	Tahsil Road, Belha, Bilaspur	21	57	23.5	82	4	28.0
32	Vinod Electronics & Mobile	Tahsil Road, Belha, Bilaspur	21	57	23.3	82	4	28.1
33	Rakesh Electronics & Mobile	Tahsil Road, Belha, Bilaspur	21	57	21.2	82	4	26.8

Bilaspur Division

01 N	N		Latitude		e	Longitude			
SI. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
34	Dev Furniture& Electronics	Tahsil Road, Belha, Bilaspur	21	57	53.4	82	4	26.8	
Mungeli									
35	Nav Durga Electronics	Main Market, Lormi, Mungeli	22	16	13.7	81	42	1.7	
36	Laxmi Electronics	Near Court, Lormi, Mungeli	22	16	17.4	81	41	52.0	
37	Divya Enterprises	Tahsil Road, Lormi, Mungeli	22	16	18.0	81	41	47.7	
38	Gaurav Enterprises	Pandaria Road, Lormi, Mungeli	22	16	16.7	81	41	40.6	
39	Ganga Shree Electronics	Main Road, Lormi, Mungeli	22	16	18.0	81	42	2.2	
40	Mansi Enterprises	Main Road, Lormi, Mungeli	22	16	18.5	81	42	2.7	
41	Santosh Sahu Electronics	Pani Tanki, Padaria Road, Mungeli	22	4	0.5	81	40	42.1	
42	Amit Electronics	Padaria Road, Mungeli	22	3	59.3	81	40	53.8	
43	Gupta Radioa & TV Center	Balani Chowk, Mungeli	22	3	58.4	81	41	10.6	
44	Kant Radio House	Balani Chowk, Mungeli	22	3	58.8	81	41	10.5	
45	Pradeep Radio	Near Manju Takies, Mungeli	22	4	4.6	81	41	27.5	
46	Shree Raj Enterprises	Near Radha KrishnaTakies, Mungeli	22	4	4.0	81	41	29.6	
47	Satya Electronics	Dawpara, Mungeli	22	4	12.6	81	41	35.3	
48	Mahavir Electronics	Dawpara, Mungeli	22	4	13.6	81	41	34.8	
49	Anuraj Sales	Bada Bazar, Mungeli	22	3	54.9	81	41	28.4	
50	Mukesh Electronics	Sindhi Colony, Shankar Mandir, Mungeli	22	3	45.1	81	41	7.9	
51	Kotadia Sons	Gol Maket, Mungeli	22	3	59.1	81	41	19.4	
52	Maruti Electronics	Gol Maket, Mungeli	22	3	58.5	81	41	19.3	
53	Om Shanti Enterprises	Chhoti MasjidComplex, Mungeli	22	3	51.2	81	41	16.4	
54	Bhanu Enterprises	Gol Maket, Mungeli	22	3	52.5	81	41	17.0	
55	Shree Balaji Enterprises	Gol Maket, Mungeli	22	3	53.7	81	41	17.4	
		Korba							
56	Kanha Trading	Niharika Subhas Chowk, Kala Sagar Complex, Korba	22	21	43.3	82	43	42.6	
57	Shivam Electronics	Ghanta Ghar Chowk, Korba	22	21	35.2	82	43	13.8	
58	Pushpak Electronics	CSB Chowk, Korba	22	21	45.9	82	42	40.2	
59	Electropark	Main Road, Transport Nagar, Korba	22	21	44.8	82	42	39.8	
60	Naresh Trading	Main Road, Transport Nagar, Korba	22	21	41.9	82	42	37.8	
61	Naresh Electronics	Main Road, Transport Nagar, Korba	22	21	41.1	82	42	37.6	
62	Gulati Electronics	Main Road, Transport Nagar, Korba	22	21	27.9	82	42	29.0	
63	Singh Electronics	Main Road, Transport Nagar, Korba	22	21	22.2	82	42	25.0	
64	Royal Watch & Electroncs	Near Bus Stand, Katghora, Korba	22	30	33.0	82	33	0.7	

01 N	N	Address	Latitude			Longitude			
SI. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
65	Balaji Electronics	Main Road, Katghora, Korba	22	30	37.5	82	32	59.5	
66	Agrawal Agency	Korba Road, Katghora, Korba	22	30	27.7	82	33	6.8	
67	Jyoti Electronics	Main Road, Katghora, Korba	22	30	27.3	82	32	59.6	
68	Jyoti Agency	Main Road, Katghora, Korba	22	30	26.7	82	32	59.0	
69	New Jai Bajrang Enterprises	Main Road, Katghora, Korba	22	30	21.3	82	32	49.9	
70	Versha Electronics	Old Bus stand, Katghora, Korba	22	30	20.9	82	33	49.8	
71	Shiv Enterprises	Jay Stabh Chowk, Katghora, Korba	22	30	20.5	82	32	49.4	
72	Maa Electronics	Jay Stabh Chowk, Katghora, Korba	22	30	19.4	82	32	46.2	
73	Sri Ram Electronics	Main Market, Kartala, Korba	22	17	56.3	82	57	28.9	
74	Gauri Electronics	Main Market, Kartala, Korba	22	17	48.2	82	57	31.3	
		Janjgir - Champa							
75	Shree Shyam Electronics	Collectrate Chowk, Janjgir	22	0	53.0	82	35	39.3	
76	Himanshu Electronics	Champa Road, Janjgir	22	0	43.4	82	35	22.0	
77	Mahakali Enterprises	Link Road, Janjgir	22	0	43.0	82	34	50.5	
78	KVC Agency	Link Road, Janjgir	22	0	42.7	82	34	39.8	
79	Kailash Electronics	Link Road, Janjgir	22	0	42.8	82	34	38.2	
80	Prasant TV	Link Road, Janjgir	22	0	42.8	82	34	37.3	
81	Yash TV Center	Netaji Chowk, Janjgi r	22	0	42.4	82	34	32.0	
82	Babloo TV Center	Naila Stn. Road, Janjgir	22	0	47.2	82	34	27.9	
83	Gattani Agency	Naila Stn. Road, Janjgir	22	0	42.2	82	34	19.0	
84	Kumar Radio	Naila Stn. Road, Janjgir	22	0	36.6	82	34	34.8	
85	Sri Bala Ji Electronics	Birgahni Chowk, Champa, Janjgir	22	1	40.0	82	38	17.5	
86	Sahu Electronics	Beriyal Chowk, Champa, Janjgir	22	1	49.6	82	38	29.9	
87	Gajanand Electronics	Beriyal Chowk, Champa, Janjgir	22	1	59.8	82	38	27.3	
88	Paras Electronics	Beriyal Chowk, Champa, Janjgir	22	1	59.8	82	38	25.8	
89	Asgar Electronics	Beriyal Chowk, Champa, Janjgir	22	2	4.0	82	38	24.6	
90	Kesharwani Enterprises	Machhali Talab, Champa, Janjgir	22	2	9.4	82	39	18.9	
91	Isha TV Center	Baipali Chowk, Champa, Janjgir	22	2	9.2	82	39	17.5	
92	Kediya Electronics	Baipali Chowk, Champa, Janjgir	22	2	10.2	82	39	31.2	
93	Pratap Electronics	Baipali Chowk, Champa, Janjgir	22	2	10.7	82	39	25.7	
94	New Om Electronics	Near Bus Stand, Bhaindih, Janjgir	21	54	24.0	82	43	12.8	
95	Jain General Store & Electronics	Main Market, Bhaindih, Janjgir	21	54	8.0	82	43	6.0	
96	Jaiswal Electronics	Bazar Para, Bhaindih, Janjgir	21	54	7.4	82	43	5.7	
97	Ajay Electronics	Bazar Para, Bhaindih, Janjgir	21	54	6.0	82	43	7.1	
98	Narendra Electronics	Haldi Bazar Chowk, Baloda, Janjgir	22	8	7.1	82	28	32.5	

SI No	N		Latitude			Longitude			
SI. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
99	Om Electronics	Haldi Bazar Chowk, Baloda, Janjgir	22	8	7.7	82	28	31.5	
100	Mauli Music & Electronics	Haldi Bazar Chowk, Baloda, Janjgir	22	8	7.0	82	28	32.5	
101	Manish Gupta Electronics	Janjgir Road, Baloda, Janjgir	22	8	8.9	82	28	48.9	
102	Neel Kamal Electronics	Janjgir Road, Baloda, Janjgir	22	8	8.2	82	28	51.2	
103	Banti Electrical	Main Market, Akaltara, Janjgir	22	1	30.3	82	25	37.6	
104	Sai Enterprises	Shivri Naryan Road, Akaltara, Janjgir	22	1	17.9	82	25	36.0	
105	Minakshi Electronics	Main Market, Akaltara, Janjgir	22	1	9.1	82	25	34.9	
106	Chaudhary Enterprises	Main Market, Akaltara, Janjgir	22	1	29.5	82	25	37.4	
107	Navnit Electronics	Main Market, Akaltara, Janjgir	22	1	29.5	82	25	37.6	
108	Binu Agency	Main Road, Akaltara, Janjgir	22	1	32.7	82	25	37.8	
109	Gupta Enterprises	Shakhi Chowk, Akaltara, Janjgir	22	1	34.7	82	25	35.9	
110	Shree Ganesh Electronics	Mukam, Pamgarh, Janjgir	21	52	29.6	82	26	46.2	
111	Balaji Enterprises	Main Road, Pamgarh, Janjgir	21	52	29.3	82	26	47.2	
112	Jai Durga Electronics	Near Bus Stand, Pamgarh, Janjgir	21	52	24.6	82	27	0.2	
	Raighar								
113	Shyam Jyoti Electronics	Himrapur, Raigarh	21	54	33.4	83	23	24.3	
114	Tushar Sales (Sony)	Jagatpur, Raigarh	21	54	30.4	83	23	26.8	
115	Tulsi Digital	Jagatpur,Dimlapur Road, Raigarh	21	54	24.5	83	23	27.3	
116	Ambey Electronics	Dimlapur Road, Raigarh	21	54	16.3	83	23	32.8	
117	Mahamia Enterprises (LG Shoppe)	Dimlapur Road, Raigarh	21	54	17.3	83	23	31.7	
118	Shivam Radio	Near Shyam Takies, Raigarh	21	53	38.3	83	23	33.1	
119	Ganesh Radio & Watch	Near Shyam Takies, Raigarh	21	53	39.4	83	23	33.8	
120	Voice Vision	Shyam Takies Chowk, Raigarh	21	53	37.2	83	23	34.2	
121	Anupam Electronics	New Tulsi Hotel, Raigarh	21	53	27.6	83	23	45.0	
122	Mukesh Traders	Ram Niwas Takies Chowk, Raigarh	21	53	29.8	83	23	43.3	
123	Cinni Sales	Ram Niwas Takies Chowk, Raigarh	21	53	31.2	83	23	43.0	
124	Ram Dayal Electronics (Digi World)	Subhas Chowk, Raigarh	21	53	41.4	83	23	38.4	
125	Platinu Gift (Paasonic)	Near Bus Stand, Raigarh	21	54	0.6	83	23	39.7	
126	Sri Ram Electonics & Electricals	Agrasen Marg, Kharsia, Raigarh	21	59	20.1	83	6	18.1	
127	Rani Sati Agency	Agrasen Marg, Kharsia, Raigarh	21	59	17.0	83	6	18.9	
128	Chhatisgarh Sale	Agrasen Marg, Kharsia, Raigarh	21	59	17.7	83	6	18.8	
129	Shivam Electronics	Agrasen Marg, Kharsia, Raigarh	21	59	16.0	83	6	19.3	
130	Prakash Watch & Radio	Raigarh Chowk, Kharsia, Raigarh	21	58	52.7	83	6	24.8	

SI No			Latitude		e	Longitude		
SI. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.
131	Shyam Furniture & Electronics	Raigarh Chowk, Kharsia, Raigarh	21	58	51.1	83	6	24.9
132	Sanjay Enterprises	Dr. Shyam Prasad Mukhargi Marg, Kharsia, Raigarh	21	59	22.6	83	6	16.0
133	Sanjay Electronics	Near Bus Stand, Dharamjaygarh, Raigarh	22	27	43.7	83	12	35.5
134	Gupta Electronics	Near Bus Stand, Dharamjaygarh, Raigarh	22	27	43.7	83	12	34.1
135	Garg Furniture & Electronics	Main Market, Dharamjaygarh, Raigarh	22	27	48.1	83	12	33.0
136	Mukesh Electronics	Near Bus Stand, Dharamjaygarh, Raigarh	22	27	40.0	83	12	33.5
137	Taj Electronics	Near Bus Stand, Dharamjaygarh, Raigarh	22	27	41.5	83	12	35.1
138	Om Electronics	Main Market, Ghardhoda, Raigarh	22	10	30.3	83	21	10.2
139	Ambey Electronics	Raigarh Road, Ghardhoda, Raigarh	22	10	32.6	83	21	0.5
140	Rashmi TV Center	Raigarh Road, Ghardhoda, Raigarh	22	10	32.0	83	21	0.0
141	Hira Watch & Electronics	Raigarh Road, Ghardhoda, Raigarh	22	10	21.1	83	20	57.6
142	Taj Electronics	Near Bus Stand, Ghardhoda, Raigarh	22	10	9.6	83	20	57.1
143	Taj Tv Center	Main Road, Ghardhoda, Raigarh	22	10	8.7	83	20	56.8

Durg Division

01 N.	N	A 11	Latitude		Latitude Long		Latitude		Longitude	
51. INO.	Iname	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.		
	Durg									
1	Coman India Electronic	Ward No5, Main Market, Dhamdha, Durg - 491331	21	27	37.7	81	19	51.5		
2	Jangel Electronic	Bemitra Road, Dhamdha, Durg - 491331	21	27	58.7	81	19	58.4		
3	Sangam Electronic	Ajad Chock, Patan, Durg - 491111	21	2	10.3	81	32	34.0		
4	Anil Enterprise	Bharat Chock, Patan, Durg - 491111	21	2	13.3	81	32	31.1		
5	Sheetal Traders	Shop No. 11/A, Indira Market, Durg - 491001	21	11	17.9	81	16	40.6		
6	Shreezee	Shop No. 10/A, Indira Market, Durg - 491001	21	11	18.2	81	16	40.5		
7	Sigma Enterprise	Indira Market Rd., Durg - 491001	21	11	21.9	81	16	43.3		
8	Naresh Treding & Co.	Santra Badi Area, Durg - 491001	21	11	44.8	81	17	2.1		
Bemetara										
9	Bajaj Electronic	Sindhi Colony, Bemetara-491335	21	43	8.4	81	32	16.0		
10	Kabra Electronic	Sadar Rd., JN Kabra Complex, Bemetara - 491335	21	43	2.4	81	31	57.8		

<i></i>			Latitude		Longitude				
SI. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
11	Rajesh Electronic	Sabji Market, Nawagarh, Bernetara- 491337	21	54	23.1	81	36	27.9	
12	Sir Sai Electronic	Ward No11, Pathan Para, Than Khamarie, Bernetara - 491338	21	47	45.1	81	20	2.1	
13	Sandeep Furniture	Purani Sabji Mandi, Ward No4, Than Khamarie, Bernetara - 491338	21	47	59.8	81	20	5.4	
14	Shjad Mall	Gol Bajar, Than Khamarie, Bemetara - 491338	21	48	9.4	81	20	13.8	
15	Soni Bartan	Ward No10, Bajar Chock, Saja, Bemetara	21	39	52.7	81	18	48.7	
16	Gurukripa Sales	Than Kamarie Rd., Saja, Bemetara	21	39	52.2	81	18	43.2	
Kawardha - Kabirdham									
17	Gupta Appliances	Rishabda Chock, Kawardha	22	0	24.5	81	14	4.6	
18	Simran Electronics	Ajad Chock, Kawardha	22	0	17.9	81	14	4.3	
19	Mutreja Sales	Ajad Chock, Kawardha	22	0	17.9	81	14	4.3	
20	Aman Electronics & Furniture	Bajrang Chock, Khanna Tower, Kawardha	22	0	17.6	81	13	59.3	
21	Mahamaya Electronics	Masjid Chock, Bodla, Kawardha	22	9	43.7	81	13	10.1	
22	Chabra Enterprices	Larmi Rd., Pandariya, Kawardha	22	13	10.8	81	24	38.8	
23	Bham Enterprices	Ward No9, Pandariya, Kawardha	22	13	11.0	81	24	28.2	
24	Narkar Enterprices	Ward No9, Pandariya, Kawardha	22	13	9.5	81	24	28.8	
25	Himesh Electronics	Sahaspur, Ward No11, Lohara, Kawardha	21	50	6.6	81	7	38.5	
26	Sahu Electronics	Mahavir Complex, Ward No9, Lohara, Kawardha	21	50	8.1	81	7	37.4	
		Rajnandgaon							
27	Soni Electronics	Bartan len, Chhuikhadan, Rajnanndgaon	21	31	19.1	80	59	48.0	
28	Anmol Gift Corner	Bajar Lain, Chhuikhadan, Rajnanndgaon	21	31	18.9	80	59	51.1	
29	Tramakar Electronics	Gol Bajar, Khairagarh, Rajnanndgaon	21	25	1.8	80	58	48.3	
30	Adhunik Store	Masjid Chock, Khairagarh, Rajnanndgaon	21	25	5.1	80	58	49.7	
31	Vicky Electricals & Electronics	Deevan Bada Rd., Khairagarh, Rajnanndgaon	21	25	1.7	80	58	51.3	
32	Ashish Store	Deevan Bada Rd., Khairagarh, Rajnanndgaon	21	25	0.5	80	58	52.9	
33	Shri Ariyant Enterprices	Bajar Chock, Chhuriya, Rajnanndgaon	21	0	19.7	80	37	39.9	
34	Veshnoi Electronics	Old Bus Stand Chock, Chhuriya, Rajnanndgaon	21	0	22.4	80	37	25.0	

01 N			Latitude		Longitude			
SI. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.
35	Ram Enterprices	Main, Rd., Dungargaon, Rajnanndgaon	20	58	14.1	80	51	2.7
36	Shama Electronics	Shulekha Market, Dongargaon, Rajnanndgaon	20	58	16.2	80	51	0.1
37	Bindal Electronics	Budhwari Park, Dongargarh, Rajnanndgaon	21	11	18.2	80	45	27.9
38	S P Electronics	Gurudwara Rd., Dongargarh, Rajnanndgaon	21	11	18.5	80	45	26.2
39	Shri Pitambar Sales	Budhwari Park, Dongargarh, Rajnanndgaon	21	11	18.5	80	45	22.4
40	Suresh Electronics	Gol Bajar, Dongargarh, Rajnanndgaon	22	11	16.8	80	45	10.8
41	Kishori Computers	Ganj Line, Rajnanndgaon	21	5	32.7	81	2	17.5
42	Jhalak Enterprise	Ramadin Marg, Rajnanndgaon	21	5	42.3	81	2	14.7
43	Shri Ram Marketing	Manav Mandir Chock, Rajnanndgaon	21	5	41.3	81	2	1.2
44	Panasonic Distributers	Ramadin Marg, Rajnanndgaon	21	5	50.8	81	2	15.7
45	Bagadi Brothers	Ramadin Market, Rajnanndgaon	21	5	46.9	81	2	15.3
46	Anshdeep Electronics	G E Rd., Opp. New Bus Stand, Rajnanndgaon	21	5	47.9	81	1	42.7
		Balod						
47	Vikas Electronics & Furniture	Fuhara Chock, Balod	20	43	51.3	81	12	20.5
48	Sahu Electronics	Budhwari Bajar, Balod	20	44	1.6	81	12	30.7
49	Sanjeev Enterprices	Budhwari Bajar, Balod	20	44	0.2	81	12	28.8
50	Dhahiya Brothers	Sadar Rd., Balod	20	44	0.0	81	12	28.3
51	Krishna TV & Mobile Shop	Bhakt Mata Karma Complex, Balod	20	43	49.5	81	12	17.3
52	Mahavir Electronics	Purana Bus Stand, Balod	20	43	50.9	81	12	20.0
53	Sharyansh Enterprise	Viveka Nand Chock, Dondilohara, Balod	20	47	24.9	81	3	16.9
54	Nisha Electrical	Main Rd., Dondilohara, Balod	20	47	25.2	81	3	16.5
55	Ganesh Enterprices	Balod Rd., Gunderdehi, Balod	20	56	30.8	81	17	39.5
56	Preeti TV & Fridge	Gulab Market, Gunderdehi, Balod	20	56	54.6	81	17	40.3
57	Sourab Electricals	Main RD., Gunderdehi, Balod	20	56	38.1	81	17	40.1
58	Kirti Eletricals	Main RD., Gunderdehi, Balod	20	56	38.3	81	17	40.2
59	Ma Gayatri Electricals	Gulab Market, Gunderdehi, Balod						
60	Vinay Mobile & Laptop House	Gulab Market, Gunderdehi, Balod	20	56	53.3	81	17	40.8
61	National Traders	Main Rd., Gurur, Balod	20	41	0.6	81	24	12.6
62	Raj Electricals & Electronics	Ward No4, Gurur, Balod	20	41	1.6	81	24	12.9

	I No. Nomo]	Latitud	e	Longitude			
Sl. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
	•	Balrampur							
1	Juganoo Electronics	Main Market, Balrampur	23	36	34.9	83	37	11.6	
2	Sandeep Electronics	Main Market, Balrampur	23	36	31.9	83	37	10.0	
3	Raja Electronics	Mission Road, Balrampur	23	36	28.2	83	37	12.0	
4	Rajesh Radio	Main Road, Balrampur	23	36	29.4	83	37	8.5	
5	R.K.Electronics	Main Road, Balrampur	23	36	30.3	83	37	8.6	
6	Vinay Radio	Main Road, Balrampur	23	36	28.9	83	37	9.1	
7	Yash Raj Enterprises	Near Police station, Balrampur	23	36	25.7	83	37	6.3	
8	Dinesh Enterprises	Main Road, Shankargarh, Balrampur	23	18	2.3	83	36	14.6	
9	Raquib Electronics	Main Road, Shankargarh, Balrampur	23	18	3.4	83	36	11.6	
10	Neeraj Electronics	Bachwar Road, Shankargarh, Balrampur	23	18	1.3	83	35	35.1	
11	Maha Maya Electroics	Main Road, Rajpur, Balrampur	23	20	6.8	83	24	22.8	
12	Balaji Electronics	Main Road, Rajpur, Balrampur	23	20	7.2	83	24	22.1	
13	Prakash Electronics	Main Road, Rajpur, Balrampur	23	20	10.5	83	24	11.0	
14	Furniture Mart & Electronics	Main Road, Near SBI, Rajpur, Balrampur	23	20	11.2	83	24	10.0	
15	Uphar Electronics	SBI Road, Ramanujganj, Balrampur	23	48	24.2	83	42	6.8	
16	Gupta Electronics	Main Market, Ramanujganj, Balrampur	23	48	15.3	83	42	4.9	
17	Yadav Electronics	Balangi, Wadraf Nagar, Balrampur	23	45	50.8	83	11	35.3	
		Jashpur							
1	Gupta Watch & Electronics	Near Bus Stand, Jashpur	22	53	18.5	84	8	29.7	
2	Gupta Radio House	Gupta Line, Jashpur	22	53	18.1	84	8	23.9	
3	Sai Enterprises	Gupta Line, Jashpur	22	53	17.1	84	8	23.9	
4	Shiva Electronics & Steel	Sanna Road, Jashpur	22	53	23.5	84	8	17.2	
5	Prateek Enterprises (Samsung Plaza)	Sanna Road, Jashpur	22	53	9.6	84	8	15.3	
6	Ghar Sansar	Near SBI Bank, Madhuban Toli Road, Jashpur	22	53	6.7	84	8	10.8	
7	Sao Electronics	Balaji Road, Jashpur	22	53	0.2	84	8	13.0	
8	Saw Electronics	Gamhariya, Raipur Road, Jashpur	22	53	13.6	84	9	19.4	
9	Gupta Electronics	Karbala Road, Jashpur	22	53	19.8	84	8	25.5	
10	Rupesh Electronics	Karbala Road, Jashpur	22	53	19.7	84	8	25.5	
11	Vishwa Bharti Enterprises	Purani Tola, Jashpur	22	53	6.4	84	8	20.5	
12	New Samir Electronics	Near bus Stand, Kansabel, Jashpur	22	38	46.4	83	44	33.8	

Surguja Division

	Latitude		e	L	Longitude			
SI. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.
13	Sonu Mobile & Electronics	BJP Complex, Near bus Stand, Kansabel, Jashpur	22	38	46.2	83	44	33.9
14	Vashim Mobile & Electronics	Near bus Stand, Kansabel, Jashpur	22	38	46.2	83	44	34.0
15	Shekhar Mobile & Electronics	Bagicha Road, Kansabel, Jashpur	22	38	46.1	83	44	33.0
16	Payal Electronics	Pathargaon Road, Kansabel, Jashpur	22	38	48.3	83	44	32.3
17	Friends Mobile & Electronics	Main Road, Kansabel, Jashpur	22	38	45.6	83	44	32.1
18	National Electronics	Main Road, Kansabel, Jashpur	22	38	42.6	83	44	32.0
19	Shree Hanuman Electronics	Main Chowk, Kansabel, Jashpur	22	38	41.6	83	44	31.7
20	Sonu Mobile & Electronics	Main Chowk, Kansabel, Jashpur	22	38	40.1	83	44	31.6
21	Sri Ram Electronics	Church Road, Main Chowk, Kansabel, Jashpur	22	38	38.9	83	44	31.5
22	Golden watch & Electronics	Main Chowk, Kansabel, Jashpur	22	38	41.2	83	44	32.7
23	Amit Mobile & Electronics	Main Chowk, Kansabel, Jashpur	22	38	41.3	83	44	32.9
24	Seema Electronics	Near Bus Stand, Kansabel, Jashpur	22	38	45.9	83	44	34.9
25	Agarwal Electronics	Main Road, Kunkuri, Jashpur	22	44	30.6	83	57	4.9
26	Glaxy Electronics	Jashpur Road, Kunkuri, Jashpur	22	44	36.0	83	57	20.1
27	Arushi Electronics	Bazar Road, Kunkuri, Jashpur	22	44	30.2	83	56	58.6
28	Taj Electronics	Tapkara Road, Kunkuri, Jashpur	22	44	19.9	83	57	4.7
29	Sargam Electronics	Bus Stand Chowk, Kunkuri, Jashpur	22	44	28.6	83	57	1.4
30	Surabhi Electronics	Near Bus Stand, Kunkuri, Jashpur	22	44	27.6	83	57	1.3
31	Sai Electronics	Near Bus Stand, Kunkuri, Jashpur	22	44	24.7	83	56	59.8
32	Goyal Electronics	Main Road, Pathargaon, Jashpur	22	33	21.1	83	27	33.3
33	Vijay Electronics	Abikapur Road, Pathargaon, Jashpur	22	33	26.5	83	27	33.5
34	Harsh Electronics	Abikapur Road, Pathargaon, Jashpur	22	33	28.2	83	27	32.2
35	Sri Jai Balaji Electronics	Abikapur Road, Pathargaon, Jashpur	22	33	29.5	83	27	32.3
36	Ashok Electronics	Near Bus Stand, Pathargaon, Jashpur	22	33	22.5	83	27	36.2
37	Shubham Electronics	Jashpur Road, Pathargaon, Jashpur	22	33	23.9	83	27	48.7
38	Balaji Electronics	Jashpur Road, Pathargaon, Jashpur	22	33	27.2	83	27	55.4
		Koriya						
1	Vijenddra Electroncs	Mazar Chowk, Sonhat, Koriya	23	28	41.5	82	31	2.6
2	Aman Electroncs	Main Road, Sonhat, Koriya	23	28	43.4	82	31	2.8
3	Vandana Telecom	Main Road, Baikunthpur, Koriya	23	28	53.0	82	31	4.1
4	Kaish Electronics	Main Road, Baikunthpur, Koriya	23	15	40.6	82	33	40.3
5	Upkar Electronics	Main Market, Baikunthpur, Koriya	23	15	41.0	82	33	40.4
6	Sangeet Mahal	Ghadi Chowk, Baikunthpur, Koriya	23	15	43.7	82	33	40.3

			Latitude		Longitude			
SI. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.
7	Shivam Music	Ghadi Chowk, Baikunthpur, Koriya	23	15	44.3	82	33	40.0
8	Baijnath Prasad Ayodhya Prasad	Ghadi Chowk, Baikunthpur, Koriya	23	15	43.1	82	33	39.3
9	Super Electronics	Main Road, Baikunthpur, Koriya	23	15	43.2	82	33	35.9
10	Surya Electronics	Main Road, Baikunthpur, Koriya	23	15	43.5	82	33	35.8
11	Vikas Electronics	Manendragarh Road, Baikunthpur, Koriya	23	15	46.4	82	33	31.1
12	Sri Krishna Distributer (Whirlpool)	Nehru Ward No-14,Manendragarh, Koriya	23	12	44.3	82	11	2.8
13	Balmik Electronics	Nehru Ward, Manendragarh, Koriya	23	12	47.0	82	12	3.0
14	Vivek Electronics	Sai Baba Tiraha, Manendragarh, Koriya	23	12	47.9	82	12	2.9
15	Leela Sales	Sai Baba Tiraha, Manendragarh, Koriya	23	12	49.4	82	12	4.8
16	Nafis Watch & Electronics	Mohar Para, Manendragarh, Koriya	23	12	53.5	82	12	2.4
17	Amar Agency	Old Nagar Palika Office, Manendragarh, Koriya	23	12	55.3	82	12	7.3
18	Shyran Electronics	Guru Dwara Road, Manendragarh, Koriya	23	12	52.2	82	12	8.4
19	Agarwal Electronics	Station Road, Manendragarh, Koriya	23	12	58.4	82	12	2.9
20	Rahul Agency	Ambikapur Road, Manendragarh, Koriya	23	13	6.2	82	12	40.4
		Surguja						
1	Sri Ram Electronics Mobile & Eletronics	Hospiral Road, Ambikapur, Sarguja	2	3 5	46.4	83	11	41.0
2	Amber Light & Electronics	School Road, Ambikapur, Sarguja	23	7	28.3	83	11	55.3
3	Luxus Enterprises	New Market, Ambikapur, Sarguja	23	7	22.8	83	11	50.9
4	Alankar Electronice	Maha Maya Chowk, Ambikapur, Sarguja	23	7	23.0	83	11	50.7
5	Devsar Enterprises	Maha Maya Chowk, Ambikapur, Sarguja	23	7	22.8	83	11	51.2
6	Satyam Electronics	Deviganj Road, Sangam Chowk Ambikapur, Sarguja	23	7	26.7	83	11	43.6
7	Natioal Electronics	School Road, Ambikapur, Sarguja	23	7	43.4	83	12	4.0
8	Sri Ram Electronics	Pratap Naka, Ambikapur, Sarguja	23	8	16.5	83	11	52.6
9	Raj Electronics	Nawa Para, Ambikapur, Sarguja	23	8	3.4	83	11	7.3
10	Ashok Electronics	Near Old Bus Stand, Ambikapur, Sarguja	23	7	49.5	83	11	20.1
11	Manoj Electronics	Jai Stambh Chowk, Ambikapur, Sarguja	23	7	5.2	83	11	45.7

01 N	N		Latitude		Latitude Longitude					le
SI. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.		
12	Swagat Enterprises	Jai Stambh Chowk, Ambikapur, Sarguja	23	7	5.9	83	11	46.0		
13	Srikant Enterprises	Bramh Road, Ambikapur, Sarguja	23	7	22.6	83	11	40.4		
14	Deshraj Electronics	Bilaspur Road Road, Udaipur, Sarguja	22	54	37.2	82	56	34.9		
15	Ravi Electronics& Mobile	Main Market, Udaipur, Sarguja	22	54	37.4	82	56	40.0		
16	Gaurav Radio	Main Market, Udaipur, Sarguja	22	54	37.6	82	56	47.4		
17	Janta Electronics	Near Rest House, Lakhanpur, Sarguja	22	58	49.1	83	2	47.5		
18	Manohar Radio	Ambikapur Road, Lakhanpur, Sarguja	22	58	52.4	83	2	47.7		
19	Janta Watch & Electronics	Ambikapur Road, Lakhanpur, Sarguja	22	58	52.7	83	2	47.9		
20	Baba Musical & Mobile	Ambikapur Road, Lakhanpur, Sarguja	22	58	53.5	83	2	47.6		
21	Nazir Electronics	Main Road, Lakhanpur, Sarguja	22	59	11.1	83	2	50.9		
22	Trimurti Enterprises	Main Road, Lakhanpur, Sarguja	22	58	55.5	83	2	48.7		
23	Agarwal Radio & Mobile	Beldgi Road, Lakhanpur, Sarguja	22	58	47.7	83	2	47.4		
24	Shivam Photo Studio & Electronic	Main Road, Sitapur, Sarguja	22	46	48.4	83	29	38.4		
25	Santosh Electronics	Main Road, Sitapur, Sarguja	22	47	18.3	83	29	27.8		
26	Taj Electrical	Main Road, Sitapur, Sarguja	22	47	31.6	83	29	19.5		
27	Dipanshu Electronics	Bagich Chowk, Batauli, Sarguja	22	58	34.4	83	24	44.0		
28	Bishanu Electronics	Bagich Chowk, Batauli, Sarguja	22	58	35.4	83	24	45.5		
29	Pragya Electronics	Main Road, Sitapur, Sarguja	22	58	39.3	83	24	41.1		
30	Amit Radio &Electronics	Main Road, Sitapur, Sarguja	22	58	46.1	83	24	36.5		
31	Umesh Radio &Electronics	Main Road, Sitapur, Sarguja	22	58	38.4	83	24	41.8		
		Surajpur								
1	Uma Electonics	Main Maket, Bhaiyathan, Surajpur	23	23	24.9	82	50	56.5		
2	Garg Electronics	Main Road, Bhaiyathan, Surajpur	23	23	23.1	82	50	55.9		
3	Goyal Electronics	Main Road, Bhaiyathan, Surajpur	23	23	22.2	82	50	55.5		
4	Prayag Electronics	Main Road, Bhaiyathan, Surajpur	23	23	21.6	82	50	55.9		
5	Ashu Electronics	Main Market, Odgi, Surajpur	23	28	41.6	82	48	18.5		
6	Singhal Radio	Main Market, Bishrapur, Surajpur	23	11	5.3	82	58	26.6		
7	Jain Electronics	Main Road, Bishrapur, Surajpur	23	11	5.1	82	58	25.4		
8	Music Parlor	Main Market, Bishrapur, Surajpur	23	11	5.6	82	58	23.8		
9	Vikash Electronics	Main Market, Bishrapur, Surajpur	23	11	6.0	82	58	17.3		
10	G A Electronics	Main Market, Bishrapur, Surajpur	23	11	6.7	82	58	11.8		
11	Shringar Sadan Electronics	Main Market, Bishrapur, Surajpur	23	11	5.7	82	58	10.9		
12	Kheda Electronics	Main Market, Bishrapur, Surajpur	23	11	6.4	82	58	7.6		
13	Ashok Radio Center	Bhaiyathan Road, Surajpur	23	12	59.2	82	52	0.7		

Sl. No.	Name	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
14	Ekta Electronics	Bhaikunthpur Road, Surajpur	23	12	52.0	82	51	56.6
15	R K Radio	Bhaikunthpur Road, Surajpur	23	12	52.5	82	51	56.2
16	Suraj Electronics	Bhaikunthpur Road, Surajpur	23	12	53.3	82	51	54.8
17	Payal Electronics	Manendragarh Road, Surajpur	23	12	53.1	82	51	54.9
18	Ayus Radio	Manendragarh Road, Surajpur	23	12	56.6	82	51	44.2
19	Amit Radio	Manendragarh Road, Surajpur	23	12	56.2	82	51	46.7
20	New Satya Electronics	Manendragarh Road, Surajpur	23	12	54.1	82	51	51.0
21	Singhal Radio	Near Bus Stand, Surajpur	23	12	51.2	82	52	9.3
22	Vicky Electronics	Main Chowk, Pratappur, Surajpur	23	29	8.7	83	12	25.3
23	Akash Electronics	Main Chowk, Pratappur, Surajpur	23	29	6.8	83	12	24.3
24	Maa Mahamaya Electronics	Kadapara, Pratappur, Surajpur	23	29	5.7	83	12	36.5
25	Gupta Electronics	Kadapara, Pratappur, Surajpur	23	29	4.1	83	12	36.6

Bastar Division

Sl. No.	Name	Address	Latitude			Longitude						
			Deg.	Min.	Sec.	Deg.	Min.	Sec.				
Bastar												
1	Kamal Electronics	Dharampura No-2, Jagdalpur, Bastar	19	5	41.2	1	59	43.9				
2	Sarojni Electronics	Near Anupam Takies, Jagdalpur, Bastar	19	5	12.7	81	0	58.0				
3	Rahul Enterprises	State Bank Road, Chadni Chowk, Jagdalpur, Bastar	19	5	7.8	82	1	30.6				
4	Sajawat (Electronics)	Chadni Chowk, Jagdalpur, Bastar	19	5	9.2	82	1	32.5				
5	Sony	Infront of Maharani Hospital, Chadni Chowk, Jagdalpur, Bastar	19	5	6.8	82	1	25.4				
6	Vimal Electronics	Infront of New Narendra Theater, Chadni Chowk, Jagdalpur, Bastar	19	5	9.2	82	1	21.2				
7	Rajeev Electronics	Sirasar Chowk, Jagdalpur, Bastar	19	5	25.9	82	1	25.7				
8	Golden Marketing	Sirasar Chowk, Jagdalpur, Bastar	19	5	26.8	82	1	24.4				
9	Meru Electronics (Samsung)	Sirasar Chowk, Jagdalpur, Bastar	19	5	28.1	82	1	24.8				
10	Mahaveer Electronics	Gol Bazar, Jagdalpur, Bastar	19	5	25.1	82	1	23.9				
11	K.C. Electronics	Gol Bazar, Jagdalpur, Bastar	19	5	25.2	82	1	23.8				
12	Sai Electronics	Gol Bazar, Jagdalpur, Bastar	19	5	23.2	82	1	23.9				
13	MIB Shopping	Thakur Road, Gol Bazar, Jagdalpur, Bastar	19	5	21.4	82	1	29.9				
14	Tulsi Electronics	Main Road, Gol Bazar, Jagdalpur, Bastar	19	5	19.1	82	1	29.0				
01 N.			Latitude			Longitude						
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51. INO.	Iname	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.				
15	Khurana Radio	Main Road, Gol Bazar, Jagdalpur, Bastar	19	5	17.5	82	1	29.8				
16	Agarwal Sale	Main Road, City Kotwali, Jagdalpur, Bastar	19	5	16.0	82	1	32.9				
17	Kushal Furniture	Pratap Word, Near Sakal Jain Mandir, Jagdalpur, Bastar	19	5	18.9	82	1	22.3				
18	Sai Deep Enterprises	Hospital Road, Bastar Tahsil, Bastar	19	12	18.2	81	56	6.9				
19	Siddhi Palace	Jagdalpur Road, Bastar Tahsil, Bastar	19	12	18.6	81	56	11.6				
Kondagaon												
20	Saukin House	Main Road, Kondagaon	19	35	32.0	81	39	46.4				
21	Vijay Electronics	Main Road, Kondagaon	19	35	45.6	81	39	54.2				
22	Ashok Electronics	Gandhi Ward, Kondagaon	19	36	25.6	81	40	5.2				
23	Reet Electroics	Jamkot Para Road, Main Market, Kondagaon	19	36	1.2	81	40	4.9				
24	Sandeep Sajawat	Jamkot Para Road, Main Market, Kondagaon	19	35	44.4	81	39	53.8				
25	R.K.Enterprises	Gandhi Ward, Kondagaon	19	35	42.3	81	39	51.6				
26	Solanki Electronics	Shitala Para, Kondagaon	19	35	32.3	81	39	47.0				
27	Sidh Electronics	Main Road, Kondagaon	19	35	27.6	81	39	45.5				
28	Nanak Bhai Electronics	Sargipal Para, Kondagaon	19	35	23.6	81	39	33.6				
29	Navkar Traders	Main Road, Keshkal, Kondagaon	20	5	14.6	81	35	26.7				
30	Rathi Metal & Electronics	Main Road, Keshkal, Kondagaon	20	5	2.8	81	35	20.8				
31	Payal General & Electronics	Pharasgaon Road, Keshkal, Kondagaon	20	4	51.8	81	35	15.5				
32	Muskan General & Electronics	Bargaon, Keshkal, Kondagaon	20	4	44.7	81	35	14.4				
33	Versha Electronics	Main Road, Pharasgaon, Kondagaon	19	51	44.3	81	38	7.7				
34	Lucky Electronics	Main Road, Pharasgaon, Kondagaon	19	51	43.1	81	38	8.9				
		Sukma										
35	Niaz Electronics	New Bus Stand, Bajar Rd., Chhindgarh, Sukma	18	31	31.2	81	45	15.1				
36	Maheshwari Electronics	Old Bus Stand, Sukma	18	23	25.0	81	39	32.6				
37	S M Electronics	Opp. State Bank, Sukma	18	23	20.3	81	39	33.5				
38	Prachi Electronics	Ward No13, Sukma	18	23	20.8	81	39	32.7				
		Dantewada										
39	Raj Enterpirse	Main Rd., Dantewada	18	53	29.7	81	20	48.4				
40	Mansi Electronics	Main Rd., Dantewada	18	53	21.5	81	20	51.8				
41	Vandna Electronics	Paraspal Chock, Dantewada	18	53	21.5	81	20	52.9				

SI No	N	Address Latitude Longitude					le			
SI. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.		
42	Regal Electronics	Main Rd., Dantewada	18	53	19.0	81	20	53.4		
43	Sai Electronics	Gram Post Nakulnar, Kuwa Konda	18	43	32.0	81	25	4.8		
44	Sri Shakti Electronics	Nakulnar, Kuwa Konda	18	43	44.8	81	24	26.0		
		Bijapur				1				
45	Baghed Electronics	Purana Petrol Pump, Bijapur	18	48	2.6	80	48	45.5		
46	E-Point	Indra Marekt, Bijapur	18	47	39.9	80	49	0.8		
47	Sanjay Treading Company	Indra Marekt, Bijapur	18	47	41.5	80	48	59.9		
48	Sanjay Treading Company	Main Rd., Bijapur	18	48	3.5	80	48	44.1		
Narayanpur										
49	Raj Luxary Sofa Mark	Sonpur Rd., Chandni Chock, Narayanpur	19	43	7.0	81	14	38.2		
50	Samrat Furniture	Sonpur Rd., Narayanpur	19	43	6.6	81	14	45.5		
51	Jagdish Chand Pawan Kumai Shop	Sonpur Rd., Narayanpur	19	43	6.6	81	14	46.4		
52	Sidharth Traders	Chandni Chock, Narayanpur	19	43	6.3	81	14	48.8		
53	Ariyant Saigel Electronics	Main Rd., Narayanpur	19	43	6.8	81	14	50.4		
	Kanker									
54	Lakshmi Electronics	Near Jain Mandir, Main Rd., Anthagarh	20	5	44.5	81	9	26.8		
55	Lakshmi Bartan Bhandar Furniture & Electronics	Near Gramin Bank, Main Rd., Anthagarh	20	5	47.5	81	9	27.4		
56	Patel Enterprises	Ward No8, Shyam Nagar, Anthagarh	20	5	53.2	81	9	26.6		
57	Rahul Electronics	Veer Narayan Chock, Anthagarh	20	5	38.5	81	9	27.6		
58	Ma Parmeshwari Electronics	Awas Para, Naharpur	20	26	49.2	81	37	21.9		
59	Hari Om Furniture & Electronics	Atal Bihari Vajpai Ward, Naharpur	20	26	48.9	81	37	16.5		
60	Kabir Radio	Infront of Janpat Panchayat office, Charama, Kanker	22	29	12.0	81	22	17.8		
61	Navkar Electronics	Makadi Road, Charama, Kanker	20	29	22.9	81	22	12.0		
62	Amar Radio	Makadi Road, Charama, Kanker	20	29	23.7	81	22	12.1		
63	Sri Bhagwati Enterprises	Dhamtari Road, Charama, Kanker	20	29	25.8	81	22	11.1		
64	Shani Electronics	Dhamtari Road, Charama, Kanker	20	29	26.9	81	22	10.2		
65	Devendra Electronics	Main Road, Charama, Kanker	20	29	26.6	81	22	10.2		
66	Jatwani Furniture & Electronics	Din Dayal Chowk, Charama, Kanker	20	29	34.8	81	22	7.1		
67	Gopi Electronics	Sadar Bazar, Charama, Kanker	20	29	29.6	81	22	6.6		
68	Astha Enterprises	Sadar Bazar, Charama, Kanker	20	29	29.8	81	22	6.7		
69	Chhaya Enterprises	Anapara, Main Road, Kanker	20	16	19.5	81	29	31.5		

01 N	N]	Latitud	e	Longitude			
SI. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
70	R.K.Suppliers	Old Kachahari Chowk, Kanker	20	16	12.0	81	29	28.1	
71	Gupta Electronics	Cinema Chowk, Kanker	20	16	9.5	81	29	26.9	
72	Amit Electronics	Cinema Chowk, Kanker	20	16	8.9	81	29	26.7	
73	New Ranjeet Enterprises	Cinema Chowk, Kanker	20	16	8.9	81	29	26.8	
74	Hind Radio	Manjha Para, Kanker	20	16	5.2	81	29	26.3	
75	Prakash Electronics	Gilli Chowk, Kanker	20	16	7.3	81	29	27.5	
76	Ganpati Electronics	Gilli Chowk, Kanker	20	16	3.1	81	29	31.2	
77	Sheetal Electronics	Daily Market, Kanker	20	16	5.0	81	29	35.4	
78	DeepaK Electronics	Manjha Para, Kanker	20	16	4.1	81	29	32.5	
79	Ahuja Radio	Manjha Para, Kanker	20	16	5.4	81	29	33.7	
80	Ahuja Electronics	Manjha Para, Kanker	20	16	5.5	81	29	34.4	
81	Dhannamal Gullumal Electronics	Manjha Para, Kanker	20	16	8.2	81	29	35.8	
82	Agarwal Electronics	New Bus Stand, Kanker	20	15	50.3	81	30	0.0	
83	Jeetu Electronics	Near Bus Stand, Durgu Kondal Kanker	20	13	10.5	80	56	42.7	
84	Shree Radha Electronics	Sambhalpur Road, Main Chowk, Durgu Kondal Kanker	20	13	9.9	80	56	41.7	
85	Akash Electronics	Dalli Road, Bhanu Pratap Pur, Kanker	20	18	40.2	81	4	17.3	
86	Shankar Variety	Near Bus Stand, Bhanu Pratap Pur, Kanker	20	18	34.6	81	4	9.2	
87	Manokamna Electronics	Shambhalpur Road, Bhanu Pratap Pur, Kanker	20	18	35.0	81	4	11.3	
88	Nirmal Agency	Shambhalpur Road, Bhanu Pratap Pur, Kanker	20	18	35.1	81	4	11.7	
89	Santosh Electronics	Main Market, Bhanu Pratap Pur, Kanker	20	18	35.0	81	4	12.4	
90	Aishwarya Electronics	Main Market, Bhanu Pratap Pur, Kanker	20	18	35.4	81	4	14.5	
91	Radio Corner	Main Market, Bhanu Pratap Pur, Kanker	20	18	35.8	81	4	14.5	
92	Star Radio	Main Road, Bhanu Pratap Pur, Kanker	20	18	35.7	81	4	15.6	
93	Sonu Electronics	New Market, Pakhunja, Kanker	20	1	59.6	80	37	33.3	
94	Ray Electronics	New Market, Main Road, Pakhunja, Kanker	20	1	59.9	80	37	33.1	
95	Rajesh Electronics	New Market, Main Road, Pakhunja, Kanker	20	2	0.3	80	37	33.2	
96	Khusi Traders	Near Post office, Main Road, Pakhunja, Kanker	20	2	14.6	80	37	29.3	

Partial List of Bulk Consumers in Chhattisgarh- Annexure 3

01 N I	N		Latitude			Longitude			
SI. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
	-	Raipur							
1	Zila Vyapar and Udhyog office	Raipur	21	14	43.9	81	38	40.8	
2	Mahila & bal Vikas	Raipur	21	14	44.0	81	38	41.3	
3	Nirvachan office	Raipur	21	14	44.9	81	38	38.9	
4	Nagar Palika Office	Arang	21	11	33.7	81	58	9.1	
5	Tahsil Office	Arang	21	11	34.2	81	58	28.8	
6	Janpat Panchayat Offie	Arang	21	11	35.4	81	58	31.8	
7	Tahsil Office	Abhanpur	21	3	12.8	81	44	43.1	
Dhamtari									
8	Nagar Palika Office	Dhamtari	20	42	10.1	81	33	0.3	
9	Tahsil Office	Dhamtari	20	42	12.9	81	32	56.8	
10	Lok Sewa Kendra	Tahsil, Dhamtari	20	42	11.8	81	32	56.5	
11	Collectrate office	Dhamtari	20	40	43.1	81	32	59.9	
12	Janpat Panchayat office	Dhamtari	20	40	44.4	81	33	16.5	
13	Tahsil Office	Nagri	20	21	2.6	81	57	22.2	
14	Lok Sewa Kendra	Nagri	20	21	2.7	81	57	22.9	
15	Janpat Panchayat office	Nagri	20	21	3.0	81	57	20.3	
16	Tahsil Office	Magarlod	20	44	46.7	81	51	1.9	
		Gariaband							
17	Tahsil Office	Rajim	20	58	30.6	81	50	38.0	
18	Tahsil Office	Chhura	20	48	5.9	82	12	18.5	
19	Post office	Gariaband	20	38	0.6	82	3	42.6	
20	Collectrate office	Gariaband	20	38	10.5	82	3	35.6	
21	Tahsil Office	Gariaband	20	37	55.9	82	3	39.0	
22	Lok Sewa Kendra	Gariaband	20	37	55.9	82	3	39.0	
Baloda Bazar									
23	Collectrate office	Baloda Bazar	21	39	45.2	82	8	48.6	
24	Tahsil Office	Baloda Bazar	21	39	31.6	82	8	47.4	
25	Lok Sewa Kendra	Baloda Bazar	21	39	32.3	82	8	46.0	
26	Treasury office	Baloda Bazar	21	39	32.3	82	8	46.2	
27	Janpat Panchayat	Baloda Bazar	21	39	28.4	82	8	48.9	
28	Tahsil Office	Simga	21	38	8.9	81	42	34.6	

Raipur Division

Sl. No.	N]	Latitud	e	Longitude				
51. INO.	Iname	Address Image: Constraint of the second	Deg.	Min.	Sec.	Deg.	Min.	Sec.		
29	Tahsil Office	Kasdol	21	37	36.8	82	25	14.6		
30	Janpat Panchayat	Kasdol	21	37	35.5	82	25	13.7		
Mahasamund										
31	Collectrate office	Mahasamund	21	6	10.1	82	5	0.5		
32	RTO office	Mahasamund	21	6	6.5	82	5	1.5		
33	Civil Court	Mahasamund	21	6	17.8	82	5	3.6		
34	Zila Shiksha Adhikari	Mahasamund	21	6	7.3	82	5	11.0		
35	Tahsil Office	Mahasamund	21	6	24.9	82	5	40.8		
36	Lok Sewa Kendra	Mahasamund	21	6	23.6	82	5	40.8		
37	Janpat Panchayat	Pithora	21	14	43.3	82	31	4.8		

Bilaspur Division

CI NI	NT	Latitude			e	Longitude				
51. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.		
Bilaspur										
1	Head Post office	Chota para, Bilaspur	22	5	13.3	82	8	41.5		
2	Tahsil office	Bilaspu r	22	5	13.0	82	8	36.1		
3	Civil Court	Bilaspu r	22	5	12.9	82	8	35.9		
4	Vikas Bhawan	Bilaspur	22	5	10.9	82	8	3.6		
5	Collectrate office	Bilaspu r	22	5	15.2	82	8	25.0		
6	Zila Panchayat office	Bilaspu r	22	5	16.1	82	8	20.5		
7	Nagar Palika Office	Kota	22	17	22.7	82	1	5.3		
8	Tahsil Office	Kota	22	17	22.5	82	1	5.1		
9	Tahsil Office	Belha	21	57	47.2	82	4	30.2		
10	Nagar Pachayat Office	Belha	21	57	1.2	82	4	22.7		
		Mungeli								
11	Janpat Panchayat office	Lormi	22	16	18.2	81	41	54.1		
12	Vyavhar Court	Lormi	22	16	18.1	81	41	53.1		
13	Tahsil office	Mungeli	22	4	37.9	81	42	35.1		
14	Collectrate office	Mungeli	22	4	25.2	81	42	2.4		
15	Lok Seva Kendra	Mungeli	22	4	41.9	81	42	45.7		
16	Zila Pachayat Office	Mungeli	22	4	25.1	81	42	2.3		
Korba										
17	RTO Office	Korba	22	22	4.7	82	44	44.9		
18	Tahsil office	Korba	22	22	0.0	82	44	49.0		

01 N	N]	Latitud	atitude		Longitude		
SI. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
19	Collectrate office	Korba	22	21	40.5	82	42	16.8	
20	Nagar Paika office	Pondi Uproda	22	35	55.6	82	33	24.8	
21	Tahsil office	Pondi Uproda	22	36	48.5	82	32	52.6	
22	Lok sewa Kendra	Pondi Uproda	22	36	7.0	82	33	26.1	
23	Tahsil office	Katghora	22	30	13.3	82	33	25.9	
24	Nagar Paika office	Katghora	22	30	6.8	82	33	32.6	
25	Tahsil office	Kartala	22	17	54.4	82	57	9.1	
	Janjgir - Champa								
26	Civil Court	Janjgir	22	0	26.9	82	34	43.1	
27	Tahsil office	Janjgir	22	0	26.9	82	34	43.1	
28	Collectrate office	Janjgir	22	0	53.2	82	35	39.9	
29	Lok Sewa Kendra	Janjgir	22	0	25.0	82	34	43.6	
30	Tahsil office	Champa	22	2	19.6	82	39	21.2	
31	Nagar Palika Office	Champa	22	2	36.6	82	38	48.7	
32	Tahsil office	Bhamindih	21	54	33.3	82	43	11.6	
33	Nagar Pachayat Office	Baloda	22	8	3.9	82	28	21.4	
34	Tahsil office	Baloda	22	8	4.1	82	29	53.8	
35	Tahsil office	Akaltara	22	1	1.7	82	25	36.3	
36	Zila Panchayat office	Pamgarh	21	52	13.3	82	27	15.0	
37	Tahsil office	Pamgarh	21	52	12.1	82	27	15.1	
		Raighar							
38	Collectrate office	Raigarh	21	53	25.5	83	24	18.5	
39	Tahsil office	Raigarh	21	53	19.2	83	24	17.5	
40	Tahsil office	Dharamjaygarh	22	27	42.6	83	12	29.6	
41	Tahsil office	Gharghoda	22	10	21.1	83	20	57.7	

Durg Division

Sl. No.	N		Latitude		tude Longitude				
51. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
Durg									
1	Collectrate office	Patel Chock, Collectrate Parisar Durg - 491001	21	11	3.0	81	16	32.7	
2	Tahsil Office	Patel Chock, Durg - 491001	21	11	8.0	81	16	33.0	
3	Nagar Palika	M. C. Head Office, Letai Rd., Durg - 491001	21	11	8.5	81	16	39.1	
4	PWD Office	Near Bus Stand, N.H. Rd., Durg -	21	11	13.0	81	16	52.7	

01.34			Latitude		e	Longitude			
51. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
		491001							
5	RTO Office	Civil Line, Malvi Nagar Chock, Durg - 491001	21	11	24.6	81	17	36.0	
6	Collectrate office	Kabai Bhata, Collectrate Parisar, Bemetara, Durg - 491335	21	41	22.8	81	33	4.8	
Bemetara									
7	Tahsil Office	Tahsil Office, Bemetara-491335	21	43	7.9	81	32	10.7	
8	Nagar Palika	Singori, Durg Rd., Bemetara-491335	21	42	1.2	81	32	2.3	
9	PWD Office	Ward No4. Bemetara-491335	21	43	6.5	81	32	11.0	
10	RTO Office	Village Khobia, Bemetara-491335	21	41	43.6	81	32	52.0	
11	Tahsil Office	Tahsil Parisar, Nawagarh, Bernetara- 491337	21	54	18.8	81	36	47.8	
12	PWD Office	Ward No15, Shankar Nagar, Nawagarh, Bemetara-491337	21	53	57.6	81	36	46.0	
13	Nagar Palika	Near Bus Stand, Nawagarh, Bemetara- 491337	21	54	19.0	81	36	26.4	
Kawardha - Kabirdham									
14	Nagar Palika	Ward No9, Kawardha	22	0	32.6	81	13	40.7	
15	Tahsil Office	Ward No8, Proffecer Colony, Kawardha	22	0	26.9	81	12	58.6	
16	RTO Office	Chir Pali Colony, Kawardha	22	0	22.6	81	13	9.0	
17	PWD Office	Ward.∖ No5, Kawardha	22	0	23.4	81	13	48.4	
18	Tahsil Office	Pondi Rd., Bodla, Kawardha	22	9	36.2	81	13	29.8	
19	PWD Office	Pondi Rd., Bodla, Kawardha	22	9	36.2	81	13	29.8	
20	Nagar Panchayat	Ward No7, Bodla, Kawardha	22	9	46.2	81	13	7.7	
21	PWD Office	Lormi Rd., Pandariya, Kawardha	22	13	10.5	81	24	56.3	
22	Nagar Panchayat	Ward No8, Pandariya, Kawardha	22	13	7.0	81	24	38.2	
23	Tahsil Office	Berak Pura, Pandariya, Kawardha	22	13	28.6	81	24	17.1	
		Rajnandgaon							
24	Nagar Palika	Ward No12, Dongargarh, Rajnanndgaon	21	11	11.5	80	45	15.3	
25	Tahsil Office	Civil Line, Dongargarh, Rajnanndgaon	21	11	26.1	80	44	53.1	
26	SDM Office	Civil Line, Dongargarh, Rajnanndgaon	21	11	26.1	80	44	53.1	
27	PWD Office	Sub Division Office, Dongargarh, Rajnanndgaon	21	11	31.2	80	44	54.0	
28	Collectrate office	Karyalya Collectrate, Rajnanndgaon	21	5	51.4	81	1	13.8	
29	DIC Office	Sayukt Karyalya Bhawan, Rajnanndgaon	21	5	53.0	81	1	16.4	
30	RTO Office	Outer Rd., Rajnanndgaon	21	6	8.7	81	0	3.0	

Sl. No.	N			Latitude			Longitude		
51. No.	Name	Address Imam Chock, Rajnanndgaon 2 Imam Chock, Rajnanndgaon 2 Baldev Ward, Rajnanndgaon 2 Kelash Nagar, Rajnanndgaon 2 Kelash Nagar, Rajnanndgaon 2 Jila Karyalya, Balod 2 Civil Line, Balod 2	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
31	Nagar Palika	Imam Chock, Rajnanndgaon	21	5	54.4	81	2	4.0	
32	Tahsil Office	Baldev Ward, Rajnanndgaon	21	6	2.6	81	1	55.4	
33	PWD Office	Kelash Nagar, Rajnanndgaon	21	5	54.0	81	2	30.7	
Balod									
34	Collectrate office	Jila Karyalya, Balod	20	43	44.2	81	12	12.0	
35	RTO Office	Civil Line, Balod	20	43	44.3	81	12	9.4	
36	PWD Office	Civil Line, Balod	20	43	44.8	81	12	9.3	
37	Nagar Palika	Sadar Rd. Near Budhwari Bajar, Balod	20	44	5.4	81	12	33.8	
38	Tahsil Office	Madhu Chock, Balod	20	43	45.9	81	12	9.6	
39	Nagar Panchayat	Ward No8, Dondilohara, Balod	20	47	11.2	81	3	15.9	
40	Tahsil Office	Tahsil Parisar, Dondilohara, Balod	20	47	11.4	81	3	11.1	

Surguja Division

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Sl. No.	Nama]]	Latitude	e	L	ongituo	le
51. INO.	Iname	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.
		Balrampur						
1	Tahsil office	Balrampur	23	36	8.2	83	36	32.5
2	Collectrate office	Balrampur	23	36	31.6	83	37	2.5
3	Zila Panchayat office	Balrampur	23	36	30.7	83	37	5.1
4	Tahsil office	Shankargarh	23	18	3.8	83	36	19.6
5	Nagar Nigam office	Rajpur	23	20	16.6	83	25	3.6
6	Tahsil office	Rajpur	25	20	28.6	83	25	15.5
	Jashpur							
1	Collectrate office	Jashpur	22	52	36.4	84	8	27.8
2	Lok sewa kendra	Jashpur	22	52	36.1	84	8	27.2
3	Tahsil office	Jashpur	22	52	36.8	84	8	28.0
4	Nagar Nigam office	Jashpur	22	53	23.1	84	8	27.9
5	Tahsil office	Kunkuri	22	45	5.9	83	57	41.6
6	Janpat Panchayat office	Pathargaon	22	33	23.0	83	27	38.3
		Koriya						
1	Tahsil office	Sonhat	23	28	56.8	82	31	11.7
2	Collectrate office	Baikunthpur	23	18	1.4	82	33	20.8
3	Tahsil office	Baikunthpur	23	15	57.3	82	33	51.0
4	Lok Sewa Kendra	Baikunthpur	23	15	57.3	82	33	492

01 N 1				Latitud	e	Longitude			
SI. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
5	Nagar Palika office	Manendragarh	23	12	47.2	82	12	8.3	
6	Tahsil office	Manendragarh	23	12	54.5	82	12	25.9	
7	Janpat Panchayat office	Manendragarh	23	12	53.9	82	12	26.7	
8	PWD office	Manendragarh	23	12	53.6	82	12	27.5	
Surguja									
1	District Court	Ambikapur	23	7	41.5	83	11	16.6	
2	Tahsil office	Ambikapur	23	7	39.2	83	11	14.6	
3	Collectrate office	Ambikapur	23	7	35.6	83	11	19.0	
4	Nagar Palika office	Ambikapur	23	7	44.8	83	11	25.0	
5	Tahsil office	Lakhanpur	22	59	42.3	83	3	3.9	
6	Tahsil office	Sitapur	22	48	15.0	83	28	58.6	
		Surajpur							
1	Tahsil office	Bhaiyathan	23	23	24.0	82	51	0.0	
2	Janpat Panchayat office	Bhaiyathan	23	23	24.2	82	51	2.2	
3	Tahsil office	Odgi	23	28	41.3	82	48	16.1	
4	Tahsil office	Bishrapur	23	11	2.6	82	57	39.6	
5	Civil Court	Surajpur	23	12	48.5	82	52	10.8	
6	Collectrate office	Surajpur	23	12	45.4	82	52	17.9	
7	Tahsil office	Surajpur	23	12	44.1	82	52	24.1	
8	Janpat Panchayat office	Pratappur	23	29	5.0	83	12	11.4	
9	Tahsil office	Pratappur	23	29	2.8	83	11	47.5	

Bastar Division

Sl. No.	N		Latitude Longitude Deg. Min. Sec. Deg. Min. 19 4 52.0 82 1		le			
SI. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.
Bastar								
1	Collectrate office	Jadgalpur	19	4	52.0	82	1	16.9
2	PWD Office	Jadgalpur	19	4	54.5	82	1	23.2
3	Tahsil office	Jadgalpur	19	5	25.4	82	1	14.9
4	Zila Panchayat office	Jadgalpur	19	4	51.5	82	1	2.9
5	Nagar Palika Office	Jadgalpur	19	4	45.9	82	1	0.9
6	Tahsil office	Darbha	18	52	16.4	81	52	10.5
7	Tahsil office	Bastanar	18	59	16.9	81	38	12.1

01.01	N]	Latitud	e	Longitude			
SI. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
8	Tahsil office	Tokapal	18	0	43.5	81	52	32.0	
9	Nagar Panchayat Office	Bastar	19	12	13.9	81	56	2.0	
10	Tahsil office	Bastar	19	12	7.7	81	56	3.5	
		Kondagaon							
11	Zila Panchayat office	Kondagaon	19	35	17.1	81	39	47.5	
12	Tahsil office	Kondagaon	19	35	16.8	81	39	41.9	
13	Collectrate office	Kondagaon	19	34	38.2	81	40	4.7	
14	Lok Sewa Kendra	Kondagaon	19	34	38.9	81	40	4.6	
15	Nagar Palika Office	Kondagaon	19	35	15.0	81	40	9.8	
16	Nagar Pachayat Office	Kesh Kal	20	4	57.4	81	35	19.7	
17	Vyavhar court	Kesh Kal	20	4	57.9	81	35	18.6	
18	Tahsil office	Pharasgaon	19	50	22.4	81	38	35.9	
Sukma									
19	Tehsil Office	Jagdalpur Rd., Tehsil Parisar, Chhindgarh, Sukma	18	32	25.2	81	44	54.6	
20	Janpad Office	Main Rd, Chhindgarh, Sukma	18	32	15.5	81	45	0.0	
21	PWD Office	Near New Bus Stand, Sukma	18	23	30.3	81	39	31.6	
22	Nagar Palika	Nagar Palika Parishad, Sukma	18	23	28.3	81	39	31.9	
23	SDM Office	SDM Karyalya, Sukma	18	23	28.8	81	39	32.4	
24	Tehsil Office	Tehsil Parisar, Sukma	18	23	27.5	81	39	32.1	
		Dantewara							
25	Janpad Office	Barseli, katekalyan	18	48	0.2	81	39	9.9	
26	Tehsil Office	Barseli, katekalyan	18	48	0.9	81	39	11.2	
27	Janpad Office	Janpad Panchayat, Chitalanka, Dantewara	18	54	57.9	81	20	35.5	
28	RTO Office	Main Rd., Chitalanka, Dantewara	18	54	44.0	81	20	38.2	
29	Collectrate Office	Amra Pata, Dantewada	18	54	36.1	81	20	39.5	
30	Tehsil Office	Amra Pata, Dantewada	18	54	36.2	81	20	39.6	
31	Court	Amra Pata, Dantewada	18	54	27.6	81	20	42.3	
32	Nagar Palika	Opp. JAD Colony, Dantewara	18	54	0.1	81	20	48.5	
33	Tehsil Office	Tehsil Parisar, Kuwa Konda	18	43	34.5	81	25	7.3	
34	Janpad Office	Nakulnar, Kuwa Konda	18	43	27.7	81	25	2.5	
Bijapur									
35	Jila Panchayat	Dantewara Rd., Bijapur	18	48	16.3	80	48	22.8	
36	Collectrate Office	Dantewara Rd., Bijapur	18	48	15.0	80	48	20.8	

01.34			Latitude			Longitude			
SI. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
37	Janpad Office	Panara Pari Chock, Bijapur	18	48	49.4	80	47	49.3	
38	Nagar Palika	Sanchi Nagar, Bijapur	18	47	59.2	80	48	9.2	
39	Tehsil Office	Purana Bus Stand Para, Bijapur	18	47	33.4	80	49	0.1	
40	RTO Office	Indra Market Rd., Bijapur	18	47	32.5	80	49	2.8	
41	PWD Office	Main Rd., Bijapur	18	47	47.9	80	48	55.2	
Narayanpur									
42	PWD Office	Jai Stambh Chock, Narayanpur	19	43	16.8	81	14	41.7	
43	Nagar Palika	Subash Chock, Narayanpur	19	43	8.2	81	14	19.6	
44	Tehsil Office	Main Rd., Narayanpur	19	43	14.0	81	14	47.3	
45	Collectrate Office	Mahaka Gram, Narayanpur	18	43	22.5	81	14	12.7	
Kanker									
46	Nagar Panchayat	Rajiv Gandhi Chock, Anthagarh	20	5	57.0	81	9	30.9	
47	Janpad Office	Bajar Para, Anthagarh	20	5	57.7	81	9	36.3	
48	Tehsil Office	Naya Para, Anthagarh	20	6	4.0	81	9	41.3	
49	Tehsil Office	Dantewara Rd., Narharpur	20	26	59.6	81	37	37.3	
50	Janpad Office	Dantewara Rd., Narharpur	20	27	4.1	81	37	41.8	
51	Nagar Palika	Dantewara Rd., Narharpur	20	27	6.3	81	37	42.1	
52	PWD Office	Dantewara Rd., Narharpur	20	26	87.2	81	37	35.6	
53	Janpad Office	Opp. Staff Colony, Pakhunja	20	2	7.4	80	37	31.1	
54	Nagar Panchayat	Naya Bajar, Pakhunja	20	1	55.3	80	37	36.2	
55	Tehsil Office	Kali Mandir Rd. Pakhunja	20	2	20.7	80	37	34.9	
56	Tahsil office	Charama	20	29	16.0	81	22	14.5	
57	Zanpat Panchayat office	Charama	20	29	14.5	81	22	15.8	
58	Collectrate office	Kanker	20	15	57.8	81	29	55.1	
59	Nagar Palika Office	Kanker	20	15	55.9	81	29	55.4	
60	Tahsil office	Durgu Kondal	20	13	18.1	80	56	48.9	
61	Mahila & Bal Vikas office	Durgu Kondal	20	13	19.2	80	56	47.3	
62	Zanpat Panchayat office	Durgu Kondal	20	13	20.5	80	56	47.6	
63	Nagar Panchayat Office	Bhanu Pratap Pur	20	18	38.5	81	4	26.3	
64	Tahsil office	Bhanu Pratap Pur	20	18	38.9	81	4	25.0	

				atitude	-	Longitude			
S1. No.	Name of Shops	Address	Deg	Min	Sec	Deg	Min	Sec	
		Raipur	Deg.			Deg.			
1	Glacier Refrigeration	Nagar complex, Khatamtai, Raipur	21	16	42.2	81	38	8.8	
2	LB Enterprises	Nagar complex, Khatamtai, Raipur	21	16	42.0	81	38	9.0	
3	Munna TV Repairing Shop	MG Road, Raipur	21	14	44.0	81	38	1.0	
4	AC & Refrigerator Repairing shop	Maudhapara, Raipur	21	14	51.0	81	38	13.8	
5	Annapurna Electronics	Kalik Chowk, Arang	21	11	46.1	81	57	37.0	
6	Bhupendra Electronics	Indira Chowk, Arang	21	11	40.3	81	57	57.6	
7	Shibu Electronics	Mahamaya Mandir, Arang	21	11	38.6	81	57	54.7	
8	Shubham TV Repairing	Mahamaya Mandir, Arang	21	11	38.4	81	57	54.3	
9	Narendra Electronics	Mahamaya Mandir, Arang	21	11	38.4	81	57	54.6	
10	Shubham TV Repairing Center	Mandir Chowk, Arang	21	11	38.7	81	57	54.8	
11	Punesh Electronics	Near Bus Stand, Arang	21	11	34.0	81	57	59.3	
12	Suraj Electronics	Near Bus Stand, Arang	21	11	33.6	81	57	59.3	
13	Kabir Electronics	Main Road, Abhanpur	21	3	9.9	81	44	59.5	
14	Laxmi Electronics	Main Road, Abhanpur	21	3	8.2	81	45	1.2	
15	Om Reprairing Center	Main Road, Abhanpur	21	3	8.0	81	45	1.6	
16	Shakti Electronics	Main Market, Abhanpur	21	3	7.5	81	44	35.8	
		Dhamtari							
17	Anjali Electronics	Sihawa Chowk, Dhamtari	20	42	48.8	81	32	58.6	
18	TV Repairing Shop	Ambedkar Chowk, Dhamtari	20	42	4.3	81	32	9.5	
19	Kundan Electronics	Rambagh, Dhamtari	40	41	42.5	81	33	20.5	
20	D.K Electronics	Near Bus Stand, Nagri, Dhamtari	20	20	58.5	81	57	30.7	
21	Ali Computer & Mobile	Near Bus Stand, Nagri, Dhamtari	20	20	57.6	81	57	29.7	
22	Durga TV Center	Nagri, Dhamtari	20	20	47.1	81	57	33.2	
23	Sen Electronics	Near Bus Stand, Nagri, Dhamtari	20	20	58.7	81	57	28.0	
24	Hirani TV Repairing Center	Mandi Road, Naya Bazar, Magarlod	20	44	51.2	81	51	2.2	
25	A1 Electronics	Naya Bazar, Magarlod	20	44	55.8	81	51	2.7	
26	Hirwani Tv Center	Naya Bazar, Magarlod	20	44	56.0	81	51	4.4	
27	Sri Ram Electronics	Main Road, Magarlod	20	44	57.4	81	51	2.2	
Gariaband									
28	Gitika Refrigeration	Tarri Road, Nayapara, Rajim, Gariaband	20	58	0.1	81	51	15.0	

Raipur Division

Sl. No.]	Latitud	e	Longitude			
SI. No.	Name of Shops	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
29	Mahul TV Repairing	Ganj Road, Rajim, Gariaband	20	58	2.4	81	51	39.4	
30	Om TV Center	Sadar Bazar, Rajim, Gariaband	20	58	7.2	81	51	59.9	
31	Arvind Electronics	Chhura, Gariaband	20	48	37.7	82	12	36.7	
32	Shree Vishnu Electronics	Chhura, Gariaband	20	48	40.2	82	12	38.8	
33	Sahu Computer Repairing	Raipur Road, Gariabad	20	38	8.4	82	3	37.0	
34	Khemu Radio	Main Road, Gariabad	20	38	0.5	82	3	45.5	
35	Modern Electronics	Main Road, Gariabad	20	38	1.9	82	3	47.4	
36	KGN Sale & Service	Raipur Road, Gariabad	20	38	5.8	82	3	52.3	
Baloda Bazar									
37	Dev TV Service Center	Sabji Mandi, Baloda Bazar	21	39	21.0	82	9	46.1	
38	Patel TV Service	Sabji Mandi, Baloda Bazar	21	39	23.0	82	9	46.0	
39	Ajay Electronics	Sabji Mandi, Baloda Bazar	21	39	22.9	82	9	43.8	
40	Eliyas Rink TV Repairing	Mandi Road, Baloda Bazar	21	39	21.6	82	9	43.1	
41	Ramesh Radio	Gandhi Chowk, Baloda Bazar	21	39	20.0	82	9	37.5	
42	Sai Mobile & Electronics	Bhagat Singh Ward, Bhatapra	21	44	14.9	81	56	57.9	
43	Seema TV Center	Ram Saptah Chowk, Bhatapara	21	44	7.1	81	56	44.1	
44	Yuvraj Electronics	Gandhi Mandir Ward, Bhatapara	21	44	9.0	81	56	29.5	
45	Chaman TV Repairing	Gandhi Chowk, Batapara	21	44	9.9	81	56	28.2	
46	Shree Satguru Electronics	Bemetara Chowk, Simga	21	37	32.1	81	42	17.3	
47	Patel TV Center	Sadar Road, Simga	21	37	39.7	81	42	16.6	
48	Sanjay Electronics	Sadar Road, Simga	21	37	41.8	81	42	20.3	
49	TV Center	Bilaspur Road, Simga	21	38	5.0	81	42	31.7	
50	Shree Shyam Ji Electronics	Main Market, Kasdol	21	37	23.2	82	25	22.0	
51	Ashok Tv Repairing Center	Main Market, Kasdol	21	37	16.7	82	25	25.3	
52	Chanchal Electronics	Main Market, Kasdol	21	37	15.2	82	25	36.5	
53	Sunil Electronics	Main Market, Kasdol	21	37	15.7	82	25	25.6	
		Mahasamund							
54	Bhau Electronics	Near Bus stand, Mahasamund	21	6	44.8	82	5	42.6	
55	Aryan TV Center	Near Bus stand, Mahasamund	21	6	45.1	82	5	42.2	
56	Anand TV Service	Shankar Nagar, Near Bitholi Takies, Mahasamund	21	6	52.3	82	5	37.5	
57	Dharam Electronics	Shankar Nagar,Mahasamund	21	6	53.6	82	5	31.4	
58	Jyoti Electronics	Purani Bazar,Mahasamund	21	6	42.7	82	5	35.9	
59	Ram Tv Center	SCI Road, Mahasamund	21	6	36.7	82	5	48.5	
60	Gopal TV Center	Old Kachahari Chowk, Mahasamund	21	6	27.2	82	5	43.0	

CI NI	N. COL]	Latitud	e	Longitude			
51. INO.	Name of Shops	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
61	Surendra Tv Center	Old Kachahari Chowk, Mahasamund	21	6	26.9	82	5	42.5	
62	Chandra TV Serice	Kachahari Chowk, Mahasamund	21	6	25.1	82	5	43	
63	Anand TV Service	Kachahari Chowk, Mahasamund	21	6	24.9	82	5	43.4	
64	Nitesh TV Repairing	Barunda Chowk, Mahasamund	21	6	15.7	82	5	42.4	
65	Sahu Electronics	Barunda Chowk, Mahasamund	21	6	15.6	82	5	40.8	
66	Rahul TV Center	Barunda Chowk, Mahasamund	21	6	12.7	82	5	36.2	
67	Sahu Radio & TV Center	Shastri Chowk, Mahasamund	21	6	12.3	82	5	35.9	
68	Ritesh Freeze Service	Shastri Chowk BTI Road, Mahasamund	21	6	12.5	82	5	35.6	
69	Vijay TV & Refrigration	Near Bus Stand, Mahasamund	21	6	48.2	82	5	42.8	
70	Sarwar Cooling Center	Main Road, Pithora, Mahasamund	21	15	2.3	82	30	4.5	
71	Mahendra Tv center	Main Road, Pithora, Mahasamund	21	15	1.8	82	30	59.7	
72	Prince Electronics	Main Road, Pithora, Mahasamund	21	14	59.9	82	31	4.5	
73	Global Computer Service	Rani Mahal, Pithora, Mahasamund	21	14	48.6	82	31	9.2	
74	Mahesh Electronics	Rajpoot Marg, Pithora, Mahasamund	21	14	52.6	82	31	0.2	
75	Om Electronics	Bagbahra Road, Pithora, Mahasamund	21	14	47.3	82	31	4.7	
76	Amar Freez, AC Repairing	Main Market, Bagbahra, Mahasamund	21	2	47.5	82	23	4.4	
77	Gopal TV Center	Main Market, Bagbahra, Mahasamund	21	2	52.4	82	22	58.3	
78	Verma Electronis	Main Market, Bagbahra, Mahasamund	21	2	56.5	82	22	53.8	

Bilaspur Division

Sl. No.			Latitude			L	ongituo	le	
SI. No.	Name of Shops	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
Bilaspur									
1	Kaushik TV Repairing Center	Rajiv Gandhi chowk, Raipur Road, Bilaspur	22	4	38.8	82	8	21.9	
2	New Fridge Point	Karbala Road, Bilaspur	22	4	48.3	82	9	47.1	
3	Neha TV Center	Juna Bilaspur	22	5	0.9	82	9	33.5	
4	Shivam TV Radio Center	Near Shyam Takies, Juna Bilaspur	22	5	0.7	82	9	34.4	
5	Bharmal Electronics	Shastri Chowk, Bilaspur	22	5	4.5	82	9	25.9	
6	J.S. Refrigeration	Khararganj, Bilaspur	22	5	2.8	82	9	22.6	
7	Baksh Refrigeration	Sadar Bazar, Bilaspur	22	5	8.6	82	9	11.9	
8	R.K. Service	Juni Line, Sadar Bazar, Bilaspur	22	5	7.9	82	9	11.6	
9	New Baksh Refrigeration	Madhya Nagari Chowk, Bilaspur	22	5	2.1	82	9	10.0	
10	Dinesh TV Center	Telipara, Bilaspur	22	4	52.2	82	9	23.1	
11	Whirpool Cooling Center	Masanganj, Bilaspur	22	4	51.1	82	9	3.6	

SI No			Latitude Longitud		le				
Sl. No.	Name of Shops	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
12	Ahuja TV Center	Shanichari Bazar, Bilaspur	22	5	1.8	82	9	36.6	
13	Sahu Repairing Center	Kargi Road, Kota, Bilaspur	22	17	22.0	82	0	58.3	
14	Versha TV Center	Kargi Road, Kota, Bilaspur	22	17	22.4	82	0	58.2	
15	Bajrang Electronics	Kargi Road, Kota, Bilaspur	22	17	22.1	82	0	59.1	
16	Geeta Electronics	Kargi Road, Kota, Bilaspur	22	17	23.3	82	1	9.3	
17	Amisha Refrigeration	Near Rly. Station , Kota, Bilaspur	22	17	28.8	82	1	23.1	
18	Saxena Electronics	Hatri Chowk , Kota, Bilaspur	22	17	42.5	82	1	28.8	
19	Durga Radio & Color TV	Hatri Chowk , Kota, Bilaspur	22	17	45.5	82	1	29.0	
20	Jai & Jala Ram Electronics	Near Rly. Station , Kota, Bilaspur	22	17	48.9	82	1	30.4	
21	Shree Durga Electronics	Main Road, Near Rly Crossing, Belha, Bilaspur	21	57	30.1	82	4	25.0	
22	Bagga TV Center	Bilaspur Road, Belha, Bilaspur	21	57	27.5	82	4	29.0	
23	Ravi Radio	Tahsil Road, Belha, Bilaspur	21	57	18.3	82	4	25.5	
24	Saurya Refrigeration	Bodri Road, Chakar Bhata Camp, Belha, Bilaspur	21	57	2.6	82	4	23.5	
25	Raj TV Repairing Center	Shanichari Bazar, Belha, Bilaspur	21	57	15.4	82	4	23.4	
Mungeli									
26	Babloo Electronics	Main Market, Lormi, Mungeli	22	16	13.9	81	42	1.4	
27	Paras Electronics	Main Market, Lormi, Mungeli	21	16	15.8	81	42	1.3	
28	Rajpoot Electronics	Mungeli Road, Lormi, Mungeli	22	16	17.0	81	42	1.1	
29	Santosh TV Center	Near Police Station, Lormi, Mungeli	22	16	18.5	81	41	59.0	
30	Maa Godawari Electronics	Main Market, Lormi, Mungeli	22	16	17.7	81	41	57.4	
31	Maa Durga Electronics	Tahsil Road, Lormi, Mungeli	22	16	18.1	81	41	49.8	
32	Maa Sarswati Electronics	Main Road, Lormi, Mungeli	22	16	17.4	81	41	48.7	
33	Satyavan Sound & Ganesh TV Repairing	Main Road, Lormi, Mungeli	22	16	17.7	81	41	48.7	
34	Prakash Mobile & TV Repairing	Main Road, Lormi, Mungeli	22	16	17.5	81	41	40.2	
35	Maa Maha Maya Refrigeration	Main Road, Lormi, Mungeli	22	16	18.8	81	42	6.6	
36	Jai shakti Electronics	Padaria Road, Mungeli	22	4	1.0	81	40	43.5	
37	Sahu Electronics	Padaria Road, Mungeli	22	4	0.9	81	40	57.6	
38	Suraj Electronics	Balani Chowk, Mungeli	22	3	58.8	81	41	10.7	
39	Manju TV Repairing	Balani Chowk, Mungeli	22	4	0	81	41	11.9	
40	Om TV Repairing	Balani Chowk, Mungeli	22	4	1.7	81	41	11.2	
41	Patel Frigde Repairing	Near Radha KrishnaTakies, Mungeli	22	4	3.9	81	41	30.1	
42	Nikhil Electronics	Bilaspur Road, Mungeli	22	4	3.8	81	41	30.3	
43	Amit Watch & Electronics	Lormi Road, Mungeli	22	4	12.8	81	41	30.5	

			Latitude		Longitude			
Sl. No.	Name of Shops	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.
44	Mukesh Electronics	Sindhi Colony, Shankar Mandir, Mungeli	22	3	45.1	81	41	7.9
45	Maa Ambey Electronics	Near Bus Stand, Mungeli	22	3	44.4	81	41	3.6
46	Dwivedi TV & Electronics	Near Kotwali, Mungeli	22	4	2.1	81	41	19.9
47	Shakti Electronics	Near Kotwali, Mungeli	22	4	1.6	81	41	19.9
48	Laxmi Prasad Electronics	Sardar Patel ward, Mungeli	22	4	0.9	81	41	20.7
Korba								
49	Sahu TV Center	Sunday Market, Korba	22	20	36.5	82	41	56.1
50	Laxmi Electronics	Power House Road, Korba	22	21	4.9	82	42	14.3
51	Kisan Electronics	Mudapar bypass, Korba	22	20	58.1	82	42	33.0
52	TV Janta Electronics	Transport Nagar, Korba	22	21	19.3	82	42	22.2
53	Saurabh Refrigeration	Suvidha ComplexTransport Nagar, Korba	22	21	19.4	82	42	22.1
54	Shahabuddin Electronics	Transport Nagar, Korba	22	21	23.0	82	42	26.4
55	Q Max (Freeze Repairing shop)	Budhwari Bazar, Korba	22	21	56.0	82	43	1.9
56	Anil Electroncis (TV &Freeze Repairing)	Budhwari Bazar, Korba	22	21	55.5	82	43	1.9
57	Refrigeration Care	Budhwari Bazar, Korba	22	21	56.2	82	43	1.7
58	Bareth Electronics	ITI Chowk, Korba	22	22	4.9	82	44	47.9
59	Refrigeration (Friends Engineering Training)	Kasabadi Chowk, Korba	22	21	48.7	82	44	3.7
60	Shree Krishna Electronics	Pushpanjali Chowk, Korba	22	21	41.5	82	43	31.4
61	Prahlad Electronics	Niharika Chowk, Korba	22	21	41.1	83	43	30.1
62	Yadav Electronics	Tahsil Chauraha, Pondi Uproda, Korba	22	36	48.5	82	32	52.6
63	Royal Watch & Electroncs	Near Bus Stand, Katghora, Korba	22	30	33.0	82	33	0.7
64	Royal Watch & Computer Repairing	Main Road, Katghora, Korba	22	30	32.3	82	33	0.9
65	Balaji Electronics	Main Road, Katghora, Korba	22	30	37.5	82	32	59.5
66	Javed TV Repairing	Durga Mandir, Katghora, Korba	22	30	12.9	82	32	41.2
67	Prakash TV Repairing	Durga Mandir, Katghora, Korba	22	30	12.9	82	32	40.8
68	Sunil TV Repairing	Main Road, Katghora, Korba	22	30	21.6	82	32	50.6
69	Culcutta Refrigeration	Abikapur Road, Katghora, Korba	22	30	52.2	82	32	57.3
70	Vimal Electronics	Main Market, Kartala, Korba	22	17	59.5	82	57	26.4
71	Narendra Electronics	Main Market, Kartala, Korba	22	17	51.6	82	57	30.3
72	Prakash Electronics	Main Market, Kartala, Korba	22	17	48.0	82	57	31.0
73	Gauri Electronics	Main Market, Kartala, Korba	22	17	48.2	82	57	31.3

01 N 1			Latitude		Longitude			
Sl. No.	Name of Shops	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.
		Janjgir - Champa						
74	Refrigeration & Auto Electricals	PTI Chowk, Janjgir_Champa	22	0	41.6	82	35	11.7
75	Sani TV Center & Refregeration	Link Road, Janjgir_Champa	22	0	42.5	82	34	44.7
76	Kabir Refregeration	Link Road, Janjgir_Champa	22	0	42.3	82	34	42.7
77	Namdev TV Center	Link Road, Janjgir_Champa	22	0	42.4	82	34	42.5
78	Raju Refrigeration	Link Road, Janjgir_Champa	22	0	42.6	82	34	36.4
79	Paras Electronics	Link Road, Janjgir_Champa	22	0	42.6	82	34	36.2
80	Shatrughan Electronics	Naila Stn. Road, Janjgir_Champa	22	1	19.2	82	34	2.2
81	Patel Electronics	Naila Stn. Road, Janjgir_Champa	22	1	19.2	82	34	3.1
82	Sahu Electronics & Refrigeration	Kera Road, Janjgir	22	0	36.9	82	34	34.6
83	Sanju Electronics	Kera Road, Janjgir	22	0	16.6	82	34	48.6
84	Banti TV Center	Kera Road, Janjgir	22	0	19.3	82	34	46.4
85	Ritesh TV Center	Janjgir Road, Champa, Janjgir	22	1	51.7	82	38	44.9
86	Manoj Electronics & Refrigeration	Beriyal Chowk, Champa, Janjgir	22	1	46.7	82	38	32.6
87	Suresh Electronics	Birgahni Chowk, Champa, Janjgir	22	1	39.6	82	38	14.7
88	Samleshwari Electronics	Beriyal Chowk, Champa, Janjgir	22	1	48.2	82	38	31.6
89	Ashok Electronics & TV Center	Beriyal Chowk, Champa, Janjgir	22	1	49.4	82	38	30.1
90	Kumar TV Center	Thana Chowk, Champa, Janjgir	22	1	53.9	82	38	47.8
91	Baba Akash TV Center	Thana Chowk, Champa, Janjgir	22	2	1.2	82	38	55.9
92	Om TV Center	Machhali Talab, Champa, Janjgir	22	2	7.2	82	39	6.1
93	Sandeep TV Center	Tahsil Road, Champa, Janjgir	22	2	13.4	82	39	21.5
94	Sahu TV Center	Main Chouraha, Bhaindih, Janjgir	21	54	21.1	82	43	14.7
95	New Star Music Center	Main Market, Bhaindih, Janjgir	21	54	19.7	82	43	12.7
96	Anant Electronics	Main Market, Baloda, Janjgir	22	8	8.8	82	28	41.9
97	Rizvi Refrigeration	Haldi Bazar Chowk, Baloda, Janjgir	22	8	7.8	82	28	31.5
98	Santosh TV Center	Haldi Bazar Chowk, Baloda, Janjgir	22	8	7.0	82	28	30.4
99	Rohit Electronics & TV Center	Haldi Bazar Chowk, Baloda, Janjgir	22	8	7.8	82	28	30.0
100	Arun TV center	Haldi Bazar Chowk, Baloda, Janjgir	22	8	7.1	82	28	32.3
101	Raju Electronics	Near Bus Stand, Baloda, Janjgir	22	8	8.5	82	28	49.7
102	Dwivedi Electronics	Shivri Naryan Road, Akaltara, Janjgir	22	1	29.6	82	25	37.5
103	Azad TV Center	Shivri Naryan Road, Akaltara, Janjgir	22	1	22.3	82	25	36.0
104	Dewangan Electronics	Main Road, Akaltara, Janjgir	22	1	27.8	82	25	37.2
105	Chhotu Electronics	Main Road, Akaltara, Janjgir	22	1	30.3	82	25	37.8

			Latitude		Longitude					
51. No.	Name of Shops	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.		
106	Jai Electronics & Refrigeration	Staton Road, Akaltara, Janjgir	22	1	39.6	82	25	26.0		
107	Vikrant Refrigetation & AC Repairig	Rly.Staton Road, Akaltara, Janjgir	22	1	39.9	82	25	24.9		
108	Kashyap TV Center	Near Police Station, Akaltara, Janjgir	21	52	27.7	82	26	56.1		
109	Patel Electronics	Near Police Station, Akaltara, Janjgir	21	52	27.3	82	26	56.5		
110	Jai Durga Electronics	Near Bus Stand, Pamgarh, Janjgir	21	52	24.6	82	27	0.2		
111	Khushi Electroics	Somvari Bazar, Pamgarh, Janjgir	21	52	21.9	82	27	5.8		
112	Amber Enterprises	Tahsil Road, Pamgarh, Janjgir	21	52	19.3	82	27	8.2		
113	Sanjay Electronics	Near Bus Stand, Pamgarh, Janjgir	21	52	23.3	82	27	2.5		
	Raighar									
114	Sri Vinayak Refrigeration	Stadium Road, Raigarh	21	53	55.2	83	24	49.9		
115	Deep Electronics	Stadium Road, Raigarh	21	53	56.6	83	24	53.0		
116	Pradeep Electronics	Stadium Road, Raigarh	21	53	56.6	83	24	52.5		
117	Latest TV Training Center	Stadium Road, Raigarh	21	53	41.9	83	24	26.1		
118	Raju Electronics	Chakradhar Nagar, Raigarh	21	53	32.5	83	24	11.5		
119	Speed Computer sale & Service	Chakradhar Nagar, Raigarh	21	53	31.8	83	24	9.9		
120	Guru Kripa Electronics	Jail Parisar Shop No23, Raigarh	21	53	23.0	83	23	51.4		
121	Ankit Electronics	Jail Parisar, Raigarh	21	53	23.1	83	23	48.9		
122	TV Case Electronics	Kabir Chowk, Raigarh	21	52	44.7	83	23	29.8		
123	Sur Sangam TV	Kabir Chowk, Raigarh	21	52	44.5	83	23	29.4		
124	Sahil Electronics	Sattaguni Chowk, Raigarh	21	53	50.8	83	23	17.5		
125	Bhuvneshwar Electronics	Sattaguni Chowk, Raigarh	21	53	50.6	83	23	17.5		
126	Gupta Electronics	Katra Road, Raigarh	21	53	55.8	83	22	51.5		
127	Bhuvneshwar Electronics	Katra Road, Raigarh	21	53	55.2	83	22	51.3		
128	AC Friedge Repairing Shop	Himrapur, Raigarh	21	54	48.4	83	23	9.7		
129	Jagat Electronics	Ram Niwas Takies Parisar, Raigarh	21	53	29.1	83	23	42.2		
130	Video Tech	Ram Niwas Takies Chowk, Raigarh	21	53	29.2	83	23	42.3		
131	Raja Electronics & Refrigeration	Kewda badi Bus stand, Raigarh	21	53	57.8	83	23	39.7		
132	Maha Maya Freeze & Ac Repairing	Raigarh Chowk, Kharsia, Raigarh	21	59	23.9	83	6	44.5		
133	Devi TV Repairing	Raigarh Chowk, Kharsia, Raigarh	21	58	40.2	83	6	26.3		
134	Bharat Musical	Atal Chowk, Kharsia, Raigarh	21	59	23.0	83	6	53.5		
135	Mishra Electronics	Mauhapali Road, Kharsia, Raigarh	21	59	24.0	83	6	25.5		
136	Mahesh Music & Electronics	Near Railway Crossing, Kharsia, Raigarh	21	59	25.6	83	5	43.7		

SI No		A 11	Latitude		L	Longitude Deg. Min. Set 83 12 3.			
51. No.	Name of Shops	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
137	Sima Radio & TV center	Near Bus Stand, Dharamjaygarh, Raigarh	22	27	45.3	83	12	33.6	
138	Mangla Electronics	CDO office, Jashpur Road, Dharamjaygarh, Raigarh	22	27	46.5	83	12	29.1	
139	Om Electronics	Jashpur Road, Dharamjaygarh, Raigarh	22	27	46.4	83	12	29.5	
140	Babloo Electronics	Main Market, Ghardhoda, Raigarh	22	10	31.2	83	21	8.0	
141	Hira Watch & Electronics	Raigarh Road, Ghardhoda, Raigarh	22	10	21.3	83	20	57.4	

Durg Division

01 N		Address]	Latitud	e	Longitude			
SI. No.	Name of Shops	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
Durg									
1	Coman India Electronic	Ward No5, Main Market, Dhamdha, Durg - 491331	21	27	37.7	81	19	51.5	
2	Jangel Electronic	Bemitra Road, Dhamdha, Durg - 491331	21	27	58.7	81	19	58.4	
3	Sangam Electronic	Ajad Chock, Patan, Durg - 491111	21	2	10.3	81	32	34.0	
4	Singh Refrigration	Polsai Para, Durg - 491001	21	11	30.7	81	17	0.8	
5	Shubham Refrigration	Ward No27, Polsai Para, Durg - 491001	21	11	30.7	81	17	0.8	
6	Mhobia Electronic	Polsai Palra, Station Rd., Durg - 491001	21	11	34.4	81	16	57.5	
		Bemetara							
7	Veshno T.V. Center	New Market, Bemetara - 491335	21	42	59.6	81	31	53.5	
8	Ashok T.V. Center	Ward No10, Nawagarh, Bemetara - 491337	21	54	27.4	81	36	35.0	
9	Shitla Electronic	Gaurav Path Rd., Nawagarh, Bemetara-491337	21	54	23.3	81	36	25.9	
10	Sir Sai Electronic	Ward No11, Pathan Para, Than Khamarie, Bemetara - 491338	21	41	45.1	81	20	2.1	
11	Nand Shakti TV Center	Ward No8, Saja, Bemetara	21	39	54.5	81	18	42.5	
		Kawardha - Kabirdham							
12	The Dawar Refirigation	Sinchai Colony, Kawardha	22	0	17.3	81	13	47.6	
13	R K Electronics	Bajrang Chock, Kawardha	22	0	17.4	81	13	59.4	
14	Chaya Electronics	Janpad Complex, Bodla, Kawardha	22	9	47.9	81	12	59.6	
15	Patil TV Center	Ward No9, Kondhi House, Bodla, Kawardha	22	9	49.4	81	12	55.2	
16	Mahamaya Electronics	Masjid Chock, Bodla, Kawardha	22	9	43.7	81	13	10.1	

]	Latitud	e	Longitude		
SI. No.	Name of Shops	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.
17	Devedi Radios	Ward No.10, Pandariya, Kawardha	22	13	22.9	81	24	23.8
18	Rupali Electronics	Ward No10, Pandariya, Kawardha	21	31	20.4	80	59	55.3
		Rajnandgaon						
19	Vicky Electricals & Electronics	Deevan Bada Rd., Khairagarh, Rajnanndgaon	21	25	1.7	80	58	51.3
20	Naman Electronics	Mahavir Chock, Chhuriya, Rajnanndgaon	21	0	22.9	80	37	52.3
21	Jyoti Electronics	Fuhara Chock, Dongargaon, Rajnanndgaon	20	58	12.8	80	51	1.6
22	Maateshvari Electronics	Ward No1, Dongargarh, Rajnanndgaon	21	11	25.1	80	45	5.0
23	Chauhan TV Center	Marvadi Dharmshala Market, Dongargarh, Rajnanndgaon	21	11	12.6	80	45	16.5
24	Shir Balaji Electronics	Loguli Naka Chock, Rajnanndgaon	21	5	24.2	81	2	37.4
25	Miland Electronics	Ranadin Marg, Rajnanndgaon	21	5	43.6	81	2	15.7
26	Bharat Electronic & Electricals	Kanchana Chock, Rajnanndgaon	21	5	15.1	81	3	5.8
		Balod						
27	Shakil Electronics	Musalman Para, Ward No8, Balod	20	43	59.5	81	12	27.7
28	Harish Electronics	Opp. New Bus Stand, Gurur, Balod	20	41	0.7	81	24	9.2
29	Ganjir Electronics	Sahu Sadan, Kaliya Marg, Gurur, Balod	20	40	59.3	81	24	25.3

Surguja Division

01.01		Address]	Latitud	e	Longitude		
51. INO.	Name of Shops	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.
		Balrampur						
1	Smart Computer	Main Market, Balrampur	23	36	36.3	83	37	12.1
2	Pal Electronics	Mission Road, Balrampur	23	36	29.7	83	37	10.1
3	Khusi Electroics	Mission Road, Balrampur	23	36	29.5	83	37	10.5
4	R.K.Radio	Chando Road, Balrampur	23	36	19.7	83	37	2.9
5	Shabnam Electronics	Main Road, Shankargarh, Balrampur	23	18	3.8	83	36	19.6
6	Raquib Electronics	Main Road, Shankargarh, Balrampur	23	18	3.4	83	36	11.6
7	Shabnam Electronics (Mobile shop)	Main Market, Shankargarh, Balrampur	23	18	3.6	83	36	11.5
8	Sri Balaji Bartan & Electronics	Main Road, Shankargarh, Balrampur	23	18	2.4	83	36	11.1
9	Sandeep Electronics	Bachwar Road, Shankargarh, Balrampur	23	18	1.7	83	35	38.4
10	Ashok Electronics	Main Road, Rajpur, Balrampur	23	20	7.2	83	24	22.1

		Name of Shops Address]	Latitud	e	Longitude			
SI. No.	Name of Shops	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
11	Sharma Mobile & Electronics	Main Road, Rajpur, Balrampur	23	20	11.3	83	24	7.2	
12	Irfan Electronics	SBI Road, Ramanujganj, Balrampur	23	48	25.7	83	42	7.0	
13	Mohit Electronics	Main Market, Ramanujganj, Balrampur	23	48	15.5	83	42	4.5	
14	Raju Electronics	Main Market, Ramanujganj, Balrampur	23	48	14.9	83	42	3.2	
15	Khusaboo Watch & Electronics	Chadani Chowk, Ramanujganj, Balrampur	23	48	23.6	83	41	50.7	
16	Rajesh Electronics	Larang say Chowk, Ramanujganj, Balrampur	23	48	27.5	83	41	48	
17	Ayub Ayush Electronics	Varanasi Road, Wadraf Nagar, Balrampur	23	45	52.8	83	11	40.1	
18	Javed Electronics	Balangi, Wadraf Nagar, Balrampur	23	45	50.1	83	11	34.9	
19	Vikash Electronics	Balangi, Wadraf Nagar, Balrampur	23	45	49.7	83	11	34.7	
20	Sachan Electronics	Balangi, Wadraf Nagar, Balrampur	23	45	50.9	83	11	35.9	
21	Nausad Electronics	Main Market, Wadraf Nagar, Balrampur							
22	Jay Electronics	Main Market, Wadraf Nagar, Balrampur	23	43	49.1	83	11	39.9	
23	Suhail Electronics	Pratappur Road, Wadraf Nagar, Balrampur	23	45	46.5	83	11	43.2	
		Jashpur							
1	Jashpur Radio	Near Bus Stand, Jashpur	22	53	18.4	84	8	29.9	
2	Balaji Electronics	Near Bus Stand, Jashpur	22	53	18.2	84	8	30.3	
3	Raja Electronics	College Road, Jashpur	22	53	18.7	84	8	30.9	
4	Minz Electronics	Karbala Road, Jashpur	22	53	22.9	84	8	26.7	
5	Vinod Electronics	Karbala Road, Jashpur	22	53	21.4	84	8	25.7	
6	Vishwakarma Electronics	Near Shiv Mandir, Sanna Road, Jashpur	22	53	22.5	84	8	15.8	
7	Anjali Electronics	Madhuban Toli Road, Jashpur	22	53	6.2	84	8	9.3	
8	Maa Durga Electronics	Ganbaria, Raipur Road, Jashpur	22	52	14.7	84	9	18.7	
9	Sakeel Electronics	Tapashya Complex, Kansabel, Jashpur	22	38	47.2	83	44	31.3	
10	Friends Mobile & Electronics	Main Road, Kansabel, Jashpur	22	38	45.6	83	44	32.1	
11	National Electronics	Main Road, Kansabel, Jashpur	22	38	42.6	83	44	32.0	
12	National Electronics & Refrigeration	Main Road, Kansabel, Jashpur	22	38	42.4	83	44	32.0	
13	Kuldeep Electronics	Church Road, Main Chowk, Kansabel, Jashpur	22	38	32.5	83	44	29.3	
14	Dubey Repairing Shop	Church Road, Kansabel, Jashpur	22	38	32.1	83	44	29.5	

01 N		Address	1	Latitud	e	Longitude			
SI. No.	Name of Shops	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
15	JMD Refrigeration	Church Road, Kansabel, Jashpur	22	38	30.3	83	44	29.0	
16	Anoop Electronics	Jashpur Road, Kunkuri, Jashpur	22	44	35.9	83	57	19.3	
17	Kumar Electronics	Main Road, Kunkuri, Jashpur	22	44	27.9	83	56	57.9	
18	Singh Radio Center	Pathargaon Road, Kunkuri, Jashpur	22	44	25.5	83	56	51.5	
19	Ishwari Refrigeration	Main Road, Kunkuri, Jashpur	22	44	25.1	83	56	51.1	
20	Aman Electronics & Refrigeration	Main Road, Kunkuri, Jashpur	22	44	25.7	83	56	50.1	
21	Prakash Electronics	Bazar Road, Kunkuri, Jashpur	22	44	30.2	83	56	58.5	
22	Diamond Electronics	Near Bus Stand, Kunkuri, Jashpur	22	44	26.2	83	56	59.7	
23	Subham Electronics & Refrigeration	Tapkara Road, Kunkuri, Jashpur	22	44	21.7	83	57	2.9	
24	Subhir Electronics	Raigarh Road, Pathargaon, Jashpur	22	33	14.3	83	27	29.2	
25	Singh Electronics	Abikapur Road, Pathargaon, Jashpur	22	33	25.5	83	27	32.8	
26	Rohila Electronics	Abikapur Road, Pathargaon, Jashpur	22	33	39.7	83	27	28.7	
		Koriya							
1	Vijenddra Electroncs	Mazar Chowk, Sonhat, Koriya	23	28	41.5	82	31	2.6	
2	Uma Electronics	Main Road, Sonhat, Koriya	23	28	40.1	82	31	2.1	
3	Maa Ambey Mobile Shop	Main Road, Sonhat, Koriya	23	28	46.7	82	31	2.8	
4	Raza Mobile & Repairing	Main Road, Sonhat, Koriya	23	28	49.8	82	31	2.5	
5	Vinod Electronics	Durga Mandir, Main Road, Sonhat, Koriya	23	28	53	82	31	4.1	
6	Super Electronics	Main Road, Baikunthpur, Koriya	23	15	43.2	82	33	35.9	
7	Surya Electronics	Main Road, Baikunthpur, Koriya	23	15	43.5	82	33	35.8	
8	Guddu Electronics	School Para, Baikunthpur, Koriya	23	15	52.2	82	33	25.5	
9	Wale Guru Electronics	Bhatti Para, Baikunthpur, Koriya	23	16	16.5	82	33	10.9	
10	Indore Refrigeration	Bhatti Para, Baikunthpur, Koriya	23	16	18	82	33	9.9	
11	Ajay Electronics	Talwa Para, Baikunthpur, Koriya	23	16	51.9	82	33	11.2	
12	Meghani Electronics	Sai Baba Tiraha, Manendragarh, Koriya	23	12	48.8	82	12	3.9	
13	Freez Services	Cendral Hospiral Road, Manendragarh, Koriya	23	12	42.8	82	12	33.6	
14	S S Electronics	Mahar Para, Manendragarh, Koriya	23	12	53.7	82	11	57.7	
15	Shree Watch & Radio	Near Bus Stand, Manendragarh, Koriya	23	12	13.4	82	12	13.4	
		Surguja							
1	Sunit Electronics	Manipur, Bilaspur Road, Abmikapur, Sarguja	23	6	24.9	83	11	31.2	
2	Ama Electronics	Kharsia Naka, Ambikapur, Sarguja	23	6	44.2	83	12	6.5	

01 N		Address]	Latitud	e	Longitude			
SI. No.	Name of Shops	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
3	Jai Maha Maya Electronics	Mayapur, Ambikapur, Sarguja	23	7	25.2	83	12	8.0	
4	Rakesh Radio	Maha Maya Chowk, Ambikapur, Sarguja	23	7	25	83	11	47.7	
5	Shiv Electronics	Sangam Chowk, Ambikapur, Sarguja	23	7	27.3	83	11	42.2	
6	Shankar Electronics	Satti Para, Ambikapur, Sarguja	23	7	16.9	83	11	23.2	
7	Soni Electronics	Bori Para, Ambikapur, Sarguja	23	7	42.9	83	12	5.5	
8	Cooling Center	Nawa Para, Ambikapur, Sarguja	23	7	55.6	83	11	12.0	
9	Sarguja Refrigeration	Chopda Para, Ambikapur, Sarguja	23	7	49.5	83	11	20.1	
10	Manoj Radio Center	Near Old Bus Stand, Ambikapur, Sarguja	23	7	5.6	83	11	35.8	
11	Dipak Radio	Jai Stambh Chowk, Ambikapur, Sarguja	23	7	3.3	83	11	44.4	
12	Satya Cool World	Near Old Bus Stand, Ambikapur, Sarguja	23	7	3.3	83	11	35.6	
13	TV Repairing Shop	Near Old Bus Stand, Ambikapur, Sarguja	23	7	3.5	83	11	35.6	
14	Deshraj Electronics	Bilaspur Road Road, Udaipur, Sarguja	22	54	37.2	82	56	34.9	
15	Singh Computer	Bilaspur Road, Udaipur, Sarguja	22	54	39.2	82	56	31.6	
16	Pappu Electronics	Main Road, Udaipur, Sarguja	22	54	37.8	82	56	42.5	
17	Rajwade Electronics	Main Market, Udaipur, Sarguja	22	54	37.8	82	56	46.2	
18	Rajesh Radio	Main Market, Udaipur, Sarguja	22	54	38.2	82	56	46.9	
19	Gaurav Radio	Main Market, Udaipur, Sarguja	22	54	37.6	82	56	47.4	
20	Janta Electronics	Near Rest House, Lakhanpur, Sarguja	22	58	49.1	83	2	47.5	
21	Laxmi Mobile & Electronics	Ambikapur Road, Lakhanpur, Sarguja	22	58	52.3	83	2	46.9	
22	Rajwade Electronics	Main Road, Lakhanpur, Sarguja	22	58	54.5	83	2	47.8	
23	Vijesh Electronics	Main Road, Lakhanpur, Sarguja	22	58	54.9	83	2	48.1	
24	Gyan Deep Electronics	Beldgi Road, Lakhanpur, Sarguja	22	58	47.7	83	2	47.0	
25	Dwivedi Mobile & Electronics	Main Road, Sitapur, Sarguja	22	46	58.9	83	29	38.7	
26	Vikas Electronics	Main Road, Sitapur, Sarguja	22	47	5.5	83	29	35.2	
27	Maha Maya Electronics	Main Road, Sitapur, Sarguja	22	47	17.6	83	29	28.2	
28	Pankaj Watch & Electronics	Sitapur Road, Batauli, Sarguja	22	58	28.9	83	24	47.1	
		Surajpur							
1	Kamal Electronics	Near Poice Stn., Pratappur Road, Bhaiyathan, Surajpur	23	23	27.6	82	51	0.7	
2	Geetanjali Electronics	Pratappur Road, Bhaiyathan, Surajpur	23	23	28.9	82	51	6.2	
3	Prince Electronics	Main Market, Odgi, Surajpur	23	28	41.2	82	48	19.8	
4	Sanju Electronics	Bilaspur Road, Odgi, Surajpur	23	28	41.7	82	48	22.3	

01 N]	Latitud	e	Longitude			
51. No.	Name of Shops	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
5	Rajwade Electronics	Near Bus Stand, Odgi, Surajpur	23	28	39.4	82	48	16.9	
6	Tanvir Refrigeration	Station Road, Bishrapur, Surajpur	23	10	47.5	82	58	49.4	
7	Khan Electronics	Station Road, Bishrapur, Surajpur	23	10	49.0	82	58	47.8	
8	G N Electronics	Main Market, Bishrapur, Surajpur	23	11	5.4	82	58	26.8	
9	Santosh Electronics	Main Market, Bishrapur, Surajpur	23	11	5.5	82	58	26.8	
10	Kajal Electronics	Main Market, Bishrapur, Surajpur	23	11	5.2	82	58	26.0	
11	Vikash Electronics	Main Market, Bishrapur, Surajpur	23	11	6.0	82	58	17.3	
12	Munna Electronics	Main Market, Bishrapur, Surajpur	23	11	5.9	82	58	15.8	
13	Vinod Radio	Near Bus Stand, Bishrapur, Surajpur	23	11	7.1	82	58	0.1	
14	Laxmi Electronics	Near Bus Stand, Bishrapur, Surajpur	23	11	6.0	82	57	54.4	
15	Chanchal Electronics	Bhaiyathan Road, Surajpur	23	13	7.5	82	52	0.3	
16	Bombay Electronics	Bhaiyathan Road, Surajpur	23	13	5.1	82	52	0.3	
17	Manoj Radio	Main Road, Surajpur	23	12	52.4	82	51	57.0	
18	S K Electronics	Bhaikunthpur Road, Surajpur	23	12	52.8	82	51	55.2	
19	A K Electronics	Manendragarh Road, Surajpur	23	12	55.8	82	51	47.3	
20	Aman Electronics	Near Bus Stand, Pratappur, Surajpur	23	29	15.8	83	12	31.7	
21	Jai Bhawani TV Repairing	Main Road, Pratappur, Surajpur	23	29	7.2	83	12	27.6	
22	Raj Electronics	Main Road, Pratappur, Surajpur	23	29	7.5	83	12	29.7	
23	Sri Sai Electronics	Main Road, Pratappur, Surajpur	23	29	7.6	83	12	30.1	
24	Ajay Electronics	Main Road, Pratappur, Surajpur	23	29	7.7	83	12	32.7	

Bastar Division

01 N		Address]	Latitud	e	Longitude		
51. No.	Name of Shops	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.
		Bastar						
1	Mayak Electronics	Dharampura No-2, Bazar Chowk, Jagdalpur, Bastar	19	5	38.5	81	59	52.6
2	Sarojni Electronics	Near Anupam Takies, Jagdalpur, Bastar	19	5	12.7	81	0	58.0
3	Golden Electronics	Geedam Road, Jagdalpur, Bastar	19	5	5.1	82	1	2.1
4	Khan Electronics	Geedam Road, Jagdalpur, Bastar	19	5	5.0	82	1	2.5
5	Speed Refrigeration	Infront of PWD office, Chadani Chowk, Jagdalpur, Bastar	19	4	54.2	82	1	23.6
6	Vinay Refrigeration	Chadani Chowk, Jagdalpur, Bastar	19	5	1.3	82	1	26.4
7	Baba Electronics	Pratapganj Para, Jagdalpur, Bastar	19	5	11.0	82	1	21.3
8	Vinay Enterprises	Kumar Para Road, Moti Line, Jagdalpur, Bastar	19	5	3.6	82	1	34.4

01.34]	Latitud	e	Longitude		
SI. No.	Name of Shops	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.
9	Lalita Electroics	Moti Line, Jagdalpur, Bastar	19	5	2.4	82	1	36.7
10	Barsh Electronics	Shiv Basant Comlex, Sirasar Chowk, Jagdalpur, Bastar	19	5	25.7	82	1	25.9
11	Yadav Electronics	Sirasar Chowk, Jagdalpur, Bastar	19	5	27.6	82	1	24.8
12	Mehra Store	Gol Bazar, Jagdalpur, Bastar	19	5	25.0	82	1	23.7
13	Prakash Radio	Gol Bazar, Jagdalpur, Bastar	19	5	25.7	82	1	24.3
14	R.P. Radio	Gol Bazar, Jagdalpur, Bastar	19	5	23.5	82	1	23.8
15	Kanika Mobile	Main Market, Darbha, Bastar	18	52	6.8	81	52	9.6
16	Verma Electronics	Main Market, Bastaar, Bastar	18	58	29.3	81	34	23.9
17	Bulbul Mobile	Main Road, Bastaar, Bastar	18	58	28.6	81	34	24.8
18	Star Electronics	Main Road, Tokapal, Bastar	19	0	43.6	81	52	35.2
19	Ekta Mobile	Main Road, Bastar Tahsil, Bastar	19	12	15.9	81	56	4.6
20	Siddhi Palace	Jagdalpur Road, Bastar Tahsil, Bastar	19	12	18.6	81	56	11.6
21	Om Electronics	Jagdalpur Road, Bastar Tahsil, Bastar	19	12	11.5	81	56	16.8
		Kondagaon						
22	Ashok Electronics	Gandhi Ward, Kondagaon	19	36	25.5	81	40	4.6
23	Satendra Electronics	Arkachhepara Para, Kondagaon	19	36	16.0	81	40	5.0
24	Sharda Electronics	Vikas Nagar, Kondagaon	19	35	22.4	81	39	45.2
25	Arvind Electronics	Vikas Nagar, Kondagaon	19	35	21.4	81	39	45.4
26	Guru Nanak Electronics	Congress Bhawan, Kondagaon	19	35	21.2	81	39	45.7
27	Megha Electronics	Congress Bhawan, Kondagaon	19	35	20.8	81	39	45.8
28	Sri Ram Refrigeration	DNK Colony, Kondagaon	19	35	20.7	81	40	4.9
29	Pooja Electronics	Ghati Road, Keshkal Kondagaon	20	5	16.7	81	35	27.1
30	R.C. Radio	Main Road, Keshkal Kondagaon	20	5	4.2	81	35	20.9
31	New Naredra Mobile & Electronics	Bargaon, Keshkal Kondagaon	20	4	41.1	81	35	13.2
32	Ayaan Computer	Bazar Road, Pharasgaon, Kondagaon	19	51	44.0	81	38	14.1
33	Taj Electronics	Near Bus Stand, Pharasgaon, Kondagaon	19	51	41.7	81	38	10.3
34	Dewangan Repairing Center	Near Bus Stand, Pharasgaon, Kondagaon	19	51	42.5	81	38	10.3
		Sukma						
35	Asad Refigration	Bajar Road, Sukma	18	23	19.4	81	39	33.5
36	Mahavir Electronics	Bajar Road, Sukma	18	23	19.4	81	39	33.3
		Dantewada						
37	Ma Danteshwari Electronics	Main Rd., Dantewada	18	53	26.9	81	20	49.1

01 N 1	Name of Shore]	Latitud	e	Longitude		
SI. No.	Name of Shops	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.
38	Swastik Electronics	Congres Bhawan, Dantewada	18	53	14.8	81	20	54.6
		Bijapur						
39	Mahaesh Electronics	Deepo Para, Bijapur	18	48	0.6	80	48	44.6
		Narayanpur						
40	Sinha Electronics & Electrical	Sonpur Rd., Narayanpur	19	43	7.1	81	14	40.3
41	Ma Danteshwari Electronics	Chandni Chock Market, Narayanpur	19	43	6.6	81	14	47.6
	1	Kanker		0		0	0	
42	Krishna Electronics	Naya Para, Anthagarh	20	5	50.7	81	9	28.5
43	Neeraj Electronics	Rajiv Gandhi Chock, Anthagarh	20	5	57.1	81	9	27.8
44	Lakshmi Electronics	New Bus Stand, Naharpur	20	26	48.4	81	37	22.4
45	Suman Electronics	Durga Chock, Naharpur	20	26	51.8	81	37	15.2
46	Neena Fridge Repairing	Near Janpat Panchayat office, Charama, Kanker	20	29	13.2	81	22	15.8
47	Shani Electronics	Dhamtari Road, Charama, Kanker	20	29	26.9	81	22	10.2
48	Devendra Electronics	Main Road, Charama, Kanker	20	29	26.6	81	22	10.2
49	Tanuj TV Repairing	Main Road, Charama, Kanker	20	29	27.4	81	22	10.6
50	Durga Electronics	Din Dayal Chowk, Charama, Kanker	20	29	33.6	81	22	7.3
51	Chandra Fridge & Binding	Din Dayal Chowk, Charama, Kanker	20	29	31.5	81	22	6.9
52	Dewangan Watch & TV Repairing	Sadar Bazar, Charama, Kanker	20	29	23.8	81	22	6.3
53	Pooja Electronics & TV Repairing	Sadar Bazar, Charama, Kanker	20	29	21.3	81	22	6.1
54	DeepaK Electronics	Manjha Para, Kanker	20	16	4.1	81	29	32.5
55	Krishna Electronics	Manjha Para, Kanker	20	16	9.5	81	29	36.4
56	Markam Electronics	Daily Market, Kanker	20	16	7.1	81	29	35.3
57	Deep Electronics	Daily Market, Kanker	20	16	4.2	81	29	36.2
58	Durga Refrigeration	New Bus Stand, Kanker	20	15	50.4	81	29	59.5
59	Jeetu Electronics	Near Bus Stand, Durgu Kondal Kanker	20	13	10.5	80	56	42.7
60	Anjali Electronics	Main Chowk, Durgu Kondal Kanker	20	13	8.0	80	56	41.2
61	Shivam Electronics	Sanjay para, Bhanu Pratap Pur, Kanker	20	18	39.8	81	4	6.8
62	Mandal Electronics	Near Bus Stand, Pakhunja, Kanker	20	2	21.1	80	37	27.7
63	Gautam Electronics	Near Bus Stand, Pakhunja, Kanker	20	2	21.8	80	37	27.6
64	Das Freeze Repairing	Old Market, Pakhunja, Kanker	20	2	25.7	80	37	27.2
65	Vishwas Refrigeration	Old Market, Pakhunja, Kanker	20	2	25.0	80	37	25.4

Sl No.	Name	Address
1.	M/s Navrachna Recycling Pvt. Ltd.	Plot No 1B, Somni Industrial Area, Rajnandgaon
2.	M/S ADV Metal Combine Private Limited	Borai Industrial Growth Center, Durg

Inventory of Physically established Collection Centers- Annexure-5

Partial Inventory of Scrap Vendors/ Dismantler Annexure -6

]	Latitud	e	L	ongituo	le
Sl. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.
		Raipur					•	
1	Mohd. Ameen	Maudapara, Raipur	21	15	12.2	81	38	9.1
2	Mohsin	Maudapara, Raipur	21	15	12.0	81	38	9.6
3	Vikram	Bilaspur Road, Khatamtai, Raipur	21	16	26.1	81	38	10.3
4	Vinay	Vyas Talab Birgaon, Raipur	21	18	19.2	81	38	4.6
5	Ramesh	Durga nagar, Birgaon, Raipur	21	18	2.1	81	37	48.7
6	Kausal	Gandhi Nagar, Birgaon, Raipur	21	18	3.4	81	37	54.6
7	Akbar Bhai	Bhanpuri, Ring Road, Raipur	21	17	35.0	81	37	50.5
8	Golu	Indira Chowk, Arang	21	11	42.6	81	57	52.5
9	Balbinder Gandhi	Near Railway Crossing, Abhanpur	21	3	14.1	81	44	42.5
		Dhamtari					1	
10	Mohd. Rustam	Arjun Basti, Raipur Road, Dhamtari	20	44	1.5	81	33	31.8
11	Saiyad Saheed	Ratna Bandh, Dhamtari	20	42	33.2	81	32	37.3
12	Mohd. Arif	Chameli Chowk, Dhamta r i	20	42	16.2	81	33	4.9
13	Abdul Samad	Rambagh, Dhamtari	20	41	39.7	81	33	22.9
14	Dipal	Rudri Road, Shivaji Nagar, Dhamtari	20	41	0.4	81	33	14.4
15	Mukesh	Sihawa Chowk, Dhamtari	20	42	52.2	81	32	59.0
16	Idrish	Churiapara, Nagri	20	20	48.6	81	57	27.2
17	Taheer	Dhamtari Road, Magarlod	20	45	0.9	81	51	3.2
	[Gariaband		r		r	r	r
18	Abdul Gani	Nayapara, Rajim, Gariaband	20	58	14.3	81	51	27.1
19	Aslam	Tarri Road, Nayapara, Rajim	20	58	4.7	81	51	25.5
20	Rizvi	Tarri Road, Nayapara, Rajim	20	57	56.7	81	51	10.8
21	Mohd. Rustam	Ganj Road, Rajim,	20	58	0.2	81	52	12.1
22	Roshan	Indira Market, Rajim,	20	58	6.3	81	52	12.1
23	Ashar Bhai	Indira Market, Rajim,	20	58	7.3	81	52	12.2
24	Kaku Bhai	Champaran Chowk, Rajim	20	58	22.8	81	51	44.6
25	Kalu Khan	Main Road, Chhura	20	48	41.6	82	12	32.3
26	Arif Bhai	Raipur Road, Gariabad	20	37	59.5	82	3	43.5
27	Mohd. Sajid Khan	Main Road, Near Masque, Gariaband	20	38	4.4	82	3	50.3

Raipur Division

Sl. No.	NT	Address	Latitude			Longitude			
51. INO.	Iname	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
Baloda Bazar									
28	Gopal Sahu	Purani Basti, Baloda Bazar	21	39	26.3	82	9	47.7	
29	Mohd. Anwar	Bhagat Singh Ward, Baloda Bazar	21	44	14.4	81	56	53.0	
30	Javed Bhai	Bhagat Singh Ward, Bhatapara,	21	44	14.0	81	56	52.8	
31	Mohd. Rafiq	Bhagat Singh Ward, Bhatapara,	21	44	14.2	81	56	53.0	
32	Siddiq Meman	Bemetara Chowk, Simga	21	37	34.2	81	42	11.2	
33	Mohd. Aneesh	Sadar Road, Simga	21	37	41.0	81	42	8.1	
34	Mohd. Saleem	Sadar Road, Simga	21	37	41.6	81	42	3.3	
35	Kallu	Main Road, Kasdol	21	37	20.3	82	25	27.6	
36	Jivkaran Sahi	Main Road, Kasdol	21	37	21.1	82	25	24.9	
		Mahasamund							
37	Raju	Shankar Nagar, Mahasamund	21	6	53.4	82	5	30.6	
38	Arun Sahu	Purani Bazar, Mahasamund	21	6	38.2	82	5	40.2	
39	Ajay Sharma	Purani Bazar, Mahasamund	21	6	35.2	82	5	40.1	
40	Umesh Tawri	Nayapara, Mahasamund	21	7	13.9	82	6	4.4	
41	Vijay Sahu	Nayapara, Mahasamund	21	7	4.8	82	6	4.7	
42	Madan lal		21	15	3.9	82	30	59.8	
43	Babloo	Bagbahra Road, Pithora	21	14	35.4	82	30	55.1	
44	Rambali Gupta	Main Road, Bagbahra, Mahasamund	21	2	56.2	82	22	53.6	

Bilaspur Division

Ē

Sl. No.	NT	A 11	Latitude			Longitude				
51. INO.	Iname	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.		
	Bilaspur									
1	Satu Lal Banajre	Jarha Bhata, Raipur Road, Bilaspur	22	4	35.4	82	8	21.9		
2	Saligram Jamulkar	Maharana Pratap Chowk, Gaura Path Road, Bilaspur	22	4	28.5	82	8	9.3		
3	Bholu Kabadi	Jarha Bhata,Jarha Bhata, Bilaspur	22	4	26.7	82	8	17.4		
4	Anil Panday	Masanganj, Imalipara, Bilaspur	22	4	44.0	82	9	9.9		
5	Mohd. Anish	Imalipara, Bilaspur	22	4	38.8	82	9	21.6		
6	Junaid	Khararganj, Bilaspur	22	5	3.0	82	9	21.2		
7	Smyle	Khararganj, Bilaspur	22	5	3.2	82	9	20.4		
8	Salim Quiraisi	Khararganj, Bilaspur	22	5	4.0	82	9	17.5		
9	Anil Panday	Near old Bus stand, Bilaspur	22	4	32.2	85	9	33.2		
10	Sunil	Bilaspur Road, Kota Tahsil	22	17	12.9	82	0	47.0		

SI No	N	Address]	Latitud	e	Longitude			
SI. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
11	Malti	Lormi Naka, Kota Tahsil	22	17	20.8	82	0	44.3	
12	Santosh Das	Belgaha, Road, Kota Tahsil	22	17	31.9	82	0	48.6	
13	Chandu Lal	Near Rly. Crossing, Belha, Bilaspur	21	57	30.4	82	4	24.9	
		Mungeli							
14	Niranjan Ahirwal	Near Bus Stand, Lormi, Mungeli	22	16	8.8	81	42	7.8	
15	Vikki	Raja Bada, Lo r mi, Mungeli	22	16	12.2	81	42	9.5	
16	Mustaq	Mungeli Road, Lormi, Mungeli	22	15	56.2	81	41	50.1	
17	Rasooq	Mungeli Road, Lormi, Mungeli	22	15	55.7	81	41	49.8	
18	Samim Bhai	Hira Lal ward, Mungeli	22	4	17.1	81	41	27.7	
19	Fariyad Ahmad	Bada Bazar, Mungeli	22	3	52.3	81	41	25.9	
20	Ashif Khan	Near Guru dwara, Mungeli	22	3	50.6	81	41	20.3	
21	Asla Khan	Phokat para, Raipur Road, Mungeli	22	3	35.9	81	41	12.0	
Korba									
22	Sanjay Jaiswal	Indira Nagar, Durpa Road, Korba	22	20	41.2	82	41	27.9	
23	Mohd. Wasim Memad	Sunday Market, Korba	22	20	33.4	82	41	56.1	
24	Ikbal	Mudapar bypass, Korba	22	21	5.9	82	42	30.7	
25	Tanvir	Mudapar bypass, Korba	22	20	56.0	82	42	33.6	
26	Rishi Agrawal	Mudapar bypass, Korba	22	21	12.8	82	42	34.1	
27	Om Prakash	Budhwari bypass, Korba	22	21	41.5	82	42	44.3	
28	Kadir Khan	Machhali Market, Katghora, Korba	22	30	14.3	82	32	43.4	
		Janjgir - Champa							
29	Tariq Meman	Atlas Industries, Dara bhata Road, Janjgir	22	1	48.4	82	37	29.9	
30	Nausad Ali	Station Road Naila, Janjgir	22	1	19.1	82	34	3.1	
31	Javed Khan	Station Road Naila, Janjgir	22	0	42.0	82	34	17.5	
32	Arif	Station Road Naila, Janjgir	22	1	2.4	82	34	0.6	
33	Sonu Rathore	Kera Road, Janjgir	22	0	17.0	82	34	48.7	
34	Mukesh Dewangan	Near Hardev River, Champa, Janjgir	22	1	41.1	82	38	19.6	
35	Bhagirath	Birgahni Chowk, Champa, Janjgir	22	1	37.8	82	38	15.5	
36	Arif	Idgah Complex, Champa, Janjgir	22	1	50.6	82	38	42.5	
37	Ajay Aditya	Haldi Bazar Chowk, Baloda, Janjgir	22	8	11.5	82	28	39.9	
38	Dewangan	Rajiv Chowk, Baloda, Janjgir	22	8	6.4	82	28	33.3	
39	Gudda	Near Bus Stand, Janjgir Road, Baloda, Janjgir	22	8	8.3	82	28	49.7	
40	Nizam Khan	Shivri Naryan Road, Akaltara, Janjgir	22	1	29.5	82	25	37.8	

01 N		Address]	Latitud	e	Longitude			
SI. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
41	Hasnen Kabadi	Shivri Naryan Road, Akaltara, Janjgir	22	1	26.9	82	25	37.1	
42	Mustaq	Baloda Road, Akaltara, Janjgir	22	2	10.5	82	25	39.8	
43	Bole Tharwai	Pamgarh, Janjgir	21	52	30.9	82	26	43.4	
Raighar									
44	Chunna Bhai	Chakradhar Nagar, Raigarh	21	53	30.7	83	24	10.4	
45	Munna	Chhata Mura, Raigarh	21	52	8.2	83	22	52.2	
46	Kamal	Chhata Mura, Raigarh	21	52	59.5	83	22	44.6	
47	Murad Ali	Chhata Mura, Raigarh	21	51	38.7	83	22	24.6	
48	Azhar	Himrapur, Raigarh	21	54	48.1	83	23	8.7	
49	Raj	Himrapur, Raigarh	21	54	48.8	83	23	8.0	
50	Kamal	Kewda badi Bus stand, Raigarh	21	53	57.9	83	23	38.0	
51	Naresh Murli	Panchmukhi Hanuman Mandir, Bhilwadih, Kharsia, Raigarh	21	59	24.3	83	8	4.7	
52	Kapoor Chand Agrawal	Guru Ghasi Das Chowk, Kharsia, Raigarh	21	59	23.9	83	6	44.5	
53	Taj Mall	Post office Road, Kharsia, Raigarh	21	59	22.5	83	6	11.1	
54	Chandrika Rathor	Dr. Shyam Prasad Mukhargi Marg, Kharsia, Raigarh	21	59	22.7	83	6	3.2	
55	Vikki Mahihal	New Bus Stand, Kharsia, Raigarh	21	59	11.8	83	6	10.1	
56	Sattar	New Bus Stand, Kharsia, Raigarh	21	59	12.0	83	6	9.2	
57	Gulsan	Jashpur Road, Dharamjaygarh, Raigarh	22	27	57.7	83	12	53.1	

Durg Division

Sl. No.	N]	Latitude	e	L	ognitu	te	
51. No.	Name	Address	Dig.	Min.	Sec.	Dig.	Min.	Sec.	
Durg									
1	Pathan	Motin Pur Road, Dhamdha, Durg - 491331	21	27	52.1	81	20	1.5	
2	Mr. Rafiq Menan	Muslim Para, Ward No 2, Dhamdha, Durg - 491331	21	27	46.4	81	19	52.0	
3	Ramu Dhankar	Satwani Mohalla, Pandar, Durg - 491111	21	2	45.1	81	31	14.1	
4	Neeraj Tiwari	Ward No9, Patan - 491111	21	2	11.8	81	32	40.5	
5	Vijay Devangan	Nagar Panchayat Road, Patan, Durg - 491111	21	2	13.3	81	31	42.7	
6	Mannu Chakkardhari	Ward No8, Purana Hospital Chock, Patan, Durg - 491111	21	2	14.0	81	32	46.1	
7	Babbu Khan	Green Chock, Durg - 491001	21	11	59.6	81	17	14.8	

]	Latitud	e	Lognitute			
SI. No.	Name	Address	Dig.	Min.	Sec.	Dig.	Min.	Sec.	
8	Sanjay Sahu	Ward No25, Durg - 491001	21	11	59.0	81	17	17.1	
9	Anil Kumar	Green Chock, Durg - 491001	21	11	58.5	81	17	17.8	
10	Nurdin / Sakir	Ward. No8, Takia Para, Durg - 491001	21	11	27.7	81	16	46.9	
11	M. B. Saddam	Luchki Talab, Durg - 491001	21	11	32.9	18	16	44.5	
	Bemetara								
12	Kush Senik	Ward No2, Bemetara - 491335	21	43	12.3	81	32	10.5	
13	Mohd. Salim	Ward No17, Bajar Para, Bemetara - 491335	21	42	54.9	81	31	47.9	
14	Vijay Sharma	Naya Para, Ward No16, Bernetara - 491335	21	42	32.7	81	31	50.7	
15	Arjun Nimalkar	Ward No11, Shankar Nagar Nawagarh, Bemetara -491337	21	54	14.6	81	36	47.3	
16	Santosh Agarwal	Ward No13,Rayan Bhata, Than Khamarie, Bemetara - 491338	21	41	31.6	81	20	13.3	
17	Mansur Ahmad Khan	Naurani Chock, Than Khamarie, Bemetara - 491338	21	47	48.1	81	20	3.2	
18	Sitaram Netam	Ward No2, Bharat Pur, Saja, Bemetara - 491993	21	40	3.0	81	19	8.6	
		Kawardha - Kabirdham				•			
19	Babbu Khan	Jama Masjid, Wardn NO18, Kawardha	22	0	21.2	81	14	1.9	
20	Rakesh Kr. Gupta	Ward No6, Kawardha	22	0	19.0	81	13	50.4	
21	Mohd. Hanif	Ward No-5, Adarsh Nagar, Kawardha	22	0	18.1	81	13	43.5	
22	Ashok Manipuri	Ward No9, Shetan Chock, Bodla, Kawardha	22	9	50.0	81	12	53.7	
23	Sarvan Gupta	Bania Para, Bodla, Kawardha	22	9	49.9	81	13	8.5	
24	Lal Gupta	Mosinpur, Pandariya, Kawardha	22	13	2.5	81	24	21.7	
25	Shafiq Mohd.	Bajar Para, Pandariya, Kawardha	22	13	15.5	81	24	37.8	
26	Rustam Khan	Bandha Tala, Pandariya, Kawardha	22	13	7.0	81	24	38.2	
27	Mohd. Mukhtar	Ward No10, Pandariya, Kawardha	22	13	21.0	81	24	26.8	
28	Akim Khan	Barak Para, Pandariya, Kawardha	22	13	25.3	81	24	20.9	
Rajnandgaon									
29	Shekh Majid	Kandara Para, Chhuikhadan, Rajnanndgaon	21	31	23.1	81	0	8.0	
30	Nasir Shah	Kalimandir Rd., Chhuikhadan, Rajnanndgaon	21	31	18.8	80	59	53.0	
31	Santosh	Ward No17, Khairagarh, Rajanndgaon	21	25	4.2	80	58	38.4	

]	Latitud	e	L	.ognitu	te
SI. No.	Name	Address	Dig.	Min.	Sec.	Dig.	Min.	Sec.
32	Mohd. Jakaria	Nikesh Yadav Ward, khairagarh, Rajnanndgaon	21	24	52.6	80	38	39.9
33	Hira Lal Sahu	Rani Durgavati Chock, Chhuriya, Rajnanndgaon	21	0	23.6	80	38	4.0
34	Sagar Mahile	Fuhara Chock, Dongargaon, Rajnanndgaon	20	58	12.3	80	51	3.0
35	Asgar Khan	Bhodi Tola, Dongargaon, Rajnanndgaon	20	58	27.3	80	51	13.8
36	Mohd. Sartaj	Mahavir Para, Dongargarh, Rajnanndgaon	21	11	15.5	80	45	9.3
37	Ilakat Seth	Ward No17, Dongargarh, Rajnandgaon	21	11	27.6	80	45	6.7
38	Mohd. Raja	Sola Para, Dongargarh, Rajnanndgaon	21	11	24.2	80	45	7.4
39	Ilmuddin	Bharkha Para, Rajnanndgaon	21	5	37.5	81	2	21.3
40	Gani Bhai	Purana Ganj Chock, Rajnanndgaon	21	5	25.7	81	2	22.8
41	Mohd. Salim	Lakori, Rajnanndgaon	21	5	13.5	81	3	10.1
42	Halan Bhai	kanchan Bag, Rajnanndgaon	21	5	22.4	81	3	12.4
43	Mohd. Rafi	Mamta Nagar, Rajnanndgaon	21	5	559.0	81	1	88.1
44	Basir Khan	Chikhli Kharagarh Rd., Rajnanndgaon	21	6	31.2	81	2	16.7
		Balod						
45	Nawab Khan	Jawahar Para, Balod	20	43	46.3	81	12	26.6
46	Ashok Kumar	Jawahar Para, Balod	20	43	49.3	81	12	24.1
47	Ghanshyam Jeswal	Village Jhalmila, Balod	20	42	53.3	81	14	21.5
48	Mathura Prasad	Village Jhalmila, Balod	20	42	55.4	81	14	16.4
49	Ramnarayan Malekar	Ward No11, Dondilohara, Balod	20	47	17.0	81	3	30.4
50	Prahlad Malekar	Society Para, Dondilohara, Balod Society Para	20	47	18.2	81	3	31.0
51	Jamna Prasad	Ganesh Para, Gurur, Balod	20	40	58.4	81	24	28.5

Surguja Division

SI No	NT	Address	Latitude Lon			Latitude		Sec. Deg. Min. S		
51. INO.	Iname	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.		
Balrampur										
1	Javed	Chando Road, Balrampur	23	25	53.9	83	37	2.3		
2	Tabrej	Mission Road, Balrampur	23	36	27.9	83	37	41.0		
3	Dipu Gupta	Shanti para, Balrampur	23	36	47.7	83	37	15.8		
4	Umesh	Dhanna Road, Shanti para, Balrampur	23	37	1.3	83	37	25.3		

			Latitude		e	Longitude			
SI. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
5	Ram Kumar	Jail Road, Ramanujganj, Balrampur	23	48	32.0	83	14	43.4	
6	Sanjay Gupta	Ring Road, Ramanujganj, Balrampur	23	48	33.8	83	42	4.4	
7	Uday Gupta	Gandhiji Road, Ramanujganj, Balrampur	23	48	10.1	83	42	5.8	
8	Roshan lal	Balangi, Wadraf Nagar, Balrampur	23	45	54.3	83	11	35.0	
Jashpur									
1	Haseeb	Near Jain Mandir, Jashpur	22	53	22.4	84	8	36.1	
2	Tipu Manihar	Jyoti Niwas Road, Jashpur	22	53	45.7	84	7	58.4	
3	Mukhtar	Pathargaon Road, Kunkuri, Jashpur	22	44	24.8	83	56	54.4	
4	Irfan	Abikapur Road, Pathargaon, Jashpur	22	33	31.6	83	27	32.9	
Koriya									
1	Saddam Quiraisi	Jabri Para, Baikunthpur, Koriya	23	15	33.7	82	33	26.1	
2	Shyam Srivastava	Rai baba Tiraha, Manendragarh, Koriya	23	12	49.2	82	12	2.8	
3	Chunmun	Rai Mahal Para, Manendragarh, Koriya	23	12	53.3	82	12	1.1	
4	Raju	Arab Baba, Sahdol Road, Manendragarh, Koriya	23	12	41.1	82	11	45.3	
5	Badru Jama	Arab Baba, Sahdol Road, Manendragarh, Koriya	23	12	45.9	82	11	48.4	
6	Kahira Begam	Near College, Manendragarh, Koriya	23	12	27.9	82	11	56.8	
		Surguja							
1	Jasmudding	Near Old Bus Stand, Ambikapur, Sarguja	23	7	2.4	83	11	33.4	
2	Mohd Faiyaz	Bilaspur Road, Ambikapur, Sarguja	23	6	24.9	83	11	31.2	
3	Shyam Agarwal	Kharsia Road, Ambikapur, Sarguja	23	6	55.5	83	11	44.6	
4	Lal Ji	Kharsia Naka, Ambikapur, Sarguja	23	6	39.5	83	12	12.0	
5	Mohd Faiyaz	Nawagarh, Ambikapur, Sarguja	23	6	54.2	83	12	29.2	

	N		J	Latitud	e	L	ongituo	le
51. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.
6	Golu	Chadani Chowk, Ambikapur, Sarguja	23	7	23.2	83	12	20.4
7	Munna	Near Bus Stand, Lakhanpur, Sarguja	22	58	49.7	83	2	50.1
Surajpur								
1	Islam Bhai	Sunday Market, Bishrapur, Surajpur	23	11	9.9	82	58	19.6
2	Gulam Ahmad	Sunday Market, Bishrapur, Surajpur	23	11	11.2	82	58	23.4
3	Sonu	Mahgawa, Surajpur	23	13	50.7	82	52	5.1
4	Buki	Bhaiyathan Road, Surajpur	23	13	44.5	82	51	54.1
5	Sanjay Sahu	Back side of Bus Stand, Surajpur	23	12	54.4	82	52	8.4
6	Gulshan	Near Govt. Hospital, Pratappur, Surajpur	23	29	6.8	83	12	16.2

Bastar Division

01 N	N]	Latitud	e	Longitude		
SI. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.
	Bastar							
1	Saligram	Dharampura No1, Jagdalpur, Bastar	19	5	39.8	81	59	50.3
2	Aslam Kabadi	Raut Para, Jagdalpur, Bastar	19	5	6.5	81	0	59.9
3	Dev Saran Lal Sahu	Geedam Road, Jagdalpur, Baster	19	4	39.7	82	0	17.8
4	Sumit Jaiswal	Moti Talab Para, Raaiya word, Jagdalpur, Baster	19	5	26.4	82	1	6.0
Kondagaon								
5	Suresh Jaiswal	Jamkote Para, Kondagaon	19	36	8.8	81	40	4.6
6	Sanjeet Singh	Bazar Para, Kondagaon	19	35	41.6	81	40	7.2
7	Shiv Narayan	Bazar Para, Kondagaon	19	35	41.1	81	40	5.7
8	Salim Meman	Albeda, Kondagaon	19	35	12.3	81	39	28.4
9	Hakim	Near Petrol Pump, Keshkal, Kondagaon	20	5	20.6	81	35	28.7
10	Narendra Singh Bhardwaj	Near Petrol Pump, Pharasgaon, Kondagaon	19	51	49.3	81	38	7.8
Sukma								
11	Mohd. Amir	Basti, Sukma	18	23	38.1	81	39	29.3
12	Mohd. Basir	Patna Para, Sukma	18	23	39.5	81	39	30.5

			Latitude		Longitude				
SI. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
		Dantewada							
13	Mahabir Mandabi	Aura Bhata, Dantewada	18	54	23.6	81	20	48.3	
14	Thakur Ram	Ward No6, Dantewada	18	54	22.6	81	20	49.1	
15	Navrang Devraj	Ward No15, Dantewada	18	53	17.2	81	20	55.4	
Bijapur									
16	G. Subba Raw	Ward No8, Rajender Prasad Ward, Bijapur	18	47	39.0	80	48	42.1	
Narayanpur									
17	Tapan Manjhi	Ward No5, Bangla Para, Narayanpur	19	43	48.8	81	14	47.6	
18	Abdul Habib Faruqui	Masjid Para, Narayanpur	19	43	14.8	81	14	40.1	
19	Ashok Karmkar	DNK Colony, Narayanpur	19	43	13.7	81	41	26.1	
20	Arun Karmkar	DNK Colony, Narayanpur	19	43	13.2	81	14	25.9	
Kanker									
21	Mohd. Azahar	Durga Chock, Naharpur	20	26	52.9	81	37	14.3	
22	Mohd Aaya Khan	Ward No14, Naharpur	20	26	45.5	81	37	12.3	
23	Abhijeet	Dabra Para, Charama, Kanker	20	29	31.2	81	22	4.3	
24	Hansa Sinha	Near old Bus Stand , Charama, Kanker	20	29	25.6	81	22	9.7	
25	Khuba Bai	Marketing Society , Charama, Kanker	20	29	17.6	81	22	5.6	
26	Mohd. Arif	Mahadev ward, Back side of maszid, Kanker	20	16	4.0	81	29	24.7	
27	Mohd Israk	Manjha Para, Kanker	20	16	4.7	81	29	27.9	
28	Meman	Kesh Kal Road, Kanker	20	15	49.8	81	30	14.5	
29	Vinod Sharma	Kesh Kal Road, Kanker	20	15	48.7	81	30	17.2	
30	Vinay	Sanjay para, Bhanu Pratap Pur, Kanker	20	18	40.1	81	4	7.9	
31	Ramesh	Sanjay para, Bhanu Pratap Pur, Kanker	20	18	43.3	81	4	5.7	
32	Virendra Kumar	Sanjay para, Bhanu Pratap Pur, Kanker	20	18	43.0	81	4	3.5	
33	Ankur	Sanjay para, Bhanu Pratap Pur, Kanker	20	18	43.6	81	4	5.1	
Map of Hotspots for Distributors

Annexure- 7















Sample Photo Documentation Annexure-8



Raipur Division





Bilaspur Division













Durg Division





Surguja Division









Bastar Division













Annexure - 9

Methods for Inventory Assessment

The Time Step Method

The calculation of WEEE/E-waste is made on the basis of private and industrial stock and sales data. Mathematically, the time step method is given below.

WEEE generation (t) =Stock (t₁) – Stock (t)] private + [Stock (t₁) - Stock (t)] industry + • Sales (n) - • WEEE (n) n=t1+1 to t-1 n=t1+1 to t with t₁ < t

Stock private = Number of households * (saturation level of households / 100)

= Population / average size of household * (saturation level of households / 100)

Stock industry = number of work places * (saturation level in the industry / 100)

= number of employees / number of users per appliance *saturation level in the industry/100

The Market Supply Method

The calculation of WEEE/ E-waste is made from sales data, together with typical lifespan. The waste potential during collection phase at time t is calculated from sales figures and information about consumption patterns. Mathematically, the market supply method is given below.

WEEE generation (t) = sales (t - dN) + reuse (t - dS) Where,

 $d_{\mathbf{N}}$ - Average lifetime of new items

dS - Average lifetime of second-hand items

The Carnegie Mellon Method

This method is a variation of "market supply method", where the calculation of WEEE/E-waste is made from sales data, and assumptions about typical lifetimes, recycling and storage. The model considers consumer behaviour when disposing of end-of-life EEE. This method defines the pathways of electrical and electronic equipment from purchase to end-of-life. At the point of obsolescence, there are four options of reuse, storage, recycling & landfill available to the owner.

Approximation 1

The calculation of WEEE is estimated on the basis of stock and average lifetime data. This method has also been referred to as the 'Consumption and Use' method. This method was used to calculate WEEE/ E-waste in the Netherlands. Mathematically, the method is represented by the following equation.

WEEE generation (t) = [Stock private (t) + Stock industry (t)] / average lifetime

Stock private = Number of households *saturation level of the households / 100

= Population / average size of household *saturation level of the households / 100

Stock industry = number of work places *saturation level in the industry / 100

= number of employees/number of users per appliance *saturation level in the industry /

100

Approximation 2

This method is based on the assumption, that with the sale of a new appliance, an old appliance has to be disposed of. Mathematically, it can be represented as given below.

WEEE generation (t) = sales (t)

Methodology/Features	Requirements	Constraints	Advantages
The Time Step Method	 Information about domestic sales. Appliance stock levels for household. Industrial stock levels. 	 Household saturation levels are based on predetermined stock levels Industrial stock levels are assumed in the calculations because they are difficult to obtain and require assumptions. Assumption that all the WEEE/E- waste generated is collected and transferred to treatment and disposal facility. 	 Calculations can be carried out very easily. Method gives good results in a saturated market.
The market Supply Method	 Information about domestic sales. Average life of new and second hand items. 	 The average life is to a large extent is subjective because in most of the developed countries electrical and electronic equipment is often replaced and disposed of before it reaches its technical end-of-life. WEEE/ E-waste are often stored for years. Assumed that all appliances produced in the same year will be in line for disposal after exactly the average life. Assumption that the average variance in life of items of EEE does not change very much, whereas, in reality, lifetimes may 	 Necessary data need not be very wide-ranging Calculations can be carried out very easily using a simple formula Sales data is derived from official statistics from market research institutes or trade organisations and are of good quality and available for a large number of products.

Features of the five inventory assessment methods

Methodology/Features	Requirements	Constraints	Advantages
		become shorter in the future. Therefore, this method is not especially useful in the calculation of WEEE for a dynamic market where technology and life are changing rapidly.	
The Carnegie Mellon Method	Sales data, date for typical life times, recycling & storage.	 Assumptions are made regarding the pathways or "material flow" during reuse, storage, recycling and landfilling. These assumptions are both product and country specific and therefore demand a good knowledge of consumer behaviour and the disposal position. This model also requires a full coverage of sales data as early as possible in the WEEE/E-waste trade value chain. 	 The model allows for an electrical and electronic equipment to be purchased, reused, stored and finally recycled or landfilled representing "material flow" more precisely. This method is ideal for more extensive examination of individual products. Because of the larger amount of input data, the calculation of WEEE is clearly more extensively structured.
Approximation 1	The required input data for application of this method is stock data and assumptions about average lifetime of appliance.	 A product's constant mean lifespan is assumed in this method. This method is suitable for estimating WEEE in widely saturated markets with no major deviations from the mean lifespan, 	This method is particularly useful when reliable stock data for an appliance is available

Methodology/Features	Requirements	Constraints	Advantages
		which is a subjective variable.	
Approximation 2	Sales statistics is used to calculate WEEE/E-waste generation in a particular year assuming a saturated market.	 This method is only suitable in a fully saturated market where the purchase of a product leads to the same quantity of waste from the old product. Therefore, this method has limited application in dynamic and developing markets because in these markets a larger part of the sales serves to increase stock and does not initially contribute to waste. This method is unsuitable if the temporary storage or second use of old appliances plays a significant role in consumer behaviour. 	 This method is suitable for carrying out an initial assessment. Very limited range of input data required for application of this method. No historical data is required, only sales figures for a particular period of time are required.

Methodology/	Saturation Level		Number of	Calculated Sales			Stock Data		Average	Storage			
Requirement	Household	Industry	Household	Export Data	Import Data	Manufacturing /Production	Private	Industry	Lifetime	data	Reuse	Recycle	Landfill
Time Step Method	\checkmark		\checkmark			\checkmark		V					
Market Supply Method				\checkmark	\checkmark	\checkmark			\checkmark				
Carnegie Mellon Method				\checkmark	\checkmark	\checkmark			\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
Approximation 1	\checkmark		\checkmark										
Approximation 2				$\overline{\mathbf{A}}$		\checkmark							

Data Requirements for E-waste Inventory Assessment

Note: √ means 'Yes'



Generic E-waste material flow chain

Methodology

A two-prolonged approach was adopted for the collection of relevant data and arriving at the results. Firstly, a primary survey was undertaken for data collection from the end users side. The information was then projected to the all-India level using robust projection techniques. Secondly, All-India estimates were validated by the feedback obtained from the vendors and the trade channel members.





End User Survey

Two broad user segments were covered in this phase of data collection viz. business establishments (having at least a telephone connection) and households (SEC A, B, C and D/E households). The following paragraphs explain the method of arriving at the final estimates from the end users route.

Business Establishments

A representative sample of establishments was contacted personally by our trained field personnel and relevant information on the IT products installed in the establishment during April 2012 to March 2013 and the number of units of each installed etc. was obtained. This information was then projected to the universe of establishment stratified by the Principal activity carried out at the respective establishment and the number of employees working in the respective establishment.

The detailed sampling process is as explained below:

Stratification of the Universe of Establishment

The universe of establishment was stratified on the basis of "Principal Activity carried out at the respective establishment" Classified by "Employee size" (ACE), which has been ascertained through an extensive telephonic survey conducted as a part of ITOPS' 97 – the baseline study in the ITOPS series. During the survey, 32000 telephonic contacts ware made in the Top 22 cities to determine the distribution of telephone owning establishments among different (nature of) Activity X Employee size (ACE) cells. This provided the ACE grid distribution for each of the 22 cities.

The universe of establishment as well as the ACE grid obtained from ITOPS' 97 is continuously updated and used for this study.

On the basis of the ACE grid composition thus obtained for each of the 22 centres covered, sample quota were set for the number of establishments that had to be contacted for each cell formed by the intersection of the nature of activity and numbers of employees as in the ACE grid.

Random starting addresses were selected from the telephone directory and at each starting address, 5 interviews were conducted with telephone owning establishments.

The variables used in ACE grid are robust indicator, which explains consumption of IT and Office automation products.

The market size for establishments has been obtained by applying product acquisition rate in each employee band to the respective size of universe of establishments in each city.

$$\sum_{i=1}^{n} \text{Last one year}_{i=1} = 1 \begin{pmatrix} n \\ \sum_{i=1}^{n} n \\ i = 1 \end{pmatrix} \begin{pmatrix} \text{Acquisition rate} \\ \text{in employee} \\ \text{band i} \end{pmatrix} \begin{pmatrix} \text{Universe of} \\ \text{estab. in} \\ \text{employee band i} \end{pmatrix}$$

Households

With the growing awareness of the benefits of using IT at home, this segment has grown well in the last 3-4 years and offers a huge potential for such products. A representative sample of affluent households (SEC A, B and C & D/E) was personally contacted and relevant information was obtained. The universe of households for projection purpose has been taken from National Readership Survey 2006.

The steps involved in the household sampling and the purpose of these steps have been explained in the following table:

Step	Purpose
Random Listing	 To identify the target group household (SEC A/B/C/D/E) To determine the penetration of PC and other IT products in the households To stratify the household universe into 2 broad categories Pure households Home offices
Detailed interview with the Target Group Household	 To determine the market size and profile of the owners and non-owners To determine the brand share To determine the usage of IT products among the owners To determine the intention to own IT products among the non-owners And to obtain there relevant information as needed for the study.

For the market size estimation for home offices and households, the acquisition rate in each SEC class in home offices and households were applied to their respective universe strata.

Validation from Vendors and Trade Channel

Major IT manufacturers of each of these products were contacted and their views and facts & figures on the sales during April 2012 to March 2013 and their likely share of the market were collected. This information was used to validate the findings of the End User Survey.

List of Sources of Data in the Study Area- Annexure 10

National/ Local Government Agencies	Industry/ Trade/ Recyclers/ Waste Disposal Operator's Association (Reports/ Published Data/ Field Work)	Market Research Agencies (Reports/ Published Data)
National Census Data, (1991, 2001 & 2011)	Major Trading Agencies, (Retailers)	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
National Census Data, (1991, 2001 & 2011)		
NSSO (1994 – 2010)	Industry Association, Scrap Dealers, Recyclers, EEE Retailers	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
TRAI, MOCIT, Govt of India.	Industry Association, Scrap Dealers, Recyclers, EEE Retailers	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
TRAI, MOCIT, Govt of India.	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications, Annual Reports of Major Brands
	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications, Newspapers
	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications
	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	
City Municipalities	Scrap Dealers, Recyclers, EEE Retailers	

Workshop Presentation- Annexure 11













			SOW: Items & Focused St	eps			
vt. Ltd.	S	cheo Ca	dule 1 Items as shown below SCHEDULE-1 ategories of electrical and electronic equipment covered under the rules				
á		SI.	Categories of electrical and electronic equipment				
σ		no.					
S:		<u>i</u> .	Information technology and telecommunication equipment:				
A			Centralized data processing:				
		L	Mainframes, Minicomputers				
l ⇒			Personal Computers (Central Processing Unit with input and output devices)				
			Laptop Computers (Central Processing Unit with input and output devices)				
		Notebook Computers					
S		Notepad Computers					
SC			Printers including cartridges				
			Copying equipment				
Ð			Electrical and electronic typewriters				
st		<u> </u>	User terminals and systems				
			Facsimile				
S			Televiser				
()			Des telephones				
ž			Covillage talaphonae				
			Callular talazbonar				
			Answering systems				
		15	Consume electrical and electronics:				
			Television sets fincluding sets based on (fiquid Crystal Display and Light				
			Emitting Diode technology), Refirgerator, Washing Machine, Air-				
			conditioners excluding centralized air conditioning plants.	RO			
	1000			D			

		SOW: Stakeholders	
Ltd.		Stake Holders	
Ŀ.		1 st Group	
٦		Importers / Manufacturers	
<u>ia</u>		Distributors / Traders / Retailers	
th As		Consumers – Business Sector / IT Sector / BPO / Teaching Institutions / Railways / Airlines / Defense Establishments / Transport Corporations, etc.	
no		2 nd Group	
ns S		Collectors – Scrap Dealers / Big Bazars / Malls	
sten		Recyclers – Dissemblers / Dismantlers / Material Recoveries	
Sys		Road-side Vendors	
U		Authorized / Un-Authorized Auctioneers	
R			
	2	ä	
		lf.	g






























<u>–</u>							
Ē	Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
Ž	2006	22911	20852	17215	11826	9605	82409
	2007	140634	127150	104753	71569	57835	501941
0.	2008	212922	191187	157217	106819	85886	754030
Å	2009	284208	253375	208017	140547	112429	998575
	2010	343482	303764	249045	167321	133160	1196772
t	2011	366901	328450	268233	182025	145359	1290968
0	2012	409719	364184	296895	200473	159708	1430979
S	2013	450890	397840	323846	217585	172905	1563066
Ë	2014	491185	430108	349681	233780	185286	1690040
<u>e</u>	2015	531153	461461	374823	249351	197079	1813867
<u>st</u>	2016	571206	492242	399585	264514	208453	1936000
S	2017	611668	522708	424218	279439	219535	2057568
C	2018	652809	553061	448927	294263	230426	2179487
Ř	2019	694858	583463	473895	309104	241208	2302529
	2020	738023	614049	499285	324065	251951	2427373
	Source: Census 19	91, 2001 & 2011, T	Telecom Regulatory Aut	bority of India (TRA	I), Department of Teleco	ommunications (DO	T)
	and post						II

INSTALLED BASE OF CELLULAR PHONE FOR CHHATTISGARH





INSTALLED BASE OF FIXED LINE PHONE FOR CHHATTISGARH



		1112	IALLE	D BA2	EOF		ATTISC
Ltd.	Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
:	2006	13702	12470	11096	5482	3229	45979
	2007	22060	20077	17865	8825	5199	74026
5	2008	37060	33729	30013	14826	8734	124363
	2009	63373	57676	51323	25353	14936	212661
	2010	102347	93147	82886	40946	24122	343447
	2011	161708	147172	130960	64694	38112	542646
	2012	257116	234003	208226	102863	60598	862808
	2013	419100	381426	339409	167667	98775	1406377
	2014	662741	606493	536723	265142	156725	2227825
	2015	1065325	974909	862758	426203	252167	3581361
	2016	1712460	1567120	1386842	685102	405731	5757254
	2017	2752698	2519071	2229283	1101268	652813	9255135
	2018	4424832	4049288	3583467	1770237	1050367	14878191
	2019	7112709	6509039	5760255	2845572	1690026	23917601
	2020 Source: Census 1991,	11433343 2001 & 2011, MAIT, 1	10462973 NSSO	9259337	4574123	2719234	38449010

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INSTALLED BASE OF PRINTERS FOR



					C	CHHA	TTISGA
	Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
	2006	388939	341586	312865	163726	128574	1335691
•	2007	420744	365069	331266	176878	137286	1431244
3	2008	454361	389528	350502	190885	146276	1531552
2	2009	489902	415005	370641	205869	155557	1636973
	2010	490924	426059	377284	220612	163639	1678518
	2011	527389	452742	397883	237941	173807	1789762
	2012	565872	480532	419444	256787	184349	1906984
	2013	606488	509473	442041	277418	195286	2030706
2	2014	649362	539614	465754	300162	206636	2161529
	2015	694622	571004	490674	325424	218424	2300148
	2016	742407	603693	516900	353701	230673	2447374
	2017	792863	637735	544539	385613	243410	2604159
	2018	830341	658851	562835	413634	250115	2715776
	2019	902416	710097	604562	463588	270459	2951122
	2020	961852	748535	637231	511783	284836	3144238
	Source: Census 1991, 20	001 & 2011, ELC	INA, NSSO				
1	A. S.						II

INSTALLED BASE OF TELEVISION FOR CHHATTISGARH



					C	, ННА	I IISGA
Ltd	Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
÷	2006	2922	2475	2599	845	642	9483
d	2007	3242	2687	2790	946	701	10365
ס	2008	3588	2910	2990	1060	763	11312
JS	2009	3963	3145	3201	1190	830	12331
	2010	3914	3223	3265	1085	887	12374
휙	2011	4301	3471	3478	1202	963	13414
ŏ	2012	4718	3732	3702	1333	1045	14530
S	2013	5169	4007	3940	1482	1132	15730
Ê	2014	5656	4297	4191	1652	1226	17023
ē	2015	6181	4603	4458	1847	1327	18417
st	2016	6748	4926	4743	2071	1436	19924
S	2017	7359	5266	5047	2332	1554	21558
C	2018	8017	5625	5374	2637	1680	23333
2	2019	8728	6003	5725	2995	1817	25267
	2020	9493	6401	6104	3418	1964	27381
	Source: Census 199	1, 2001 & 2011, E	LCINA, NSSO				
							IF

INSTALLED BASE OF AIRCONDITIONERS FOR CHHATTISGARH



					FOR C	CHHA	TTISGA
Ltd	Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgar h
÷	2006	3261	2735	2765	1108	833	10702
6	2007	3627	2989	2997	1229	907	11748
σ	2008	4015	3249	3233	1360	983	12841
Si	2009	4426	3517	3475	1504	1061	13984
	2010	4415	3620	3560	1427	1127	14149
닅	2011	4824	3888	3794	1554	1211	15271
Ы	2012	5255	4164	4032	1692	1298	16442
S	2013	5710	4447	4277	1844	1390	17667
US N	2014	6189	4736	4528	2012	1484	18951
B	2015	6694	5034	4788	2199	1583	20298
st	2016	7225	5338	5056	2409	1687	21715
S	2017	7784	5650	5334	2647	1795	23209
()	2018	8371	5968	5623	2917	1908	24788
M	2019	8988	6294	5925	3228	2026	26462
	2020	9634	6626	6242	3588	2150	28241
	Source: Census 199	1, 2001 & 2011, ELC	INA, NSSO				
	Source: Census 199	1, 2001 & 2011, ELC	INA, N330				

INSTALLED BASE OF WASHING MACHINES FOR CHHATTISGARH



					C	ЭННА	IIISGA
Ltd	Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
÷	2006	5847	4908	5083	1834	1373	19045
٦	2007	6746	5549	5698	2111	1545	21650
ອ	2008	7744	6242	6358	2427	1733	24504
V Si	2009	8853	6989	7068	2789	1936	27636
	2010	9077	7421	7473	2674	2124	28769
닅	2011	10283	8245	8231	3025	2363	32145
Ы	2012	11615	9132	9042	3424	2623	35836
Š	2013	13087	10087	9914	3881	2906	39876
S	2014	14712	11115	10853	4408	3217	44304
U	2015	16504	12220	11865	5018	3556	49163
ste	2016	18480	13409	12958	5729	3927	54503
S	2017	20657	14686	14143	6565	4333	60383
()	2018	23053	16058	15429	7552	4779	66871
	2019	25690	17531	16830	8726	5268	74044
=	2020	28590	19112	18360	10130	5804	81997
	Source: Census 199	91, 2001 & 2011, I	ELCINA, NSSO				
							I

INSTALLED BASE OF REFRIGERATORS FOR CHHATTISGARH



					FOR	СННА	TTISGA
Ltd.	Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
τ	2006	537597	476050	426891	236208	185807	1862553
٦	2007	683390	601600	529894	305135	238355	2358374
σ	2008	821370	718203	625736	367898	284900	2818106
S	2009	955967	830190	718764	426181	324831	3255933
	2010	1061276	932640	803299	484130	360998	3642343
	2011	1183459	1041151	893882	541263	398818	4058573
5	2012	1369723	1199184	1028287	619621	448429	4665244
Ō	2013	1633974	1426747	1224723	729485	513734	5528663
2	2014	1968490	1720052	1476886	868168	600334	6633929
5	2015	2465161	2157988	1859146	1072865	727737	8282897
	2016	3210262	2821491	2441338	1378608	918624	10770323
	2017	4352950	3846924	3344228	1845691	1211699	14601491
	2018	6116784	5438855	4750769	2562348	1720117	20588874
2	2019	8933581	7991905	7004903	3708194	2486664	30125247
	2020	13373512	12028068	10574148	5506614	3695294	45177635
	Source: Census 1	991, 2001 & 2011,	MAIT ,TRAI, NSSO)			
							IJ

INSTALLED BASE OF ALL ELECTRONICS ITEM





		Obsoleso	ceno	ce Rate of Tracer EEE
.	Sr. No.	EEE		Average Life (Years)
Ľ	1	Cellular Phone		3
ن ب	2	Computer		7
2	3	Printer		6
a D	4	Washing Machine		12
Si	5	TV		11
A	6	Refrigerator		12
근	7	Air Conditioner		12
	8	Fixed Line Telephone		6
S SC			Αv	verage weight of EEE
Ĕ		Item		Average Weight (Kg)
ē	Cellular Phor	ne	0.100	
<u>st</u>	Computer / L	aptop / Server	27.2/2	2.5 to 3 / 650
S	Printer (MFP)	6.5 – 7	
U	Washing Ma	chine	55	
Ř	TV (CRT) / L	CD / LED	31.6 (C	CRT) / 12 – 15 (LCD / LED)
	Refrigerator		35	
	Air Condition	er	55	
	Fixed Line Te	elephone	0.5 – 1	.5
				IRE

		INVE	ENTOR	Y OF CI	CELLU HHATT	LAR I ISGA	PHONE RH (in to	F O
Ltd	Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh	
₹.	2011	31.94	28.68	23.58	16.02	12.88	113.10	
а	2012	42.63	38.01	31.20	21.08	16.86	149.79	
Asi	2013	51.52	45.56	37.36	25.10	19.97	179.52	
돌	2014	55.04	49.27	40.23	27.30	21.80	193.65	
SoL	2015	61.46	54.63	44.53	30.07	23.96	214.65	
ns.	2016	67.63	59.68	48.58	32.64	25.94	234.46	
ter	2017	73.68	64.52	52.45	35.07	27.79	253.51	
Sys	2018	79.67	69.22	56.22	37.40	29.56	272.08	
Ś	2019	85.68	73.84	59.94	39.68	31.27	290.40	
Щ	2020	91.75	78.41	63.63	41.92	32.93	308.64	
							I	F

INVENTORY OF CELLULAR PHONE FOR CHHATTISGARH



		VIORI	CH		SGAR	H (in to
Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
2011	97.96	89.15	73.60	50.56	41.07	352.35
2012	83.03	75.07	61.84	42.25	34.14	296.34
2013	96.86	86.97	71.52	48.59	39.07	343.02
2014	89.20	79.52	65.29	44.11	35.29	313.41
2015	82.55	73.05	59.89	40.24	32.02	287.76
2016	78.95	70.69	57.73	39.18	31.29	277.83
2017	76.86	68.34	55.71	37.62	29.97	268.49
2018	74.86	66.07	53.78	36.13	28.71	259.55
2019	72.93	63.88	51.94	34.72	27.52	250.99
2020	71.08	61.77	50.17	33.38	26.38	242.79
						IF





			INVE	NTOR CH	Y OF C HATTI	OMPL SGAR	JTERS F H (in to	OR ns)
Lto	Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh	
₹.	2011	135.59	123.40	109.81	54.24	31.41	454.45	
аF	2012	192.54	175.23	155.93	77.03	45.38	646.09	
Asi	2013	286.88	261.09	232.33	114.77	67.61	962.68	
물	2014	461.87	420.35	374.05	184.78	108.86	1549.91	
Sou	2015	775.95	706.19	628.40	310.43	182.88	2603.85	
JS SC	2016	1326.87	1207.59	1074.57	530.83	312.72	4452.58	
en	2017	2142.89	1950.26	1735.43	857.30	505.04	7190.92	
yst	2018	3385.77	3081.41	2741.98	1354.53	797.97	11361.66	
U U	2019	5383.38	4899.45	4359.74	2153.70	1268.77	18065.04	
R	2020	8774.90	7986.10	7106.38	3510.54	2068.10	29446.01	
							IF	g



			IN	VENT CI	ORY O HHATT	F PRI ISGA	NTERS RH (in t
Lto	Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
Ş.	2011	14.39	13.09	11.65	5.76	3.39	48.28
a	2012	23.16	21.08	18.76	9.27	5.16	77.43
As	2013	33.72	30.69	27.31	13.49	10.18	115.40
F	2014	84.29	76.71	68.26	33.72	19.56	282.53
Sol	2015	171.94	156.49	139.25	68.79	27.41	563.88
ms	2016	203.75	185.44	165.01	81.51	40.02	675.73
stel	2017	269.97	245.70	218.64	108.01	61.88	904.20
S	2018	410.72	373.80	332.62	164.31	88.39	1369.84
С С	2019	460.00	418.65	372.54	184.03	127.68	1562.91
=	2020	515.20	468.89	417.24	206.12	190.54	1797.99
							l



			INVE		Y OF T	FELEV ISGAR	ISION F RH (in to	0 n
. Lto	Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh	
P <t< th=""><th>2011</th><th>7841.21</th><th>7339.20</th><th>7150.59</th><th>3333.29</th><th>2743.59</th><th>28407.88</th><th></th></t<>	2011	7841.21	7339.20	7150.59	3333.29	2743.59	28407.88	
<u>a</u>	2012	8589.35	7932.92	7617.51	3645.07	2975.63	30760.47	
As	2013	9379.04	8550.66	8101.51	3972.10	3214.45	33217.75	
l t	2014	10212.88	9193.64	8604.18	4315.93	3460.37	35787.00	
Sol	2015	11093.59	9863.06	9127.18	4678.38	3713.73	38475.94	
ns	2016	12024.05	10560.14	9672.21	5061.60	3974.88	41292.88	
ster	2017	13007.30	11286.12	10241.09	5468.18	4244.21	44246.90	
S	2018	14046.58	12042.26	10835.77	5901.21	4522.12	47347.94	
S	2019	15145.32	12829.87	11458.36	6364.43	4809.04	50607.02	
=	2020	15176.91	13171.62	11840.17	6773.30	5058.90	52020.89	
							II	Ş



				CI	НАТТ	ISGAI	RH(in to
Ltd	Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
Š.	2011	79.28	76.37	90.49	23.53	20.30	289.95
a	2012	85.63	82.61	94.17	24.74	20.72	307.87
As	2013	97.16	91.71	102.99	27.91	23.07	342.84
F	2014	109.65	101.27	112.10	31.39	25.56	379.97
Sol	2015	123.20	111.32	121.54	35.21	28.20	419.47
ns	2016	129.54	114.58	123.33	37.10	29.47	434.02
ster	2017	144.50	125.07	132.92	41.53	32.30	476.32
Sys	2018	160.72	136.13	142.94	46.47	35.32	521.58
С С	2019	178.29	147.78	153.44	52.02	38.55	570.08
=	2020	197.34	160.05	164.46	58.31	41.99	622.15
							I





				СН	HATTI	SGAR	H (in to
. Lto	Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
PZ	2011	49.16	47.21	56.62	14.45	12.38	179.82
<u>a</u>	2012	79.53	73.92	79.54	28.55	23.12	284.66
As	2013	94.02	85.92	91.32	33.39	26.79	331.45
hth	2014	109.27	98.19	103.19	38.38	30.49	379.51
Sol	2015	125.36	110.75	115.16	43.57	34.22	429.06
ns	2016	142.35	123.64	127.29	49.01	38.01	480.29
ster	2017	160.32	136.86	139.58	54.77	41.87	533.41
Sys	2018	179.35	150.44	152.08	60.93	45.82	588.62
С С	2019	199.49	164.39	164.82	67.57	49.88	646.15
벽	2020	220.83	178.72	177.82	74.80	54.05	706.23
							IF

INVENTORY OF WASHING MACHINES FOR CHHATTISGARH (in tons)



				CH	HATT	ISGA	RH (in to	ons
Lto	Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh	
Pvt.	2011	46.73	44.88	53.83	13.74	11.77	170.95	
a	2012	72.34	67.95	74.76	24.37	19.86	259.27	
As	2013	88.99	82.11	89.33	29.49	23.80	313.72	
ht	2014	107.49	97.39	104.84	35.09	27.99	372.79	
Sol	2015	128.05	113.89	121.35	41.23	32.47	437.00	
ms	2016	150.93	131.72	138.97	48.05	37.28	506.94	
stel	2017	176.37	150.98	157.78	55.65	42.46	583.23	
Sy	2018	204.66	171.77	177.90	64.20	48.05	666.58	
ů	2019	236.11	194.23	199.44	73.89	54.09	757.76	
=	2020	271.06	218.47	222.55	84.94	60.64	857.65	
							II	Rg

INVENTORY OF REFRIGERATORS FOR



			C ALL E			RH (in to
Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
2011	8296.25	7761.99	7570.17	3511.59	2876.78	30016.78
2012	9168.20	8466.78	8133.70	3872.35	3140.87	32781.91
2013	10128.20	9234.72	8753.67	4264.86	3424.94	35806.38
2014	11229.69	10116.34	9472.14	4710.70	3729.91	39258.78
2015	12562.10	11189.39	10357.31	5247.92	4074.89	43431.61
2016	14124.07	12453.47	11407.68	5879.93	4489.59	48354.75
2017	16051.90	14027.84	12733.61	6658.12	4985.53	54456.99
2018	18542.32	16091.10	14493.29	7665.19	5595.95	62387.85
2019	21761.20	18792.08	16820.20	8970.05	6406.81	72750.34
2020	25319.07	22324.03	20042.42	10783.29	7533.54	86002.35
						IF



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Sensitization and Stakeholders Workshop Photo Documentation

S. No.	Name & Address of Firm/Officers	Name & Post of Representative of the Firm/Officers	Signature	
61	M.K. PANDA,	M.K. Parale Sc Mare	ND-	
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03.	JSPM TPS Korby	RK. Roi chia chemist	0.P. (
04.	HTPS, CIPLIC, ICOTUS West	S. E. M. Ship Ship Chemik	Place 12-16	
20	KTPS Koston East	S. sidar sr. dramiof	90	
6.	HTPS Korby West	m.R. Salu, A-E	meil	
7.	BALCO, KORBA	B. SIVAICUM AR	Buhmant	
8.	BALCO, KORRA	Dekrand Devorgan	aller sint	
9.	ACB(J) Ltd.	A.K. Dewengan _	Akme 7/ 1/16	
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	Regional Officer	adla		
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Approach: "Cradle to Grave" Model 0----no m all and -1 EEE generation: Import & manufacturing of EEE 2 EEE sales 3 EEE consumption (stock) 4 WEEE generation 5. Re-use / down cycle 6. Re-oycle 7. Secondary raw material / disposal 1 de la IRg







FINAL REPORT

E-Waste Inventorization of Durg Division





2016

IRG Systems South Asia Pvt. Ltd. E-16, 3rd Floor, Main Market, Hauz Khas, New Delhi – 110 016 Tel.: +91-11-45974597 e-Mail: irgssa@irgssa.com

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Executive Summary

E-waste is one of the fastest growing waste streams in the world. In developed countries, it equals 1% of total solid waste generation on an average. In this context, Ministry of Environment & Forest, Government of India at first notified E-waste guidelines followed by Hazardous Waste (Management, Handling & Transboundary) Rules in 2008. This was followed by formulation of E-waste (Management & Handling) Rules 2011, which came into effect from 1st May 2012. In order to implement these regulations, each state mandated to prepare their E-waste inventory which can assist State Pollution Control Boards (SPCB) to monitor & regulate E-waste Management as per E-waste rules. Each of the State Pollution Control Board's have been assigned the responsibility for inventorization of E-waste in their State, grant and renewal of authorization, registration of recyclers, monitoring of compliances of authorization and registration conditions and action against violation of these rules. In view of the dues and responsibility defined under the E-waste rule, 2011, Chhattisgarh Environment Conservation Board (CECB) has planned for inventorization of E-waste in the five divisions of this State. IRG Systems South Asia Pvt. Ltd. has been assigned the task to carry out the inventorization in the five districts of Durg Division. The current effort will assist to prepare an inventory of E-waste generated in the state so that an action plan can be formulated for future interventions.

The objective of the E-waste Assessment is to identify and quantify the E-waste generation for reuse, recycle and final disposal in the study area by adopting uniform approach and methodology. SoW as per ToR includes assessment of E-waste generation, present handling practices, storage, and channelization for its recycling or disposal, by producers, consumer, or bulk consumers. The report shall also include the detail list of producers, consumer or bulk consumers, collection centers, dismantlers and recyclers with the name, address contact no. and their practices for E-waste handling & management. Finally, the inventorization of E-waste shall be done for different categories (Information Technology and Telecommunication and consumer / household appliances) listed in schedule – 1 of E-waste Rules 2012. The study area includes Kabeerdham, Rajnandgaon, Durg, Balod and Bemtara districts of Durg Division.

This **Final Inventory Assessment Report** has been compiled in six chapters. This report is being compiled giving inventory of various stakeholders and present handling practices, storages & channelization for recycling.

Some of the major features of E-waste regulation having implication on E-waste inventory assessment indicate that no target has been fixed to collect E-waste from the time of enforcement. Producer is not bound by any collection target. There are no mandatory provisions for producers in the rules to declare quantity of EEE placed in the market since 2012. No mechanism for tracking purchase of EEE by bulk consumers exists.

Therefore, monitoring of E-waste inventory through evaluation of Form 2 or Form 3 in accordance with Rule 4(9) of E-waste Rule by CECB in the state is possible only through the producers data obtained from centralized agency e.g. CPCB or the state where these producers are registered after 2012. CPCB data shows that as of September 2013. Therefore, CECB can track & monitor E-waste inventory in the state through the dismantler's / recycler's data obtained from centralized agency e.g. CPCB or the state where dismantler's / recycler's are registered. This also indicates that E-waste is either dismantled or recycled in informal sector in the state. Producers are majorly responsible for all the activities including financing of E-waste management. It indicates that producers may be fulfilling their responsibility through collection system catering to dismantlers & recycler within and outside the state. Therefore, collection centres registered in the state may offer a limited opportunity of E-waste inventory tracking & monitoring mechanism in the state. Assessment on the upstream side of the E-waste chain especially of both types of consumers (bulk & individual consumer), also indicate that only bulk consumer offer opportunity of E-waste inventory tracking & monitoring. Though, bulk consumers are required to maintain records of E-waste, they are not required to file the returns. Since no mechanism exist for tracking purchase of EEE by bulk consumers and producers are not required to declare quantity of EEE placed in the market since 2012, E-waste inventory assessment has to rely on available historical market research data. Therefore, there is need to identify different producers, profile of consumers & bulk consumers, collection centre, dismantlers & recyclers who are catering to E-waste in the state.

Tracer technique, which was pilot tested in Chhattisgarh has been used in major urban centers/towns in Chhattisgarh to fix E-waste trade value chain. A tentative E-waste trade value chain for study area which has emerged out of field work from tracer techniques indicates the following profile of stakeholders & their inventory.

<u>Producers</u>: EEE producers / manufacturers do not exist in the study area. However, their products are being sold in the division. Secondary data confirms that EEE producers do not have manufacturing facilities in the division and therefore they are not registered with CECB. Since these producers are responsible for their products under EPR, their detailed **inventory** as per schedule 1 of E-waste (Management & Handling) rules are given in Annexure 1.

<u>Distributors / Traders / Retailers</u>: EEE from these producers are sold in the study area through Distributor / Trader / Retail network as well as directly through the company. Items like Centralized Data Processing, Mainframes, Mini-computers of Schedule 1 are used by large corporate, State and Central Government agencies falling under the category of bulk consumers whose profile is given below. **Inventory** of Distributors / Traders / Retailers selling items other than mentioned above in the study area are given in Annexure 2. However, retailers / dealers do not fall under the purview of E-waste (Management & Handling) Rules 2011, unless they serve as collection centre or drop off point.

<u>Consumers</u>: There are two types of consumers, which are found in the five districts of study area, Individual Consumers & Bulk Consumers. **Inventory** of bulk consumers in the five districts is given in Annexure 3.

<u>Collection Centres / Channel</u>: Tracer analysis indicates that EEE, which becomes E-waste in the study area partly gets collected & transported in the informal sector and partly in formal sector. Primary survey carried out through Tracer technique indicates that bulk of E-waste generated in the study area goes to informal sector. Majority of the producer / manufacturer have established collection channel in the study area. These collection channels work through following mechanism.

- 1. Single point call centre
- 2. Distributors / Retailers
- 3. Service Centres
- 4. Physically established collection centre / drop off point

The producers use a combination of these mechanisms. Inventory of Service centres in the study area are given in Annexure 4. Inventory of Physically established collection centres are given in Annexure 5. Majority of producers use call centre as well as dealer's network for collection of E-waste. There are two possibilities of onward transportation & disposal of E-waste. The first possibility is the disposal through informal sector & the second is through registered recycler. An inventory location of major scrap vendor / dismantler, temporary stockpile site / informal collection centre & landfill site is given in Annexure 6.

Small scrap dealer purchase waste from Household / Commercial Area / Institution, etc. At first stage, they segregate the waste than break the item and collect valuable items like Aluminum, Copper, Iron & Steel, Compressor, motor, etc. from E-waste. They sell their collected item to the large scrap dealer. They visit nearby area on daily/weekly basis and purchase the waste. These scrap dealers are not licensed by the municipalities but are part of the networks of large scrap dealers. Dismantling and segregation of E-waste occurs in a major way at large scrap dealers. Photo documentation captured district-wise of Durg division of Chhattisgarh in given in Annexure 8. Some of the major findings of the disposal mechanism are:

- Electronic items go to mechanic shops from households for repairing, and mechanic replace damaged / defunct parts/components from it and then they sold it to scrap dealers.
- Mechanics sell E-waste to scrap dealer by weight / Pcs. mainly of ICT items (IT as per Schedule 1); TV circuit Rs. 15-45/kg; Compressor Rs. 300-400/Pcs.; Washing Machine Motor Rs. 200/Pcs.; Copper Rs. 200-350/kg; DVD Circuit Rs. 20-25/kg; Mobile kit Rs. 1000-2000/kg; SMPS Rs. 50/Pcs, Mother Board Rs. 90/Pcs.; Hard disk Rs. 120/Pcs.; CD Writer Rs. 35-40/Pcs.
- Scrap vendors sold E-waste to scrap dealer by weight at Rs. 150-250 per kg
- Scrap vendors sold damage mobile phone to scrap dealer as individual piece at Rs. 30-50 per piece

- Scrap dealer comes from Delhi yearly twice/thrice for collecting of E-waste
- There is no organized mechanism for collection, transportation and disposal of E-Waste in Durg division.
- No mechanism exists in the state to monitor and track its inventory, collection, transportation and disposal.

<u>Repair Shops (AC/WM/REF)</u>: One person repairs one of these items every day. E-waste fractions/ waste Parts, like plastic body of these items, etc. is dumped into community bin and valuable item sold to nearby scrap dealer. Some of the respondent informed that Item which is not in repairable condition is returned to the owner of the product who in turn sells to the scrap dealer. Majority of the product are in repairable condition.

<u>Repair Shops (TV / PC / Mobile Phone)</u>: Majority of mobile phones, TV & computers repair shop owners are local citizens. Waste Parts, like plastic body of these items, etc. are dumped into community bin and valuable item sold to nearby scrap dealer. They also store valuable item and use it to repair other EEE. In case of mobile phone, they utilize maximum parts while waste parts are dumped in municipal bin. Majority of the product are in repairable condition.

Data matrix versus methodology used for E-waste inventory assessment indicates "Market Supply" method and "Carnegie Mellon" method can be applied for WEEE / E-waste inventory assessment in five districts of Durg division. However, a combination of Carnegie Mellon method & tracer tracking has been selected for inventory assessment since it covers all the aspects of material flow chain. Assessment of data from these stakeholders through tracer tracking has resulted in assessment of obsolescence rate or average life of equipment described in chapter 5. Major sources of secondary data included Saturation Level – National census data was obtained from office of the Registrar General & Census Operation, Govt. of India, National Sample Survey Organization (NSSO), Department of Statistics, Government of India, State Statistics from Department of Statistics, Government of Chhattisgarh, Telecom Regulatory Authority of India (TRAI), Ministry of Communications & Information Technology (MOCIT), Government of India, Industry Association like Manufacturers Association for Information Technology (MAIT), Electronic Industries Association of India (ELCINA), Telecom Equipment Manufacturers Association of India (TEMA) & Research Institutions e.g. National Council for Applied Economic Research (NCAER). Data related to average life time, storage data, reuse, recycling & disposal at landfill site was obtained through "tracer tracking" technique & primary survey.

The description of each of this method also describes constraints and advantages of each of these methods. The data requirements for each methodology based on mathematical expressions are given in Annexure 9. The extent of data required depends on the extent of geographical boundary, which could be national, regional or city boundary. Conceptually, the source of data can be identified by understanding the "material flow chain" within the given geographical boundary. A list of sources of data in study area, which was required for application of inventory assessment methodology, is given in Annexure 10.

Analysis shows that cell phone have the highest installed base followed by Computers, TV, printers, fixed line telephone, refrigerators, washing machines and Air Conditioners. In Durg cellular phone, fixed line phone, TV, washing machine and refrigerator has the highest installed base followed by Kabeerdham, Rajnandgaon, Durg, Balod and Bemtara districts of Durg division.

Inventory estimates in Durg division indicate that E-waste generation ranges from **7570.17** tons in 2011 to **20042.42** tons in 2020. In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 88% of the total inventory followed by refrigerator (1%), Washing machine (1%), Air conditioner (1%), Cellular phone (1%), Computer (6%), Fixed Line Phone (1%) & Printer (1%). In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (59%), computer will constitute about 36% of the total inventory followed by Refrigerator (1%), Washing machine (1%), Cellular phone (0%), Printer (2%) & Fixed Line Phone (0%).

Some major observations are that Operating margin for Television waste per kilogram is Rs. 0.44. Operating margin for waste refrigerator is Rs. 11.46 per kilogram. For that of Washing Machine is Rs. 13.03 per kilogram. For that of Air Conditioners is Rs. 18.40 per kilogram. For scrap old Personal Computer is Rs. 6.98 per kg. For waste cellular phones is Rs. 24.20 per kg. The operating margin ranges from Rs. 0.44 to Rs. 24.20

per kilogram. Scrap of Mobile / cellular phones gives the maximum operating margin of Rs. 24.20 while scrap from television gives the minimum profit of Rs. 0.44 per kilogram. This indicates that informal sector if brought into formal sector considering taxation involved will only dismantle / recycle cellular phones followed by ACs and WMs to some extent. Therefore, there is a need to formulate financial instrument for making dismantling / recycling of white goods viable.

Market risks matrix highlight the availability of raw material, its collection and transportation as risks of high & medium intensities. Collection mechanism directly impacts the availability of raw material. Therefore, there is a need for both strict implementations of regulations as well as financial instrument for diverting E-waste inventory in to the formal sector.

Chapter 1: Introduction & Background

1.0 Introduction & Background

E-waste is one of the fastest growing waste streams in the world. In developed countries, it equals 1% of total solid waste generation on an average. As the fastest growing component of municipal waste across the world, it is estimated that more than 50 MT of E-waste is generated globally every year. The rapid change in technology, low initial cost, and planned obsolescence has resulted in its fast growth. These rapidly increasing numbers of electronic equipment and appliances have the potential to create serious environmental and health impacts at the "end of life" if not treated and disposed in an environmentally sound manner. E-waste is also a source of resource as some of these materials and valuable parts used in manufacture of electrical and electronic (EEE) items can be recycled and re-used. The harnessing of E-waste as a "resource" provides potential economic opportunities through the development of collection, recovery and recycling facilities. As per CPCB / MoEF 2006 estimates, India generated 1, 46,000 metric tones of E-waste from six items, which were projected to exceed 7, 00,000 metric tones by 2012. A report of the United Nations predicted that by 2020, E-waste from old computers would jump by 500 percent on 2007 levels in India [2]. In this context, Ministry of Environment & Forest, Government of India at first notified E-waste guidelines followed by Hazardous Waste (Management, Handling & Transboundary) Rules in 2008. This was followed by formulation of E-waste (Management & Handling) Rules 2011, which came into effect from 1st May 2012. In order to implement these regulations, each state is mandated to prepare their E-waste inventory which can assist State Pollution Control Boards (SPCB) to monitor & regulate E-waste Management as per E-waste rules.

In this context, Chhattisgarh Environment Conservation Board invited Proposals for Inventorization of Ewaste in Raipur, Bilaspur, Durg, Bastar and Sarguja divisions of the State of Chhattisgarh. IRGSSA submitted its technical & financial proposal to CECB to carry out E-waste inventorization in Raipur, Bilaspur, Durg, Bastar and Sarguja divisions of the State of Chhattisgarh.

1.1 Need for Study

Despite of enactment of law for handling E-waste in India, this particular waste is being disposed off unaudited, in absence of appropriate inventory of E-waste in most of the states / cities. As per National Ewaste inventory estimates carried out by CPCB in 2006, Chhattisgarh state ranks among top twenty states generating E-waste in India. Therefore, in Chhattisgarh an effective inventory comprising the details of Ewaste and related components is yet to be created to manage & handle E-waste in eco-friendly manner and to combat the problem associated this waste. In this context, it is proposed to prepare an Inventory of Ewaste & related components in five divisions of Chhattisgarh viz. Raipur, Bilaspur, Durg, Bastar and Sarguja. The overall aim of this initiative is to assess the generators, quantity and present practices for handling of Ewaste in these divisions.

The current effort is aimed to prepare an action plan for E-waste for implementation of the legislations framed. The items to be covered in this assessment include personal computers, mobile phones, televisions, washing machines and refrigerators etc. as mentioned in E-waste (Management & Handling) Rules, 2011. A list of these items as per ToR is given in **Table 1.1**.

	Table 1.1: Categories of Electrical and Electronic Equipment		
Sr. No.	Categories of Electrical and Electronic Equipment		
i.	Information Technology and Telecommunication Equipment		
	Centralized Data Processing		
	Mainframes, Minicomputers		
	Personal Computers (Central Processing Unit with input and output devices)		
	Laptop Computers (Central Processing Unit with input and output devices)		
	Notebook computers		
	Notepad Computers		
	Printers including cartridges		
	Copying equipment		

Sr. No.	Categories of Electrical and Electronic Equipment
	Electrical and Electronic typewriters
	User terminals and systems
	Facsimile
	Telex
	Telephones
	Pay telephones
	Cordless telephones
	Cellular telephones
	Answering systems
ii.	Consumer Electrical and Electronics
	Television sets (including sets based on liquid Crystal Display and Light Emitting Diode technology),
	Refrigerator, Washing Machine, Air conditioners excluding centralized air conditioning plants.

1.2 Objective

The objective of the Rapid E-waste assessment is to identify and quantify the E-waste generation for reuse, recycle and final disposal in the study area by adopting uniform approach and methodology. The main objectives of this study are as follows:

- ➤ To assess identify and quantify the WEEE generation.
- ► To examine the existing WEEE recycling system
- To study the problems / risks posed by the recycling system at present/ future
- > To estimate the existing and future quantity of WEEE in the study area
- To evaluate the capacities / capabilities of existing stakeholders and infrastructure for reuse, recycle and disposal of E-wastes
- > To analyze the environmental and social sustainability of present system.
- ➢ To determine E-trade economics for WEEE
- Preparation of directory of the stakeholders
- Conduct 01 sensitizing workshops in the each study area

1.3 Scope of Work (SoW)

In order to achieve the above objectives identified by CECB, IRGSSA has developed a comprehensive Methodology addressing the need to develop and implement an effective E-waste management based on the need to quantify and characterize this waste stream, identify major waste generators, assess risks involved and develop and implement a scientific, safe and environmentally sound management system, including policies and technologies.

The project aims to promote identification and implementation of environmentally sound and commercially viable technologies for the various elements of waste management *viz* collection, segregation, transportation, treatment, recovery and/ or recycle and disposal. The fundamental approach can be summarized in the following three phases.

Phase 1: Mobilization and work plan

Team will be mobilized & work plan will be prepared & presented to CECB.

Phase 2: Data Collection / Field Work

IRGSSA would be following the approach suggested by CECB. In order to execute this assignment, it is essential to establish the E-waste business chain linking different stakeholders to understand the trade economics and associated environmental impacts. An example of this chain is given in **Figure 1.1**.



Figure 1.1: Conceptual WEEE business chain

This chain will be mapped geographically in the study area to describe the following:

- > The stakeholders
- > Their respective geographical distribution in the study area and
- ➢ WEEE generation cycle
- Material flow across stakeholders

Study Area: As per ToR, the study area is Raipur, Bilaspur, Durg, Bastar and Sarguja Division. However, the current report is being submitted for Durg Division. In this division Kabeerdham, Rajnandgaon, Durg, Balod and Bemtara five districts are covered.

This study would lead to the identification of stakeholders, classification of organization as organized / unorganized sector. Further their geographical location would be determined in the terms of their operating base coverage. Conceptually, some of the major stakeholders would include:

Ist Group

- ➢ The Importers, Manufacturers
- The distributors, traders and retailers
- The consumers Individual households, Business sector, IT sector, BPO, teaching institutions, Railways, Airlines, Defence establishments, Transport Corporations, PUCs etc.

IInd Group

- > The Collectors Scrap dealers, Big Bazaars or malls who are buying the e-waste
- > The Recyclers dissemblers, dismantlers, material recoveries,
- The Road side vendors
- The authorized / unauthorized Auctioneers, the sellers of the used electronic goods on the footpaths.

The study would also aim at establishing E-waste trade chain using conceptual input output analysis. This idea has been developed based on "E-waste material flows" through region and on its way its disintegration and processing in numerous steps until it rejoins the raw streams or ends in a final disposal. This will be done through "tracer techniques", which includes identification of tracer for each item and its tracking through the chain from the start of dismantling process till its final disposal.

Inventorization

Inventorization of E-waste would be done as follows:

- Inventory of obsolescence rate of each electronic product (viz. Personal computer / TV / Mobile phones as mentioned in the e-waste rules and guidelines issued by CPCB) using scenario analysis from secondary / market research data.
- Confirm obsolescence rate from data of primary survey using "tracer technique".
- Identify a tracer for each product and follow it from the start of dismantling process till its final disposal.
- The inventorization other than households (on sample basis) would also be on actual basis.

The Inventorization other than households (whereas sample basis at least 500 nos in rural and urban area of each district) should be on actual basis.

Analysis of existing E-waste recycling system & quantification of E-waste

This will include description & documentation of each process used in dismantling of an EEE and the location details. Carry out photo documentation and geographical setting of each step. Estimate the quantity of material dismantled at each step. Estimate the quantity of E-waste for a particular year based on market projections & obsolescence rate.

Phase 3: Report findings

A Final Inventory Assessment Report will be prepared for each division & findings will be presented in one workshop, one each for five divisions.

1.4 Approach & Methodology

IRGSSA will follow a very comprehensive approach and methodology as described below. This is based on UNEP's manuals 1 and 2 and its application in a number of countries globally including India. The consortium will carry out the following activities and will follow the following step wise approach and methodology for each of these activities.

Activity 1: Development of Policy & Regulatory Framework

Step 1: Carry out due diligence on E-waste policy / laws / regulations eg. EPR.

- Step 2: Identify the gaps with respect to existing environmental regulations and recommend tentative content, extent and coverage of E-waste policy/ laws/ regulatory framework.
- Step 3: Carry out due diligence on expected E-waste institutional mechanism like collection and transportation system and registry e.g. Collective and clearing house system, B2C and B2B model. Identify the gaps with respect to existing collection and transportation system and recommend tentative collection and transport framework.

Activity 2: Assessment of E-waste Market

- Step 1: Determine E-waste item of interest as per Schedule 1 of E-waste (Management & Handling) Rules 2011. This will assist in studying the items of interest ex. PCs, TVs, cellular telephones, and refrigerators etc. Determine the brands, local, national and international, which are available in the market for each item and the year of their introduction in the market. Determine brands which existed earlier. This can be determined through review of secondary data from industry association or by interacting with local dealers. If the product is manufactured under a brand name, the broad feature of technology used to manufacture item is generally disclosed. This will also assist in identifying its dealer's network, existing facilities for item's manufacture and repair and its membership with local industry association.
- Step 2: Determine average weight and size of local, national and international E-waste item from each brand ex. capacity of refrigerator (liters) / washing machine, size of monitor / TV / cellular phone. The variation in size of each item should be documented under each brand. Average weight and size along with percentage composition should be estimated. This can be further confirmed while carrying out field survey for documenting dismantling operation.
- Step 3: Determine broad components out of the 26 components of E- waste items. Determine composition of E-waste item from available source like industry association / manufacturer. Determine technology of E-waste item e.g. ODS based refrigerator / 386 / 486 / Pentium series of PCs and laptops / CRT / front loading / top loading washing machines etc. Determine approximate quantity of recoverable elements from each item based on outputs of step 2. Determine possible hazardous substance in E-waste item.



Figure 1.2: Geographical mapping of different attributes

- Step 4: Establish geographical boundary / system boundary of study area. Procure maps of the area and prepare base map of the area with physical features marked on it. If the detailed map is not available easily then procure city map and fix up the municipal boundaries. Alternately, maps of the study area can be prepared based on standard map search engines available on the internet. The base map will be used for generation of different thematic layers as shown in **Figure 1.2**. This mapping will give an insight into the possible sources of E-waste and assist in carrying out the primary survey.
- Step 5: Identify different stakeholders from Group 1 & Group 2 who could be E-waste generators and mark them as layer two on the base map. Physically verify by carrying out preliminary reconnaissance survey of the identified locations of the stakeholders. Mark the tentative locations by taking latitudes and longitudes of the identified locations through GPS instrument. Identify the stakeholders, which are in the formal / organized sector and which are in the informal sector.
- *Step 6:* Prepare a tentative E-waste trade value chain as per conceptual life cycle; four phase model and E-waste trade value chain. These figures should be customized as per preliminary survey, which will be confirmed and established during field survey.
- Step 7: Identify E-waste dismantling sites, recycling sites and landfill / dump sites. Physically verify these sites by preliminary reconnaissance survey and marking the tentative locations by recording their latitudes and longitudes through GPS instrument.
- Step 8: Identify data needs from these stakeholders based on identified stakeholders in step 5 and trade value chain identified in step 6.
- Activity 3: Selection of Methodology for E-waste Inventory
- Step 1: Identify data requirements. This is carried out by classifying data needs under the heads of saturation level, households, calculated sales, stock data, average life, storage data, reuse, recycle and landfill for each electronic item ex. PC, TV, refrigerator, cellular phone, etc.
- Step 2: Identify tentative sources of data for each electrical and electronic item. This will be based on preparing preliminary or detailed interview guide / checklist / questionnaires for data collection for each time.
- Step 3: Document secondary sources of data for each electrical and electronic equipment and visit the respective agency to procure data i.e. published / unpublished / historical.
- Step 4: Check the availability, reliability, amount and range and completeness of data against following decision criteria.

Availability of data

- 1. Number of sources of data, which can provide data for study area. Generally, more than one source of data is preferred for item of interest.
- 2. In what format, data is available i.e. yearly, half yearly, cumulative or distributed.
- 3. Whether the data is published/ unpublished, confidential/ public.
- 4. Mode of procurement of data.

Reliability of data

- 1. Data of at least two sources should match.
- 2. If there is any variation in sources of data, check the methodology of calculating and compiling the data from each source. If there is a difference in the calculation and compilation of data, then check the factor responsible for the difference.
- 3. Check the trends from the data obtained from different sources and correlations with other data.

Amount and Range of data

- 1. Check the availability of historical data for each E-waste item.
- 2. Historical data should be available for more than anticipated average life time of the E-waste item.

Completeness of data

- 1. Historical data should be complete without any gap.
- 2. If gap exists then source, which provide data with minimum gap should be selected so that the gaps can be supplemented.
- 3. Incomplete data can be supplemented by trend analysis or by national / regional / city level assumptions.

Step 5: Prepare the constraint matrix by mapping outputs of steps 4 and step 5. Decide the most suitable and applicable methodology for E-waste inventory assessment

Activity 4: E-waste Inventory Assessment:

Sub Activity1: Establishment of the study area and its geographical limit

This activity will include the establishment of geographical limits of study area i.e. geographically defining the area. This will include assessment of landuse maps of the study area, fixing of rural and urban boundaries and mapping of tentative locations of stakeholders. The investigation team will geographically verify the tentative locations where generation, stockpiling, collection, handling and brokering, processing and production of other items from E-waste are taking place by using transect walk.

Sub Activity 2: Identification of E-waste and establishment of E-waste trade value chain

This activity will include identification of specific E-waste item and its tracer (CRT / Compressor / LCD screen / any other) followed by tracking of tracer's geographical movement within the identified geographical limits of the area to its final end of life, e.g. places where items are unloaded, traded, transported, dismantled, recycled, reused, repaired and disposed, using output of activity 1. The following steps are involved in field investigations.

- Step 1: Identify the E-waste streams of specific E-waste item
- Step 2: Identify the E-waste processes i.e. unloaded, treated, transported, dismantled, recycled, reused, repaired, and disposed.
- Step 3: Follow the E-waste tracer through the process in the E- waste stream by using tracer/ hazardous process walk.

A typical, E-waste trade chain will be established in a geographical context after verification of the tentative

trade value chain obtained as an output of activity 1 and activity 2. This superimposition of E-waste trade value chain on a map will facilitate spatial analysis.

Sub Activity 3: Estimate the E-waste and obsolescence rate/ average life through secondary data by following "approach and methodology upstream of demarcation" mentioned. By using secondary data e.g. market research data like market supply and imports data, installed base of the E-waste item. The key to estimate E-waste is fixing of obsolescence rate based on market research data, industry data or on consumer behaviour. Since obsolescence rate is dynamic in nature, therefore, a range is fixed with upper and lower limits. Carry out sensitivity analysis for E-waste inventory using upper and lower limits of obsolescence rate.

Sub Activity 4: Verification of obsolescence rate / average lifespan through primary data. The obsolescence rate / average life can be verified through identification of E- waste stream and E-waste processes and tracking of tracer item. The following steps are involved in tracer verification.

- Step 1: Identify the tracer item
- Step 2: Follow the tracer item through the process in the E-waste stream
- Step 3: Identify all the organized and unorganized market of a tracer in the geographical area.
- Step 4: Establish the extent of dismantling / recycling happening in a geographical boundary.

The primary survey methodologies used for tracer technique and outputs are described in Table 1.2.

Objective	Detail	Primary Survey Methodologies Output
WEEE / E- waste stream	Material flow	 Follow tracer materials: semi- Follow tracer materials: semi- Key-players are known (dealers, disassembly workers, recycler) quantities, quality, economics, and labor. Material flow (quantities / Labor in E-waste streams are identified
	Input quantities / Import	 Interviews with E- waste producers (manufacturers / retailers, auctions) to find out E-waste quantities Survey of key-players for import: structured questionnaires / interviews E-waste quantities
	Reuse	 Surveys of scrap dealers, retailers, ocomputer repair shops: structured interviews (using questionnaires) Quantities of reused entire equipment are estimated Quantities of reused equipment parts are estimated
	Disposal	 Sampling on different landfills Existence of E-waste fractions in landfills is known
Recycling technologies	Recycling technology	 Transect walks in different districts (semi-structured interviews) Applied recycling technologies are known Labor needed for different recycling processes is known
	Hazardous processes	 Semi-structured interviews in Hazards in different recycling processes districts, where potentially are identified hazardous processes.

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The structured and semi structured interviews can be conducted using questionnaires. The questionnaire has been developed to quantify and photo document each step in the E-waste value chain.

Sub Activity 5: Identify the products, by products and waste products and back calculate E-waste dismantled.

Identify products, by products and waste products. This can be carried out by using a combination of qualitative and quantitative estimations with the identified stakeholders across the value chain using photo documentation of sampled E-waste tracer. Using this data, back calculate to check the best fit scenario of E-waste inventory obtained as an output from activity 3. The output from back calculation should confirm the obsolescence rate / average life of E-Waste within the range used in activity 3. This obsolescence rate is used for calculating E-waste projections based on historical data.

Sub Activity 6: Establish E-waste trade economics

Each stakeholder in the dismantling processes is linked to the other and the trade between the two takes place based on profit. Therefore, the basic parameters driving this trade, which should be estimated, are as follows.

- 1. Input cost
- 2. Selling Price
- 3. Operating margin

Estimate input cost in terms of raw material cost / energy cost and labour cost. Estimate raw material cost / energy cost and labour cost using data collected from questionnaire add the two costs to arrive at input cost. Estimate selling price of the product by using data from questionnaire. Establish operating margin as the difference between selling price and input cost.

Sub Activity 7: Identify and assess the impacts

Identify the effluents / solid waste / emissions from each of the process. Establish their quantity if possible. Establish the geographical location of their discharge and history of the site. Classify impacts into environment, health and business impacts. Use relative ranking technique to quantify impacts. Relative ranking technique is based on scores where each sector i.e. health, environment and business are assigned with individual score subject to identified negative and positives impacts on the workers, surroundings and economy.

Activity 5: Compilation of draft & final reports.

Activity 6: Workshops in each division.

1.5 Format of the Report

This **Final Inventory Assessment Report** has been compiled in six chapters. The table of contents of each chapter is given below.

Chapter 1 Introduction and Background: Introduction; Objective of the Study as per ToR; Scope of Work (SoW) as per ToR; Approach and Methodology; Format of the Report.

Chapter 2 Policy & Regulatory Framework: Overview of Regulatory Framework; Policy, Regulations, their Scope and Institutional Responsibility; Reforms in Waste Management; E-waste and Environmental Legislation in India and Chhattisgarh.

Chapter 3 Assessment of E-waste Market: Introduction; E-waste Composition; Mechanism of E-waste Trade; Conclusions.

Chapter 4 Methodology for E-waste Inventory: Introduction; Methods for Inventory Assessment; Material Flow Chain, Data Sources and Data Gaps in Chhattisgarh; Constraints / Limitations and Selection of Methodology; Methodology / Approach & Instruments Used; Conclusion.

Chapter 5 E-waste Inventory Assessment: Introduction; Market Size Assessment of Electrical and Electronic Equipment (EEE) in Chhattisgarh; Obsolescence Rate / Average Life; E-waste Inventory; E-waste Processing in Chhattisgarh; Environmental Pollution; Market Risks; Conclusions.

Chapter 6 Conclusions & Recommendations: Regulations; E-waste Market; Methodology for Inventory Assessment; E-waste Inventory.

Chapter 2: Policy & Regulatory Framework

2.0 **Overview of Regulatory Framework**

E-waste management comes under the broad regulatory framework related to environment, foreign trade and local rules & regulations. A number of policy & regulatory initiatives have come into effect since 2006. The following sections describe the policy framework, relevant rules and regulations, which regulates E-waste management and emerging framework under extended producer responsibility (EPR). Further, their implications in the context of current situation in the study area have been described.

2.1 **Policy, Regulations and their Scope**

During the 1990s, Ministry of Environment & Forests (MoEF) adopted pollution control policy by formulating multi-pronged strategies in the form of regulations, legislations, agreements, fiscal incentives and other measures to abate pollution. National Environmental Policy, which was declared in 2006, identified pollution abatement as an important issue affecting human health and poverty. The policy focuses on optimizing resource efficiency and minimizing pollution loads. An analysis of policy statements reveals that there has been a gradual shift from simple pollution control to the pollution abatement leading to reduction, recovery and recycling. Policy states about strengthening informal sector through technological upgradation & incentivization. It states about promotion of segregation, reuse & recycling & benign disposal of waste. The policy further states involvement of private sector for hazardous waste management. The policy also focuses on optimizing resource efficiency and minimizing pollution loads. National Environment Policy clearly states about the need for preparation of guidelines & regulations for E-waste management in India.

2.1.1 E-Waste and Environmental Legislation in India

The Environment (Protection) Act 1986, an umbrella act also covers industrial waste and provides broad guidelines to address it. Under the umbrella act, a number of rules have been formulated to address hazardous waste like Hazardous Waste (Management Handling & Transboundary) Rules, Battery (Management & Handling) Rules & Bio Medical (Management & Handling) Rules. Specific laws for electronic waste have been notified in May 2011, effective from 1st May 2012 in the country. Further, India is also a signatory to international conventions like Basel Convention, whose provisions are applicable for export and import of E-waste. These provisions find expression in terms of Rules 13, 14, 15 & 16 of the HW (Management, Handling and Transboundary Movement) Rules, 2008. Therefore, there are two regulatory scenarios related to E-waste management as shown in **Table 2.1**. At first, E-waste (Management & Handling) Rules 2011 & Hazardous Waste (Management, Handling & Transboundary) Movement Rules 2008 have been described. This is followed by description of guidelines for implementation of regulations.

Table 2.1: E-waste Regulatory Scenario				
	anagement	Export & Imp	port of E-waste	
Regulations / Guidelines	Pre 1st May	Post 1st May	Pre 1st May	Post 1st May
	2012	2012	2012	2012
E-waste (Management & Handling) Rules 2011		\checkmark		
Hazardous Waste (Management, Handling & Transboundary) Rules 2008	\checkmark			\checkmark
Guidelines for Environmentally Sound Management of E-waste 2008	\checkmark	\checkmark		
Guidelines for Implementation of E-waste Regulations 2012	\checkmark	\checkmark		
Source: IRGSSA				

Table 2.1 clearly indicates that pre 1st May 2012 Hazardous Waste (Management Handling) Rules were used to regulate E-waste management. It is specifically relevant in case of E-waste recyclers, who got registered prior to 1st May 2012 & whose registration extends beyond this date.

CPCB data shows that as of September 2013, Chhattisgarh has M/s Navrachna Recycling Pvt. Ltd. & M/s ADV Metal Combine Private Limited has two E-waste dismantler / recycler, located at Rajnandgaon & Durg districts having a licensed. Therefore, this indicates that E-waste is either dismantled or recycled in both formal and informal sector in state because of their limited capacity.

2.1.2 E-Waste (Management and Handling) Rules, 2011

Salient features of the E-waste rules are given below.

- These rules are applicable to every producer(s), collection centre(s), dismantler(s), recycler(s), consumer(s) or bulk consumer(s) involved in the manufacture, sale, purchase and processing of electrical and electronic equipment or components as specified in Schedule-I. However, micro, small and medium enterprises are not covered under this regulation.
- The rules clearly define electrical and electronic equipment (EEE) and E-waste. Definition of E-waste categorizes them into two broad categories, i.e., IT and Telecommunication Equipment and Consumer Electrical and Electronics. As per Schedule-I of the rules, seventeen items have been specified under the IT and Telecommunication Equipment category and four items have been specified under the Consumer Electrical and Electronics category. The categories of E-waste covered under the rules are provided in Section 1.4 of Chapter 1.
- The rules also clearly define producers, bulk consumer, consumer, collection centre, transporter, dismantler and recycler. These form an integral part of material flow chain. The physical, financial & compliance responsibilities of each of the above stakeholders, as specified in the rules have been summarised in **Table 2.2** is given below.
- The rules provide direction to domestic EEE manufacturers/ producers to be RoHS (reduction in the use of hazardous substance) compliant within three years. It also allows imports of only RoHS compliant EEE.

Responsibilities		Producer	Consumer	Bulk Consumer	Collection Centre	Dismantler	Recycler / Reprocessor
Collection	Manufacturing	\checkmark					
	End of Life	\checkmark					
Take-back	Individual	\checkmark					
	Collectively	\checkmark					
Transportation to	Producer		\checkmark	\checkmark			
	Collection Centre	\checkmark	\checkmark	\checkmark			
	Dismantlers/ Recyclers	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	
	TSDF* Facility	\checkmark				\checkmark	
Storage					\checkmark	\checkmark	\checkmark
Financing		\checkmark					
Registration		\checkmark			\checkmark	\checkmark	
Filing of Annual Returns		\checkmark			\checkmark	\checkmark	\checkmark
Return of Annual Inventory Handled		\checkmark		\checkmark	\checkmark	\checkmark	\checkmark

Table 2.2: Responsibilities of Stakeholders for Collection, Transportation, Storage and Disposal of E-waste

Note: \sqrt{means} "Yes", TSDF means Treatment Storage and Disposal Source: IRGSSA

Table 2.2 indicates that producers' major responsibility for all the activities including financing of E-waste management. Since, the state has two registered dismantler & recycler with limited capacity, it indicates that producers may be fulfilling their responsibility through collection system catering to dismantlers & recycler outside the state.

Therefore, there is need to identify different producers, profile of consumers & bulk consumers & collection centre in the study area and dismantlers & recyclers who are catering to E-waste.

2.1.3 The Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008

The Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008, defines hazardous waste as "any waste" which by reason of any of its physical, chemical, reactive, toxic, flammable, explosive or corrosive characteristics causes danger or likely to cause danger to health or environment, whether alone or when on contact with other wastes or substances, and shall include:

- Waste substances that are generated in the 36 processes indicated in column 2 of Schedule I and consist of wholly or partly of the waste substances referred to in column 3 of same schedule.
- Waste substances that consist wholly or partly of substances indicated in Schedule II, unless the concentration of substances is less than the limit indicated in the same Schedule.
- Waste substances that are indicated in Part A or Part B of Schedule III in respect of import or export of such wastes in accordance with rules 12,13, 14, 15 and 16 or the wastes other than those specified in Part A or Part B if they possess any of the hazardous characteristics in Part C of that schedule.
- Schedule IV includes E-waste as item 18 in its list of hazardous wastes requiring registration for recycling/ reprocessing. This item covers components of waste electrical and electronic assemblies comprising accumulators and other batteries included on list A, mercury switches, activated glass cullets from cathode ray tubes and other activated glass and PCB-capacitors, or any other component contaminated with Schedule 2 constituents (e.g. cadmium, mercury, lead, polychlorinated biphenyl) to an extent that they exhibited hazard characteristics indicated in part C of this schedule.
- Rule 9 of Chapter III on procedures for recycling, reprocessing or reuse of hazardous waste states that the occupier generating hazardous waste specified in schedule IV may sell it only to recycler having a valid registration from the CPCB for recycling or recovery.

2.1.4 Basel Convention and its Application to E-waste

The Basel Convention defines waste by disposal destination or recovery processes. These various processes are listed in Anne IV of the Convention. For example, virtually any material that will be recycled or processed in order to reclaim a metal, or to reclaim an organic or inorganic substance for further use, is deemed a waste. Electronic components that are used without further processing are likely to not be defined as a waste. The convention has provided for two lists. List A found in Annex VII is presumed to be hazardous and thus covered by the Basel convention; and list B, found in Annex IX, is presumed to be non-hazardous and thus not subject to Basel convention. The waste listed in list A is waste that poses serious threats to environment and human health. As a result of their adverse effects these substances require special handling and disposal processes.

The Basel Annex-VII hazardous waste lists the following applicable entries to e-waste:

A1010 Metal wastes and waste consisting of alloys of any of the following: antimony, arsenic, beryllium, cadmium, mercury, selenium, tellurium, thallium.

A1020 Waste having as constituents or contaminants, excluding metal waste in massive form, any of the following: antimony compounds, beryllium, beryllium compounds, cadmium, cadmium compound, lead, lead compounds, selenium, selenium compounds, tellurium, tellurium compound.

A1030 Wastes having as constituents or contaminants any of the following: arsenic, Arsenic compounds, mercury, mercury compound, thallium, thallium compounds.

A1160 Waste lead-acid batteries, whole or crushed.

A1170 Unsorted waste batteries excluding mixtures of only list B batteries. Waste batteries not specified on list B containing Annex I constituents to an extent to render them hazardous. [Note: List B batteries include: waste batteries conforming to a specification, excluding those made with lead, cadmium or mercury]

A1180 Waste electrical and electronic assemblies or scraps containing components such as accumulators and other batteries included on list A, mercury- switches, glass from cathode ray tubes and other activated glass and PCB- capacitors, or contaminated with Annex 1 constituents (e.g. cadmium, mercury, lead, polychlorinated biphenyl) to an extent that they exhibit hazard characteristics contain in Annex III.

A2010 Glass waste from cathode ray tubes and other activated glass destined for direct reuse and not for recycling or final disposal.

It is also important to note that the Basel convention's list B includes:

B1110 Electrical and electronic assemblies (including printed circuit board, electronic components and wires) destined for direct reuse and not for recycling or final disposal.

From the above we can conclude that at the very least, circuit board, CRTs, and other electronic boards or components and assemblies containing lead based solders and copper beryllium alloys (which include most computer circuit boards and much other electronic equipment), are hazardous wastes according to Basel convention. Likewise, whole, used, discarded computers, printers, and monitors that contain such circuit boards or CRTs that are not to be reused directly are to be considered as hazardous waste and subject to the Basel convention.

The provisions of Basel Convention & its provisions under Hazardous Waste Rules are not applicable currently in Chhattisgarh unless export and import of E-waste is carried out by any registered dismantler / recycler. Therefore, they have been described considering E-waste management intervention in future.

2.1.5 Guidelines for environmentally sound management of E-waste, 2008

Guidelines for environmentally sound management of E-waste have been formulated by CPCB in 2008, which provide broad framework to recyclers and regulators on the technologies as well as issues related to compliance.

The objective of these Guidelines is to provide guidance for identification of various sources of waste electrical and electronic equipments (E-waste) and prescribed procedures for handling E-waste in an environmentally sound manner.

These Guidelines are reference document for the management, handling and disposal of E-wastes. These are intended to provide guidance and broad outline, however, the specific methods of treatment and disposal for specific wastes needs to be worked out according to the hazardous / risk potential of the waste under question. These Guidelines provide the minimum practice required to be followed in the management of E-wastes and the State Department of Environment or State Pollution Control Board may prescribe more stringent norms as deemed necessary.

These Guidelines shall apply to all those who handle e-waste which includes the generators, collectors, transporters, dismantlers, recycler and stakeholders of E-wastes irrespective of their scale of operation

These guidelines under classification of E-waste, describe Composition of E-waste; Components of E-waste; Possible hazardous substances present in E-waste; E-waste scenario; Basis of Defining E-waste; Proposed definition of E-waste; Reduction of the Hazardous Substances (RoHS) in the Electronic & Electrical Equipments and Extended Producer Responsibility (EPR). It gives guidelines for environmentally sound

management for E-waste. Under this head, it describes E-waste Composition and Recycle Potential; Assessment of Hazardousness of E-waste; Recycling, Reuse and Recovery Options; Treatment & Disposal Options and E-waste Recycling / Treatment technologies in India.

Further, it describes environmentally sound treatment technology for E-waste, consisting of description of environmentally sound E-waste treatment technologies; Environmental Impacts of the 1st, 2nd and 3rd level E-waste treatment system; Technology Currently used in India; Best available technology and Available operating facilities. Lastly it describes guidelines for establishment of integrated E-waste recycling & treatment facility consisting of Facility operation requirements; Procedures for setting up & management of integrated E-waste facility and Procedures for compliance with the existing regulations and guidelines.

In the context of current study, these guidelines provide guidance related to assessment of current handling practices, storages & channelization of E-waste in the study area as per SoW.

2.1.6 Guidelines for Implementation of E-waste Rules, 2011

MoEF/CPCB after consulting various stake holders felt the need for preparing a guidance document for implementation of the provisions of the E-Waste (Management & Handling) Rules, 2011 that may help the Producers, Consumer & Bulk Consumer, Collection Center, Dismantler, Recycler and Regulatory agencies (SPCBs/PCCs) for effective compliance / implementation of these rules. This document also provides guidance on setting up collection mechanism, dismantling and recycling operations. Further, guidelines also clarifies issues related to RoHS e.g. the rules call for the reduction in the use of hazardous substances in electrical and electronic equipment. Every producer of equipment listed in Schedule 1 of the Rule shall ensure that the covered products do not contain lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls or poly-brominated di-phenyl ethers above a specified threshold. The threshold for cadmium is 0.01% by weight in homogeneous material, for all other substances, the threshold is 0.1% by weight in homogeneous material.

1. Clarification regarding definitions

- **Producer** is any person who, irrespective of the selling technique used, "manufactures and offers to sell electrical and electronic equipment under his own brand; or offers to sell under his own brand, assembled electrical and electronic equipment produced by other manufacturers or suppliers; or offers to sell imported electrical and electronic equipment" and has to take authorization under these Rules for implementation of EPR.
- **Bulk Consumers** are bulk users of electrical and electronic equipment such as central government or state government departments, public sector undertakings, banks, educational institutions, multinational organizations, international agencies and private companies that are registered under the Factories Act, 1948 and Companies Act, 1956; they have to maintain records on E-waste generated and channelized to registered/authorized collection centres / recycler / dismantler.
- **Extended Producer Responsibility** is a responsibility of any producer of electrical or electronic equipment, for their products beyond manufacturing until environmentally sound management of their end of life products.
- Collection Centre is a centre established individually or jointly or a registered society or a designated agency or a company or an association to collect E-waste which has to obtain authorization under E-Waste Rules, 2011.
- **Dismantler** is any person or registered society or a designated agency or a company or an association engaged in dismantling of used electrical and electronic equipment into their components who has to obtain authorization and registration E-Waste Rules, 2011. The association may include a consortium as well.
- Recycler is any person who is engaged in recycling or reprocessing of used electrical and electronic

equipment or assemblies or their component. Recycling facility may be set up by an individual or a company or a joint venture or a consortium.

• **SPCBs / PCCs** have been given the responsibility as regulatory agencies for ensuring implementation of the E-waste Rules in their respective States.

2. Clarification regarding scope and requirements for compliance to EPR:

- Producers intending to sell their EEEs listed in Schedule-I are required to take authorization only in the place where their manufacturing facilities and corporate head offices are located. In case, of producers importing EEEs listed in Schedule-I, authorization may be taken from SPCB of the State where the port of landing is located.
- Since these products are sold across the country, SPCB/PCC concerned granting the authorization would inform the CPCB of the details of the authorization granted. CPCB would maintain a centralized database on their website, which will be available to all stakeholders. Producers will also place this information on their website and provide details of products sold to the SPCB from whom they have obtained authorization. SPCBs will provide consolidated information to CPCB on an annual basis which CPCB will maintain on the centralized database.
- In the application for authorization, it should be clearly mentioned, how the producer would ensure channelization of the E-waste at the end of its life; details of his own collection centres or take-back systems or the collection centres authorized by him, shall be specified.
- As per the EPR under the Rules, the producers are required to achieve 100% collection and channelization of the end of the life equipment. However, for the purpose of monitoring, targets need to be fixed. Such targets should be based on the life of the product, type of the product, usage and consumption patterns and other relevant factors. CPCB will, therefore, set up a Committee, which will examine the issue of fixing targets, based on the aforesaid factors and also taking into consideration the level of compliance achieved during the first two years.
- Producer who has manufacturing facility shall comply with prevailing environmental regulations under Water (P&C) Act, 1974, Air (P&C) Act, 1981, Hazardous Waste (M, H&TM) Rules, 2008 and other relevant regulations. In the case of a manufacturer, who has obtained authorization under the Hazardous Waste (Management, Handling & Transboundary Movement) Rules, 2008 need not take separate authorization under the e-waste rules till the validity/expiry of that authorization. Subsequent authorization has to be taken under the E- waste rules, 2011 to ensure that electronic scraps, rejects etc. generated during the manufacturing shall be sent or channelized to registered E-waste recycling facilities. Such producer shall obtain authorization only from SPCB/PCC of the State where the manufacturing facility is located.
- The producer is required to maintain records in form 2 along with the details of the e-waste handled/generated and has to submit the annual returns in form 3 in accordance with Rule 4(9) of these Rules.
- Producer shall finance the EPR system either by setting up individual collection system or by joining a common collection system by authorizing them.

Scope of EPR for the Producer:

- i. Producer may assess their individual requirements and design a collection or product take back system as they deem appropriate as long as it facilitates channelization of E-waste for environmentally sound management.
- ii. Producer may arrange for collection from both, individual and bulk consumers and channelize the waste to collection centres or recyclers/dismantlers.
- iii. The producer may opt to implement EPR on his own individually or collectively. There can be two

distinct models; (i.) individual producer responsibility where producer implements EPR managed on his own by setting up his own authorized collection centres or (ii.) collective producers responsibility, where producers may authorize common collection centres (CCC) independently or by joining a consortium as a member. Producers importing EEE listed in schedule – I, may take authorization from the State where the landing port is located

iv. In the E-waste rules, the logo has been printed without a bar below the symbol, whereas the present practice commonly followed by the producer, the Logo has a bar below the symbol. Logo without the bar below the symbol and the logo with bar below the symbol as shown below are acceptable. Symbol may be placed on the products or printed in the accompanying product documentation.



- v. As per Rule 4(6) of the E-waste Rules, 2011 the producer is responsible for creating awareness for the consumer about the product that has been placed on the market. The information should essentially convey the message for the compliance under the rules and the responsibility undertaken by the producer on safe handling and disposal of the end-of-life product. Various modes for creation of awareness such as publications, advertisements, posters, information booklets, use of Television, radio, newspaper etc., could be adopted for communicating the information. The details of awareness programs under taken shall be provided to SPCBs/PCCs while submitting annual returns as per Form 3.
- vi. Under Rule 4(5) it is mandatory for the producer to publicize the contact details of the authorized collection centres and collection points or their collection mechanism to the consumers and such information should be periodically updated. The detailed information should comprise of the full address, telephone number, fax number e-mail etc for each State. The helpline number (like call centre) may also be publicized so that the consumer can reach the nearest collection centre from where he/she is located.
- vii. Awareness is essential regarding the hazardous constituents present in the equipment as well as the safe handling and disposal of the product after its use. In case of the products complying with the provisions of rule 13(1), the same should be indicated in the product information booklet.
- viii. Producer may manage a system directly or with a help of any professional agency on his behalf for collection and channelization system of E-waste by involving relevant stakeholders such as consumer, bulk consumer, NGOs, informal sector, resident associations, retailers, dealers, etc.
- ix. The scope of implementing the EPR by the producers is also explained in the schematic diagram given in **Figure 2.1**.



Figure 2.1: Scope of implementing EPR for Producers Source: E-waste Regulation Guidelines 2012

3. Clarifications regarding Collection Centres

A collection centre is a store/warehouse where the E-waste collected from consumers, bulk consumers, urban local bodies and retail outlets/collection-points/collection-bins/mobile-units etc. established by producers or collection centres, can be received and stored safely for necessary channelization for dismantling/recycling. These guidelines suggest the following options and requirements for setting up Collection Centres;

- i. Collection centres can be established by various ways. If a collection centre is set up for a particular producer, it may be called individual collection centre. If a collection centre caters the EPR requirements of multiple producers it may be called common collection centre. All collection centres require authorization from SPCBs / PCCs of respective States.
- ii. In case a producer himself sets up a collection centre, he shall take separate authorization from SPCBs / PCCs for setting up such individual collection centre.
- iii. Producer may organize take-back system through their retailers or through service centres and set up collection points or bins or drop-off points and link them to their authorized individual collection centres. Such collection points can also be set-up by authorized common collection centres.
- iv. Producer may organize take-back system through their retailers or service centres and set up collection points or bins and channelize the E-waste directly to registered dismantlers or recyclers.
- v. The collection points can be designated places where E-waste can be collected through residential areas, office complexes, commercial complexes, retail outlets, customer care stores, educational and research institutions, resident welfare associations (RWAs), NGOs working with rag pickers, etc. These collection points can be financed by producers or common collection centres (on behalf of producers) to channelize the E-waste to registered dismantler or recyclers. The E-waste collected through these points should be transported to collection centres or registered dismantling or recycling plants within a stipulated time period as per rule 12. These collection points do not require taking authorization from SPCBs/PCCs.
- vi. Collection Bins could be installed in public places such as kerbsides, restaurants, malls, offices etc. which can be owned by the authorized collection centres or the producer. The contact details of authorized collection agencies should be printed on these bins for reference purposes of the general public. The E-waste collected in these bins should be transported to collection centres or channelized to registered dismantler or recyclers by the producers. These collection Bins do not

require authorization.

- vii. Mobile collection vans can also act as collection systems for door to door collection of E-waste or from institutions / individuals / small enterprises and such vans shall be linked to collection centre or provided by producer to channelize the E-waste to collection centres or registered dismantler or recyclers. A mobile collection van does not require authorization but their detail has to be provided to SPCBs / PCCs while seeking authorization by the producers or collection centres.
- viii. SPCBs shall ensure that authorized collection centres comply with the provisions of the Rules and ensure that the E-waste collected by them is stored in a secured manner and no damage is caused to the environment during storage and transportation till the e-waste reaches registered dismantler (s) or recycler (s) by undertaking periodic inspections and verifications
- ix. The Rules specify that Collection Centres are allowed to store E-waste for a maximum period of 180 days. However, this period may be extended up to one year in the exceptional cases with genuine reasons when the Collection Centres are located in the States, which do not have any registered dismantling or recycling facility and are unable to send the e-waste for recycling within the stipulated time period.

The criteria for setting up collection centres are

- i. The collection, transportation, storage and handling of E-Waste in the collection centres has to be done carefully without breaking the end of life equipments.
- ii. Collection centers, established under these Rules, need not seek Consent to Establish and Consent to Operate under the Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981.
- iii. Producers who has pan India presence having large number of distributors/dealers in each of the State and has large warehouses already in place can use the space if available in these ware house for establishing collection centre. However, the space used for collection centre has to be clearly demarcated (by enclosure or partition) from the space meant for new goods.
- iv. The storage capacity of any collection centre should be commensurate with available area, volume of operations (in weight) and type of E-waste.
- v. The collection centre where Refrigerator and Air conditioners are also stored should have adequate facilities for handling / arresting leakage of compressor oils, CFCs/HCFCs if any.
- vi. Covered shed/spaces may be used for storage of E-Waste generated from IT and Telecommunication equipments while open spaces can be used for storage of refrigerators / washing machines /air conditioners. In case of storage of E-waste, generated from IT and Telecommunication equipment, in open spaces, containers with lids/covers may be used. E-waste comprising of IT & TE waste preferably be segregated and stored at collection centre in suitable racks/containers/bins.
- vii. Containers of appropriate size and shape may be used for segregation of E-waste items generated from IT and Telecommunication equipments to facilitate effective collection and handling operations. Containers can be made either of wood or plastic or mild steel or any appropriate material with sufficient strength and shapes (top open containers, caged boxes, rakes etc.) for holding the E-waste. These containers/racks may be placed in such a way that there should be adequate space for movement of workers and material.







viii. Producer can assess their individual requirements and design a collection or product take back systems as they deem appropriate as long as it facilitates channelization of WEEE for environmentally sound management.

4. Clarification regarding E-waste Dismantler

As per these rules any person or registered society or a designated agency or a company or an association can engage in dismantling of end of life electrical and electronic equipments into their components by obtaining registration and authorization from the respective SPCB/PCC.

- Dismantling operation can be manual, semi manual and automatic involving physical segregation operations for plastics, glass, steel, non-ferrous material, wires, gases, liquids and printed circuit boards. Dismantlers may perform the following operations.
 - 1. Decontamination
 - 2. Manual dismantling using appropriate tools, PPEs and dust control equipment.
 - 3. Hammering
 - 4. Shredding
 - 5. Segregation and
 - 6. Specialized separation processes
 - a) CRT cutting into funnel and panel including removal of phosphor coating from the panel as well as lead paste binding the panel with the funnel.
 - The first step is to decontaminate E-waste and render it non-hazardous by separating hazardous components and materials. Hazardous electronic components such Hg switches, Poly Chlorinated Biphenyl (PCBs) etc. can be recovered and sent to TSDFs for treatment and disposal. In case of refrigerators and air conditioner, the refrigerant gases such as chlorofluorocarbon (CFCs), hydrochlorofluorocarbons (HCFCs) etc. can be collected by using gas recovery equipment for their recovery and storage. The refrigerant gases may be re-used or may be diposed by thermal destruction adopting any of the following options:
 - i. By incineration in existing common HW incinerators
 - ii. By co-processing in cement kiln
 - iii. By plasma destruction
- Dismantling operations shall not include Fine grinding / wet shredding / wet grinding operations. Dismantling operations shall not be permitted for chemical leaching or heating process or melting the material. Dismantlers shall not shred segregated LCDs.
- Dismantler shall have adequate facilities for disposal of bag filter residue and floor cleaning dust in secure manner or shall obtain membership with TSDF for safe disposal.
- Dismantlers can be permitted shredding or cutting of printed circuit boards not below the size of 20mm which have to be handled by employing minimal manual handling and with adequate air pollution control systems.

5. Clarification regarding E-waste Recyclers

As per these rules any person who is engaged in recycling or reprocessing of used electrical and electronic equipment or assemblies or their component is a recycler. Recyclers may also set up their own authorized collection centres and may establish linkages with producers/bulk generators/other collection agencies. They may also establish a scheme for household collection of e-waste or may establish tie–ups with other agencies involved in collection of E-waste from individual consumers.

The functions of the recycling facilities are similar to the dismantlers but implements high degree technologies for recycling or recovery operations. There shall be no restriction on degree of operations that can be permitted for recyclers. The following processes can be employed by recyclers;

- 1. Manual / semi-manual / automatic dismantling operations
- 2. Shredding / crushing / grinding / enrichment operations
- 3. Pyro-metallurgical operations Smelting furnace
- 4. Hydro metallurgical operations

- 5. Electro-weaning
- 6. CRT cutting
- 7. Toner cartridge recycling
- 8. Melting, casting, molding operations (for metals and plastics)
- A recycling facility can be permitted to receive any kind of E-waste covered under E-waste Rules.
- The recycling facilities shall comply with the requirements as specified for dismantlers in the above section for the operations specified therein.
- A recycling facility shall install adequate waste water treatment facilities for process wastewater and air pollution control equipment depending on type of operations undertaken.
- Suitable space de dusting equipment shall be installed where manual dismantling, shredding operations are carried out.
- Suitable fume hoods connected with bag dust collectors followed by wet (chemical) scrubbers shall be installed for control of fugitive emissions from furnaces or chemical reactor fumes.
- In additions to dismantling operations, recyclers may adopt suitable technologies for shredding, wet grinding, gravity / magnetic/density/eddy current / electromagnetic separators with adequate air pollution control equipment. It shall be ensured that dust control equipment comprises of mechanical dust collectors followed by fabric filters or two stage fabric filters or fabric filter followed by wet (chemical) scrubbers.
- Adequate facilities for onsite collection and storage of bag filter residues, floor cleaning dust and other hazardous material shall be provided and sent to secure land fill facility by obtaining membership with TSDF operator.
- The degree of refining and % recovery of resource or precious material present in the Ewaste shall be given due importance.

6. Clarification regarding Recycling of CRT Monitor and TVs

- Large volumes of CRTs are expected to be generated in coming years. Care should be taken for recycling of CRTs as it contains harmful substances.
- CRT monitors and TVs can be manually removed from plastic/ wooden casing. The CRT is split into leaded funnel and unleaded panel glass using different splitting technology in a closed chamber under low vacuum environment and the funnel section is then lifted off from the panel glass section and the internal metal gasket is removed for facilitating the removal of internal phosphor coating.
- The CRT can be split manually adopting Ni-Chrome hot wire cutting, Diamond wire method or Diamond saw separation
- Manual shredding, cutting, and segregation operations for CRTs should be carried out in vacuum chambers where the dust is extracted through cyclones, bag filters, ID fan and a suitable chimney. The operators should use gloves fixed to the walls of the vacuum chamber while handling CRTs as shown in the figure below.





- The internal phosphor coating from the inner side of panel glass is removed by using an abrasive wire brush and collected separately. The extracted air is cleaned through high efficiency bag-filter system to collect the phosphor dust. The phosphor dust so collected in the filter bags should be sent to TSDF.
- Segregated CRTs can also be shredded in automatic shredding machines connected with dust control

systems. The mixed shredded glass is separated into leaded glass and glass cullet using electromagnetic field or by density separation.

7. Clarification Regarding Bulk Consumers

- As per these rules a bulk consumer has to ensure that the e-waste generated by them have to be channelized to authorized collection centres or registered dismantler or recycler or is returned to the producer through its pick up or take back services or through its collection points.
- The bulk consumer has to maintain records of e-waste generated by them in Form 2 and make such records available for scrutiny to SPCBs / PCCs whenever demanded.

8. Clarification regarding reduction in the use of Hazardous Substances (RoHS) in the manufacture of electrical and electronic equipments:

The e-waste rules specifies limit for hazardous substance in the components of electrical and electronic equipments. The limits are detailed below

- i Every producer of electrical and electronic equipments as per Schedule I shall ensure that new electrical and electronic equipments should not have concentration value more than 0.1% by weight in homogenous materials for Lead, Mercury, Cadmium, Hexavalent Chromium, Polybrominated biphenyls or polybrominated diphenyl ethers and for Cadmium more than 0.01% by weight in homogenous materials. The above maximum concentration limit should be achieved before 01-05-2014. The above limits will not apply to components of electrical and electronic equipment manufactured or placed in the market six years before the date of commencement of these rules. The above limits will also not apply to applications listed in Schedule II of the e-waste rules and electrical and electronic equipments used for defense purpose.
- ii Import or placement in the market for new electrical and electronic equipment shall be permitted only for those equipment which are RoHS compliant.
- iii Components of electrical and electronic equipment manufactured or placed in the market before the date of 01-05-2014 are exempted from above provisions.
- iv The reductions have to be achieved before 1 May 2014 i.e. within two years from the dates of commencement of these rules. Certain applications listed in Schedule II are exempted from the above requirement and there is also an exemption for components of electrical and electronic equipment manufactured or placed in the market six years before the date of commencement of the reduction.

9. Clarification regarding interstate transportation or E-waste

- Transportation of e-waste, being sent for dismantling or recycling to a facility in a State other than the State, where it is generated or collected, does not require 'No objection certificate' from the SPCBs/PCCs concerned.
- However, Transporter of the E-waste is required to give prior intimation to the SPCBs/PCCs concerned i.e. the States in which the E-waste is generated, transited and being sent for the purpose of recycling or dismantling.

10. Clarification Over-all Compliance Mechanism

A compliance mechanism has been set out in E-waste Rules for producers, collection centers, consumer, bulk consumers, dismantler, recyclers and the regulatory authorities (SPCB's, PCCs, CPCB and MoEF). It also sets out the responsibilities for producers to finance and organize the take back and recycling system. However, while ensuring that the given compliance mechanism is followed the same be can be visualized in the following schematic flow sheet given in **Figure 2.2**.





2.2 Institutional Structure

The Ministry of Environment and Forests, Government of India, is the nodal agency at the central level for policy, planning, promoting and coordinating the environmental programs. A number of enforcement agencies assist the Ministry of Environment and Forests at the state level in executing the assigned responsibilities. The Central Pollution Control Board (CPCB) advises on the policy and enforcement. State Pollution Control Boards (SPCB) carry out the enforcement at the state level. The roles & responsibilities of different agencies under E-waste rules are provided in **Table 2.3**.

Sr. No.	Authority/(ies)	Duties
1.	Central Pollution Control Board, Delhi	 i. Coordination with State Pollution Control Boards/ Committees of UT ii. Preparation of Guidelines for Environmentally Sound Management of e-waste iii. Conduct assessment of e-waste generation and processing iv. Recommend standards and specifications for processing and recycling e-waste v. Documentation, compilation of data on e-waste and uploading on websites of CPCB vi. Conducting training & awareness programmes. vii. Submit Annual Report to the Ministry. viii. Any other function delegated by the Ministry under these rules. ix. Enforcement of provisions regarding reduction in use of hazardous substances (RoHS) in manufacture of electrical & electronic equipment. x. Initiatives for IT industry for reducing hazardous substances. xii. Set targets for RoHS compliance in manufacture of electrical & electronic equipment. xii Incentives and certification for green design/products
2.	State Pollution Control Boards/ Committees of Union Territories	 i. Inventorization of e-waste. ii. Grant & renewal of Authorization iii. Registration of recyclers of e-waste iv. Monitoring compliance of authorization and registration conditions v. Maintain information on the conditions imposed for authorization etc. vi. Implementation of programmes to encourage environmentally sound recycling vii. Action against violations of these rules

Table 2.3: List of Authorities and Corresponding Duties as per E-waste (Management and Handling) Rules, 2011

Sr. No.	Authority/(ies)	Duties
		viii. Any other function delegated by the Ministry under these rules
3.	Urban Local Bodies (Municipal Committee/Council/C orporation)	(i) To ensure that e-waste if found to be mixed with Municipal Solid Waste is properly segregated, collected and is channelized to either authorized collection centre or dismantler or recycler.(ii) To ensure that e-waste pertaining to orphan products is collected and channelized to either authorized collection centre or dismantler or recycler.

Source: E-waste Rules 2012

The roles and responsibilities of different agencies related to hazardous waste and its export and import is given below in Table 2.4.

Sr. No.	Authority/(ies)	Duties and Corresponding Rule
1.	Ministry of Environment and forests, under the Environment (protection) Act, 1986	 i. Identification of hazardous wastes ii. Permission to exporters of hazardous wastes iii. Permission to importers of hazardous wastes. iv. Permission for transit of hazardous wastes through India. v. Sponsoring of training and awareness program on Hazardous Waste and Management related activities.
2.	Central Pollution Control Board constituted under the Water (Prevention and Control of Pollution) Act, 1974	 i. Coordination of activities of the State Pollution Control Boards/ committees. ii. Conduct training courses for authorities dealing with management of hazardous substances. iii. Recommend standards for treatment, disposal of waste and leachates. Recommend procedures for characterisation of hazardous wastes. iv. Sector specific documentation to identify waste for inclusion in Hazardous Wastes (Management, Handling and transboundary Movement) Rules 2008. v. Prepare guidelines to prevent/ reduce/ minimize the generation and handling of hazardous wastes. vi
3.	State Government/ Union Territory Government and Administration	 VI. Any other function under rules delegated by MoEF. i. Identification of site (s) for common hazardous waste treatment, storage and disposal facility (TSDF). ii. Assess EIA reports and convey the decision of approval of site or otherwise. iii. Acquire the site or inform operator of facility or occupier or association of occupiers to acquire site. iv. Notification of sites v. Publish periodically an inventory of all disposal sites in the state/union territory
4.	State Pollution Control Boards constituted under the Water (Prevention and Control of Pollution) Act, 1974	 i. Inventorization of hazardous waste ii. Grant and renew authorization iii. Monitor the compliance of the various provisions and conditions of authorization including conditions of permission for issued by MoEF exports and imports. iv. Examining the applications for imports submitted by the importers and forwarding the same to MoEF. v. Implementation of programs to prevent/ reduce/ minimize the generation of hazardous wastes. vi. Registration and renewal of registration of Recyclers/ Re-Processors. vii. Action against violations of Hazardous Wastes (Management, Handling and Transboundary Movement) Rules 2008. viii. Any other function under these rules assigned by MoEF from time to time.
4.	Directorate General of Foreign Trade constituted under the Foreign Trade (Development & regulation) Act 1992	 Grant licence for import of hazardous wastes Refuse licence for hazardous wastes prohibited for imports and exports.

Table 2.4: The authority, duties and corresponding rule as per Schedule VII of the HW Rules, 2008

Sr. No.	Authority/(ies)	Duties and Corresponding Rule
5.	Port Authorities under	i. Verify the documents
	Indian Port Act 1908 and	ii. Inform the ministry of Environment and Forests, Govt. of India of
	Customs Authorities under	any illegal traffic
	the customs Act, 1962	iii. Analyze wastes permitted for imports and exports.
		iv. Train officials on the provisions of the Hazardous Wastes Rules and
		in analysis of hazardous wastes.
		v. Take action against export/import Acts, 1908/ Customs Act 1962.
-		

Source: Hazardous Waste (Management, Handling & Transboundary) Rules 2008

Applicability of E-waste Rules is given in Table 2.5.

Table 2.5: E-Waste (M&H) Rules - 2011 applicability									
Sr. No.	Type of Applicant	To Maintain Records	To Maintain Record in Form -2	Filling Annual Return in Form - 3	Authorization Form-I	Registration Form-IV	RoHS Compliance		
1. Consumer		X	X	Х	Х	Х	Х		
2. Bulk Consumer			\checkmark	Х	Х	Х	Х		
3. Urban Local Bodies			X	X	X	X	Х		
4. Collection Centre						X	X		
]	Producer –offer to			\checkmark		Х			
5. s	ell								
6.1	Producer - importer					Х			
7. I I	Producer - Manufacturing EEE	√ √				Х			
8.1	Dismantler						Х		
9.1	Recycler					\checkmark	Х		
Source: E-waste Rules guidelines									
X = Not applicable				= Applicable					

Clarification of the role of State Pollution Control Boards as per E-waste Guideline 2012.

- SPCB/PCC shall also ensure that Producer having manufacturing facility or corporate head office in their State shall obtain authorization. SPCB/PCC shall also ensure that a Producer having their port of landing of imported equipments in their State obtains authorization.
- Shall ensure that manufacturer has set-up adequate collection mechanism to cater the collection needs from entire State.
- The number of collection centres or take-back systems may depend on quantum of sales, number of urban centres in that State.
- The authorization granted to each producer shall be evaluated on case to case basis depending on their proposed EPR implementation scheme. The details of EPR with respect to authorized collection centres, collection points, take-back systems, authorized recyclers, authorized dismantlers and details of agreement between producers, authorized collection centre, dismantler and recycler are required for evaluation.
- Shall ensure that the collection centres, who have applied for authorization, should have adequate space for storing the quantity of e-waste for which application has been made.
- Shall ensure that adequate numbers of containers proportionate to the applied capacity are available for storing e-waste.
- Shall ensure that collection centre should not store e-waste for a period exceeding one hundred and eighty days. The storage period may be extended to one year in those States which do not have any registered dismantling and recycling facility or in such cases where the e-waste needs to be stored for development of a process for its recycling or reuse.
- Shall ensure that collection centre should have arrangement in place for transferring the e-waste to the registered dismantler or recycler.
- Shall ensure that dismantlers and recyclers who have applied for authorization and registration, possess appropriate facilities, technical capabilities and equipment to handle e-waste safely. The land may be owned by the dismantlers/recyclers or could be on lease.

- SPCBs/PCCs shall ensure that no one starts dismantling or recycling of e-waste without having prior permission (registration and authorization) to do so from SPCBs/PCCs.
- Shall ensure that dismantler and recyclers should have appropriate equipments for dismantling and recycling of e-waste.
- Grant of registration for dismantling and or recycling has to be evaluated on case to case basis depending on their capacity and level of operation. The SPCBs/PCCs should ensure that dismantler should not exceed their mandate for processing any e-waste for recovery or refining of materials.
- SPCBs/PCCs shall ensure that dismantlers have well set mechanism for providing dismantled material to recyclers. Action Plan for channelizing the disposal of dismantled component in an environmentally sound manner has to be provided by dismantler.
- SPCBs/PCCs shall ensure that dismantlers/recyclers should be members of TSDF.
- SPCBs/PCCs shall ensure that dismantlers/recyclers should file their annual returns within the stipulated time period.
- SPCBs/PCCs shall place on their web site the conditions imposed on the collection centre, dismantler and recycler while granting authorization and registration and ensure that these conditions are strictly met with by the facility concerned.
- SPCBs/PCCs should regularly monitor the compliance of authorization and registration.

Role of Municipal Authorities

- There is possibility of mixing of e-waste with municipal solid waste. In such cases, the Urban Local bodies (Municipal Committees/ Councils/ Corporations) are required to ensure that E-waste if found to be mixed with MSW is properly segregated, collected and is channelized to either authorized collection centre or dismantler or recycler.
- The Urban Local bodies (Municipal Committees/Councils/ Corporations) are also required to ensure that e-waste generated from non branded or assembled electrical and electronic equipment as specified in Schedule I is collected and channelized to either authorized collection centre or dismantler or recycler. The ULBs are also required to collect E-waste generated from those EEEs which are covered under the rules and produced by a company, which has closed its operation or has stopped product support.
- ULBs may also set up their own collection points at MSW disposal site, public places; residential locality etc to collect the E-waste and such collection points shall be connected to authorized collection centres/dismantlers/recyclers.

2.3 Overall Assessment with respect to Emerging Regulatory Scenario

Major conclusions drawn from regulatory assessment having implications an E-waste management in the state are given below.

National Environment Policy 2006

National Environment Policy 2006 provided overall guidelines on waste management including E-waste. These provided road map for preparation of guidelines and regulation policy. At first guidelines came into effect in 2008, which provided a minimum practice required for environmentally sound management of E-waste.

Guidelines Environment sound Management of E waste

These guidelines also provided the basis for amendment of Hazardous Waste (Management, Handling & Transboundary Movement) Rules 2008 & E-waste was included as part of Schedule IV. This development brought E-waste recycling into the ambit of hazardous waste regulations and facilitated control of export & import of E-waste. A number of E-waste recyclers got registered under these rules indicating the part formalization of the E-waste trade value chain but diversion less than 5% of the E-waste generation to these recyclers paved the way for separate E-waste regulation based on EPR.

E-waste (Management & Handling) Rule 2011

In 2011, new E-waste (Management & Handling) Rules were notified, which came into effect in 2012. These rules were formulated in close consultation with producers & their associations and other stakeholder. Some of the major features of this regulation having implication on E-waste inventory assessment are given below.

- No target has been fixed to collect E-waste from the time of enforcement. Producer is not bound by any collection target.
- There are no mandatory provisions for producers in the rules to declare quantity of EEE placed in the market since 2012.
- No mechanism for tracking purchase of EEE by bulk consumers exists.

Draft E-waste (Management & Handling) Rules 2016

Draft E-waste (Management & Handling) Rules have been disclosed and are expected to be notified any day. These rules have been formulated in close consultation with major stakeholders in E-waste trade value chain. Some of the major features of this regulation having implication on E-waste inventory assessment are given below.

- All the above three points (1, 2 & 3) have been addressed in the draft rules.
- Draft rules recommend financial mechanism to address financial implications for E-waste management.
- Responsibilities of Consumers especially bulk consumers have been increased.

2.4 Conclusions

None of the major brands manufacturing / importing items mentioned in Schedule 1 of the E-waste rules have manufacturing facilities or corporate head offices located in Chhattisgarh Therefore, monitoring of E-waste inventory through evaluation of Form 2 or Form 3 in accordance with Rule 4(9) of E-waste Rule by CECB in the state is possible only through the producers data obtained from centralized agency e.g. CPCB or the state where these producers are registered after 2012.

CPCB data shows that as of September 2013, Chhattisgarh has two E-waste dismantler / recycler M/s Navrachna Recycling Pvt. Ltd. & M/s ADV Metal Combine Private Limited. Therefore, CECB can track & monitor E-waste inventory in the state through the dismantler's / recycler's data obtained from centralized agency e.g. CPCB or the state where dismantler's / recycler's are registered. This also indicates that E-waste is either dismantled or recycled in both formal & informal sector in the state.

Table 2.2 indicates that producers are majorly responsible for all the activities including financing of E-waste management. Since, the state has two registered dismantler & recycler; it indicates that producers may be fulfilling their responsibility through collection system catering to dismantlers & recycler both inside & outside the state.

Assessment on the upstream side of the E-waste chain especially of both types of consumers (bulk & individual consumer), also indicate that only bulk consumer offer opportunity of E-waste inventory tracking & monitoring. Though, bulk consumers are required to maintain records of E-waste, they are not required to file the returns.

Since no mechanism exist for tracking purchase of EEE by bulk consumers and also producers are not required to declare quantity of EEE placed in the market since 2012, E-waste inventory assessment has to rely on available historical market research data.

Therefore, there is a need to identify different producers, profile of consumers & bulk consumers, collection centre, dismantlers & recyclers who are catering to E-waste in the five districts in the study area.
Chapter 3: Assessment of E-waste Market

3.0 Introduction

The increasing market penetration of the consumer electronics will lead to reduced life of electronics items and greater generation of E-waste in Chhattisgarh. Therefore, an assessment of E-waste market structure requires an understanding of E-waste as a "tradable commodity" and its "mechanism of trading". In Chhattisgarh E-waste as a "tradable commodity" can be described in terms of its composition and its potential for material recovery. "Mechanism of Trading" can be described in terms of E-waste trade value chain. This chain will identify different stakeholders consisting of producers, consumer or bulk consumers, collection centers, dismantlers and recyclers, while mechanism of trading will determine E-waste generation, present handling practices, storage and channelization for its recycling or disposal. The following sections describe each of these items to facilitate an understanding of E-waste market in five divisions of Chhattisgarh.

3.1 E-Waste Composition

E-waste Composition has been described in terms of components, which contain items of economic value. At first E-waste has been classified into 19 components forming "building blocks", which are easily "identifiable" and "removable", followed by their respective hazardousness.

3.1.1 E-waste Components

A number of components, which are assembled to produce "Electrical and Electronic Equipment" are metal, motor / compressor, cooling, plastic, insulation, glass, LCD, rubber, wiring / electrical, concrete, transformer, circuit board, fluorescent lamp, incandescent lamp, heating element, thermostat, FR / BFR – containing plastic, batteries, CFC / HCFC / HFC / HC & external electric cables. Specific component, which are found in Air Conditioners, refrigerator, washing machine, personal computers, cellular telephones, TVs and other items as per schedule 1 are described in **Table 3.1**.

Large household appliance like Air Conditioners / refrigerator may consist of electric motor, a circuit board, a transformer, capacitor, thermal insulation, switches, wiring, plastic casing (containing flame retardants) etc. A typical washing machine may consist of the metal casing, inner and outer drums, a motor, a pump, washing cycle controller unit, switches and other components. IT and telecom equipments sector is observing a trend of "micro miniaturization", while CRTs in monitor are being replaced by LCD screens. Further, there is an increasing trend of reduction in weights of these items.

Table 3.1 indicates that the range of different items found in E-waste is diverse classifying it a waste of complex nature. However, it shows that E-waste can be dismantled or disassembled into relatively small number of common components for further treatment. This disassembly results in segregation and treatment of E-waste.

3.1.2 E-waste Composition, Recyclability and Hazardousness

During market survey of major stakeholders in Durg division, it was revealed that broadly E-waste consists of ferrous and non-ferrous metals, plastics, glass, wood, printed circuit boards, rubber and other items. Iron and steel constitutes about 50% of the E-waste followed by plastics, non - ferrous metals and other constituents. Non-ferrous metals consist of metals like copper, aluminum and precious metals ex. silver, gold, platinum, palladium etc. Therefore, these items are dismantled in informal sector. However, the presence of elements like lead, mercury, arsenic, cadmium, selenium, hexavalent chromium and flame retardants in E-waste and their components beyond threshold quantities render them hazardous in nature.

									mpon	iente i											
Sr. No.	Items of Electrical & Electronic Equipment's	Metal	Motor / Cooling	Plastic	Insulation	Glass	CRT	LCD	Rubber	Wiring / Electrical	Transformer	Magnetron	Circuit Board	Fluorescent lamp (in ballast)	Incandescent lamp	Heating element	Thermostat	FR / BFR – containing plastic	Batteries	CFC, HCFC, HFC, HC	External electric cables
I.	Information Technology and Tel	lecomm	unicatio	n Equip	ment																
1.	Centralized Data Processing	\checkmark	\checkmark						\checkmark	\checkmark											
2.	Mainframes	\checkmark	\checkmark	\checkmark					\checkmark	\checkmark			\checkmark								
3.	Mini Computers	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark		\checkmark	\checkmark	\checkmark	\checkmark		\checkmark						\checkmark		\checkmark
4.	Personal Computing	\checkmark	\checkmark	\checkmark			\checkmark		\checkmark	\checkmark	\checkmark		\checkmark								
5.	Personal Computers (Central processing unit with input and output devices)	V	V	V	V		V	V	V	V	V	V	V						V		N
6.	Laptop Computers (Central processing unit with input and output devices)			\checkmark	V			\checkmark			V							\checkmark	V		\checkmark
7.	Notebook Computers	\checkmark	\checkmark		\checkmark	\checkmark			\checkmark	\checkmark	\checkmark		\checkmark	\checkmark				\checkmark	\checkmark		\checkmark
8.	Notepad Computers	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark		\checkmark		\checkmark			\checkmark	\checkmark				\checkmark			\checkmark
9.	Printers including cartridges	\checkmark	\checkmark	\checkmark		\checkmark			\checkmark	\checkmark	\checkmark		\checkmark								\checkmark
10.	Copying Equipment	\checkmark	\checkmark	\checkmark					\checkmark	\checkmark	\checkmark		\checkmark								
11.	User Terminals and Systems	\checkmark		\checkmark			\checkmark		\checkmark	\checkmark	\checkmark		\checkmark								
12.	Facsimile	\checkmark	\checkmark	\checkmark					\checkmark	\checkmark	\checkmark		\checkmark								\checkmark
13.	Telephones	\checkmark		\checkmark					\checkmark	\checkmark			\checkmark								
14.	Pay Telephones	\checkmark		\checkmark					\checkmark	\checkmark											
15.	Cordless Telephones	\checkmark		\checkmark					\checkmark	\checkmark			\checkmark								
16.	Cellular Telephones	\checkmark	\checkmark	\checkmark					\checkmark	\checkmark											
17.	Answering Systems	\checkmark	\checkmark	\checkmark					\checkmark	\checkmark			\checkmark						\checkmark		
II.	Consumer Electrical and Electro	nics	-					-							-						
18.	Cathode Ray Tube (CRT) TV									\checkmark											
19.	Liquid Crystal Display (LCD) TV	\checkmark								\checkmark											
20.	Light Emitting Diode (LED) TV	\checkmark		\checkmark						\checkmark	\checkmark		\checkmark	\checkmark							
21.	Refrigerator		\checkmark	\checkmark	\checkmark				\checkmark								\checkmark	\checkmark			\checkmark
22.	Washing Machine																				
23.	Air Conditioners excluding centralized air conditioning plants	V	V	V	V				V	V			V				V				V
24.	Compact Fluorescent Lamp CFL																				

Table 3.1: Components in E-waste

 $\sqrt{\text{Present as a component}}$

• Possible presence as a component Source: Prepared from WEEE & Hazardous Waste, A report produced for DEFRA, UK Government, March 2004, AEA Technology

The possible substances of concern, which may be released during recovery of secondary raw material from E-waste, are given in **Table 3.2**.

Component	Possible Hazardous Content
Metal	
Motor \setminus Compressor	
Cooling	ODS
Plastic	Phthalate plasticize, BFR
Insulation	Insulation ODS in foam, asbestos, refractory ceramic fiber
Glass	
CRT	Lead, Antimony, Mercury, Phosphors
LCD	Mercury
Rubber	Phthalate plasticizer, BFR
Wiring / Electrical	Phthalate plasticizer, Lead, BFR
Concrete	-
Transformer	
Circuit Board	Lead, Beryllium, Antimony, BFR
Fluorescent Lamp	Mercury, Phosphorus, Flame Retardants
Incandescent Lamp	
Heating Element	
Thermostat	Mercury
BFR – containing plastic	BFRs
Batteries	Lead, Lithium, Cadmium, Mercury
CFC, HCFC, HFC, HC	Ozone depleting substances
External electric cables	BFRs, plasticizers

Table 3.2: Possible Hazardous Substances in E-waste Components Possible Hazardous Content

Source: Compiled from WEEE & Hazardous Waste, A report produced for DEFRA, March 2004, AEA Technology

Major components, which cause most concern, include lead, mercury, cadmium and chromium (VI), halogenated substances (e.g. CFCs), polychlorinated biphenyls, plastics and circuit boards that contain brominated flame retardants (BFRs). BFR can give rise to dioxins and furans during incineration and open burning of E-waste fractions at dump site can lead to other toxic release. Other materials and substances that can be present in E-waste are arsenic, asbestos, nickel and copper. These substances may act as a catalyst to increase the formation of dioxins during incineration.

3.2 Mechanism of E-Waste Trade

"Material Flow" along the "Life Cycle" of electrical and electronic equipment within a "Geographical Boundary" of Durg division of Chhattisgarh forms the basis of E- waste generation. The following sections describe a conceptual understanding of material flow, along the life of electrical and electronic equipment, its conversion into an "obsolete" item followed by its transformation into new material. A conceptual E-waste trade value chain showing material flow along the E-waste trade value chain is shown in **Figure 3.1**. This is followed by customization of the conceptual E-waste trade value chain for Durg division.

Raw Material Input





Source: UNEP Manual Vol. I; Inventory Assessment Manual

The establishment of material flow within a geographical boundary assists in identifying, networks / chain connecting different phases of life cycle of electrical and electronic equipment and associated stakeholders. The material flow, when applied to "life cycle" of electrical and electronic equipment leads to evolution of the 'Four-Phase-Model', where each phase describes respective unit operations and different stakeholders. Each of these phases and associated stakeholders is described in **Table 3.3** and depicted in **Figure 3.2**. The dotted vertical line in the **Figure 3.2** indicates the stage of "obsolescence" in between the second and third phase of life cycle.

Table 3.3: Phases of material flow model

S.No.	Phase	Stakeholders
1.	<u>Phase I:</u> Unit Operations / Processes / Activities: Production and sales of electrical and electronic equipment including import, export, and input of equipment for re-use from repair of WEEE / E-waste.	Stakeholders: Manufacturers, importers, exporters, and retailers (brand new / second hand)
2.	<u>Phase II:</u> Unit Operations / Processes / Activities: Consumption of electrical and electronic equipment, use of electrical and electronic equipment in households, offices and industry.	Stakeholders: Consumers like households, commercial places like offices and industry
3.	<u>Phase III:</u> Unit Operations / Processes / Activities: Consumption of electrical and electronic equipment, use of electrical and electronic equipment in households, offices and industry.	Stakeholders: Consumers, importers, exporters, collectors, traders, dismantlers, waste treatment operators
4.	<u>Phase IV:</u> Unit Operations / Processes / Activities: Treatment / disposal alternatives for WEEE/E-waste ex. repair, decontaminating, dismantling, shredding, landfill and incineration.	Stakeholders: Dismantlers, Recycling, Hazards landfill site operators.
Courses De	and from Waste from electrical and electronic equipment (WEEE)	anantition damageneric substances and

Source: Prepared from Waste from electrical and electronic equipment (WEEE) – quantities, dangerous substances and treatment methods, EEA Copenhagen, 2003

In developed countries, where E-waste management system is in operation, the entire trade value chain occurs in organized / formal sector. The blue line indicates the starting point of informal sector involvement in E-waste management in a developing country. An example of generic E-waste trade value chain in a developing country is shown in **Figure 3.3**. In majority of developing countries, the informal sector engagement starts from the point of collection and continues till the last stage in some capacity. However, other steps / unit operations like E-waste processing, production / end products may be present or absent in a country. Therefore, this chain can be further modified or customized with inter or intra linkages depending on the E-waste processing or end production in Durg division.



Figure 3.2: Generic E-waste trade value chain in a developing country Source: UNEP Manual Vol. II; Inventory Assessment Manual



Figure 3.3: The 'Four-Phase-Model'

Source: Prepared from Waste from electrical and electronic equipment (WEEE) – quantities, dangerous substances and treatment methods, EEA Copenhagen, 2003

3.3 E-waste trade value chain in Durg Division (5 districts)

A tentative E-waste trade value chain for study area which has emerged out of field work is shown in **Figure 3.4**. Tracer technique, which was pilot tested in Durg division has been used in major five districts in the division to fix E-waste trade value chain. A brief description of the identified stakeholders is given below.



Figure 3.4: Tentative E-waste trade value chain in Study Area

<u>Producers</u>

Figure 3.4 indicates that EEE producers / manufacturers do not exist in the study area. However, their products are being sold in the division. Secondary data confirms that EEE producers do not have manufacturing facilities in the division and therefore they are not registered with Chhattisgarh Pollution Control Board. Since these producers are responsible for their products under EPR, their detailed **inventory** as per schedule 1 of E-waste (Management & Handling) rules are given in Annexure 1.

Distributors / Traders / Retailers

EEE from these producers are sold in the study area through Distributor / Trader / Retail network as well as directly through the company. Items like Centralized Data Processing, Mainframes, Mini computers of Schedule 1 are used by large corporate, State and Central Government agencies falling under the category of bulk consumers whose profile is given below. **Inventory** of Distributors / Traders / Retailers selling items other than mentioned above in the study area is given in Annexure 2. However, retailers / dealers do not fall under the purview of E-waste (Management & Handling) Rules 2011, unless they serve as collection centre or drop off point.

<u>Consumers</u>

There are two types of consumers, which are found in the five districts of study area; Individual Consumers & Bulk Consumers. **Inventory** of bulk consumers in the five districts are given in Annexure 3.

Collection Centres / Channel

Tracer analysis indicates that EEE, which becomes E-waste in the study area partly gets collected & transported in the informal sector and partly in formal sector. Primary survey carried out through Tracer technique indicates that bulk of E-waste generated in the study area goes to informal sector. Majority of the producer / manufacturer have established collection channel in the study area. These collection channels work through following mechanism.

- 1. Single point call centre
- 2. Distributors / Retailers
- 3. Service Centres
- 4. Physically established collection centre / drop off point

The producers use a combination of these mechanisms as given in Table 3.4.

Brands	Collection through Call Centre	Collection through Dealers / Retailer	Collection through Service Centre	Collection through Collection Centre / establishment	Remarks
LG	\checkmark		\checkmark	\checkmark	
Panasonic					
Samsung	V			\checkmark	Technician come to the site of E- waste discarded item, check the item and collect. (No compensate) provides certificate. (All the E-waste discarded item go to Haridwar, Rorkee) Attero Recycling Company.
Toshiba	V				Collection is carried out by a logistic service provider "M/s Kintetsu World Express Pvt. Ltd.", earlier "Gati"
Haier					
Kelvinator	V				Exchange your electronic item to your nearest dealer or where you buy the product
Electrolux	V	V			Exchange your electronic item to your nearest dealer or where you buy the product
Godrej		\checkmark			
Hitachi	\checkmark				Exchange offer contact to your dealer no collection center
BPL	\checkmark	\checkmark			Contact to your dealer where you buy the product
Akai	\checkmark	\checkmark			To the dealer he gives the cost of the product.
Sansui	V	V			E-waste Regarding no information Contact to nearest dealer
Philips	\checkmark			\checkmark	Call on customer care door to door collection of E-waste / discarded items of Philips
Whirlpool					To dealer he exchange your

Table 3.4: Manufacturer's E-waste Collection Centre System in Durg

Brands	Collection through Call Centre	Collection through Dealers / Retailer	Collection through Service Centre	Collection through Collection Centre / establishment	Remarks
					electronic item
			Printe	rs	
HP					Drop your items as dealer's drop
C					on locations.
Canon	N				
Brother					
TVSE	$\overline{\mathbf{v}}$				

Inventory of Service centres in the study area is given in Annexure 4. Inventory of Physically established collection centres is given in Annexure 5 **Table 3.4** indicates that majority of producers use call centre as well as dealer's network for collection of E-waste. There are two possibilities of onward transportation & disposal of E-waste. The first possibility is the disposal through informal sector & the second is through registered recycler. Since dealers are not covered under E-waste Rules, they are not legally bound to report.

Informal Sector

Tracer technique has been used in the Durg division to fix E-waste trade value chain in the informal sector.

E-waste is collected & dismantled in informal sector in the study area. Further, its major fractions are transported outside the state mainly to Ghaziabad, Gwalior, Etawah & Delhi through informal sector traders. An inventory location of major scrap vendor / dismantler, temporary stockpile site / informal collection centre & landfill site is given in Annexure 6.

It has been found that Durg, Motinpur road, Muslim Para, Satwani Mohalla, Ward NO_(, nagar panchayat Road, green Chowk, naurani Chowk, ward no 2, naya Para, Bajar para, Bharat pur, Jama Masjid, Kawardha, Adarsh Nagar, Chetan Chowk, Mossinpur Pandariya, Bajar para Khandara para, Kalimandir Road, Rani durgavati Chowk, Fuhara chowk, Bodhi Tola, Mahavir Para, Puranaganj CDhowk and Kanchan Bag area in Durg division has a strong metal and electronic scrap market. These scrap and waste items are then transported to Ghaziabad, Gwalior, Etawah & Delhi. They used to come twice/thrice in a year. The motherboards and floppy drives are removed from the machines by scrap vendors and sold by weight and mobile phone sold as individual pieces to scrap dealers. None of these scrap vendors have the ability to identify the condition of these components. They are then typically sold - TV Circuit Rs. 20-50/kg & TV 250-300/Pcs.; Compressor Rs. 400-450/Pcs.; Copper Rs. 350-450/kg; Refrigerator Rs. 500-1200/Pcs.; Washing Machine Rs. 700-800/Pcs; CFL Rs. 300/kg and Mobile kit Rs. 30-50/Pcs.

- Electronic items goes to mechanic shops from households for repairing, and mechanic replaces damaged / defunct parts / components from it and then they sell it to scrap dealers.
- Mechanics sell E-waste to scrap dealer by weight / Pcs. mainly of ICT items (IT as per Schedule 1); TV circuit Rs. 15-45/kg; Compressor Rs. 300-400/Pcs.; Washing Machine Motor Rs. 200/Pcs.; Copper Rs. 200-350/kg; DVD Circuit Rs. 20-25/kg; Mobile kit Rs. 1000-2000/kg; SMPS Rs. 50/Pcs, Mother Board Rs. 90/Pcs.; Hard disk Rs. 120/Pcs.; CD Writer Rs. 35-40/Pcs.

- Small scrap vendors sell E-waste to big scrap dealer by weight / Pcs. TV Circuit Rs. 20-50/kg & TV 250-300/Pcs.; Compressor Rs. 400-450/Pcs.; Copper Rs. 350-450/kg; Refrigerator Rs. 500-1200/Pcs.; Washing Machine Rs. 700-800/Pcs; CFL Rs. 300/kg and Mobile kit Rs. 30-50/Pcs.
- Scrap dealers comes from Ghaziabad, Gwalior, Etawah & Delhi yearly twice / thrice for collection of E-waste.
- There is no organized mechanism for collection, transportation and disposal of E-Waste in Durg division.
- No mechanism exists in the state to monitor and track its inventory, collection, transportation and disposal.

<u>Market Features</u>

E-waste Market concentration is mainly in Durg district. This is due to higher penetration of EEE because of population concentration in this area. The EEE markets have been found to be small and price sensitive. Major brands, which have been observed, are Nokia, LG, Sony, Samsung, Panasonic, Philips, Videocon, Godrej, Onida, Whirlpool, Kelvinator, Haier, Hitachi, Voltas, Blue Star, Dell, HP, HCL and Lenovo. The new items after active life gets repaired and reused by the owner of the item. In case it becomes useless, it is left at repair centre, where it is cannibalized & finally its fractions are thrown in the dust bin.

Majority of material/ E-waste is transported to Ghaziabad, Gwalior, Etawah & Delhi with scattered temporary storage at different places of different towns.

Dump Sites (E-waste tracers)

Only Plastic and Glass parts of E-waste were found in Dump Site. Mixed waste was found in all dump sites. A summary of the process observed is shown in **Figure 3.5**.



Figure 3.5: Processes observed at dumpsite

Collection, Transportation & Processing (scrap dealers)

Small scrap dealer purchase waste from Household / Commercial Area / Institution, etc. At first stage, they segregate the waste than break the item and collect valuable items like Aluminum, Copper, Iron & Steel, Compressor, motor, etc. from E-waste. They sell their collected item to the large scrap dealer. They visit nearby area on daily/weekly basis and purchase the waste. These scrap dealers are

not licensed by the municipalities but are part of the networks of large scrap dealers. Dismantling and segregation of E-waste occurs in a major way at large scrap dealers. A summary of the process observed is shown in **Figure 3.6**.



Figure 3.6: Processes observed at scrap dealers / junkyards

<u>Repair Shops (AC/WM/REF)</u>

One person repairs one of these items every day. E-waste fractions/ waste Parts, like plastic body of these items, etc. is dumped into community bin and valuable item sold to nearby scrap dealer. Some of the respondent informed that Item which is not in repairable condition is returned to the owner of the product who in turn sells to the scrap dealer. Majority of the product are in repairable condition. A summary of the process observed is shown in **Figure 3.7** and illustrated in **Figure 3.8**.



Figure 3.7: Processes observed at AC, Washing Machine, and Refrigerator Repair Shop

Repair Shops (TV / PC / Mobile Phone)

Majority of mobile phones, TV & computers repair shop owners are local citizens. Waste Parts, like plastic body of these items, etc. are dumped into community bin and valuable item sold to nearby scrap dealer. They also store valuable item and use it to repair other EEE. Majority of the product are in repairable condition. A summary of the process observed illustrated in **Figure 3.8**



Figure 3.8: Processes observed at TV, Computer, and Mobile Phone Repair Shop

Summary E-Waste Process Study

There are various processes involved for recycling / reusing of electronic waste. The major process for different types of electronic items in Kabeerdham, Rajnandgaon, Durg, Balod and Bemtara are mentioned in **Table 3.5**.

Sr.						
No.	Process name	Kabeerdham	Rajnandgaon	Durg	Balod	Bemtara
1	IC's Extraction from PCB	No	No	No	No	No
2	Surface Heating of PCB and	No	No	No	No	No
	Extraction of components					
3	Dissembling of Monitor & TV and	Yes	Yes	Yes	Yes	Yes
	extraction of components					
4	Yoke core and Copper	No	No	No	No	No
5	Metallic Core of Transformer and	Yes	Yes	Yes	Yes	Yes
	Copper					
6	Rare Earth Core of Transformer and	No	No	No	No	No
	Copper					
7	Rare Earth Core of Static	No	No	No	No	No
	Transformer					
8	Wire PVC and Copper	Yes	Yes	Yes	Yes	Yes
9	Plastic Shredder	No	No	No	No	No
10	Dismantling of Refrigerator and	Yes	Yes	Yes	Yes	Yes
	Compressor					
11	Gold Extractions from Pins and	No	No	No	No	No
	Comb					
12	Acid Bath for PCB	No	No	No	No	No
13	Regunning CRT's	No	No	No	No	No
14	Glass Recovery from CRT	No	No	No	No	No

Table 3	3.5:	Processes	involved for	or E-waste	recycling in	different towns
I WOLC C		11000000	mitorie a it		i coyoning in	

Sr.			Process S	Status		
No.	Process name	Kabeerdham	Rajnandgaon	Durg	Balod	Bemtara
15	Gold Recovery	No	No	No	No	No

The process details of fifteen processes are given in **Table 3.6**. The analysis of this table shows that there is dismantling activity occurring in, Kabeerdham, Rajnandgaon, Durg, Balod and Bemtara. The entire amount of E-waste from these towns is transported to Ghaziabad, Gwalior, Etawah and Delhi for dismantling and further supply to Delhi market. Photo documentation captured in different towns of Durg division is mentioned in Annexure 8.

3.4 Conclusions

Major conclusions, which can be derived, include growing market of EEE in Durg division. This growth may lead to increasing E-waste generation, which may further lead to higher pollution loads, health impacts and loss of recoverable items.

Chapter 4: Methodology for E-waste Inventory

4.0 Introduction

E-waste inventory forms the backbone of its E-waste management in a geographical area. There are, five methods, which have been used to determine E-waste inventory in both developed and developing countries. Each of these methods use "Material Flow" model. Therefore, the selection of E-waste inventory assessment methodology in five districts of Chhattisgarh in Durg division is based on the availability, reliability and analysis of data along the material flow chain within their geographical boundary. The following sections describe each of these methods, their application, constraints, advantages, data requirements and sources of data in the context of Chhattisgarh.

4.1 Methods for Inventory Assessment

Different methods of E-waste inventory assessment as per UNEP's Manual 1 on E-waste Inventory Assessment are given below.

- 1. The Time Step Method.
- 2. The Market Supply Method.
- 3. The Carnegie Mellon Method.
- 4. Approximation Method 1.
- 5. Approximation Method 2.

The data requirement for each methodology based on mathematical expressions is given in Annexure 9. The extent of data required depends on the extent of geographical boundary, which could be national, regional or city boundary. Conceptually, the source of data can be identified by understanding the "material flow chain" within the given geographical boundary.

The E-waste material flow chain in Chhattisgarh as described in **Figure 3.4** of Chapter 3 is again shown in **Figure 4.1** in the context of inventory assessment. **Figure 4.1** shows that in all the five districts of the study area, the material flows from an organized / formal sector starting from production / manufacture till consumption phase, where major percentage of material enters into unorganized / informal sector. Therefore, the major constraints are related to availability, reliability, amount and range and completeness of the data along the chain.

Analysis of transfer of E-waste flow chain from formal to informal sector shows that the data for EEE in Chhattisgarh needs to be collected from secondary sources & primary survey. Therefore, E-waste inventory assessment in Chhattisgarh requires collection of available secondary data from the formal sector & its strengthening by primary survey in the informal sector followed by trend analysis.

4.2 Material Flow Chain, Data Sources and Data Gaps in Study Area

Figure 4.1 indicates that stakeholders existing in the study area are EEE retailers, consumers, service centres, E-waste collectors (to a limited extent) and two dismantlers in formal sector & other E-waste collectors (majority), & dismantlers in the informal sector in the study area. Therefore, secondary data related to stakeholders in the flow chain in the formal sector at temporal level was identified, collected and collated for quantification, while primary survey was carried out covering stakeholders in the informal sector in the study area. The detailed findings of the primary survey are given in Chapter 3.



Figure 4.1: E-waste material flow chain in Study Area

Major observations related to data availability are given below.

- Saturation Level National census data was obtained from office of the Registrar General & Census Operation, Govt. of India, National Sample Survey Organization (NSSO), Department of Statistics, Government of India, State Statistics from Department of Statistics, Government of Chhattisgarh, Telecom Regulatory Authority of India (TRAI), Ministry of Communications & Information Technology (MOCIT), Government of India, Industry Association like Manufacturers Association for Information Technology (MAIT), Electronic Industries Association of India (ELCINA), Telecom Equipment Manufacturers Association of India (TEMA) & Research Institutions e.g. National Council for Applied Economic Research (NCAER).
- 2. Number of Households Available with national census data (1991, 2001 & 2011).
- 3. Stock Data Stock levels at private/households, industry, commercial & sectors with Industry Association.
- 4. Data related to average life time, storage data, reuse, recycling & disposal at landfill site is not available from secondary sources & so primary survey was carried out in the study area.

		2	
Data Source/ Item	National/ Local Government Agencies	Industry/ Trade/ Recyclers/ Waste Disposal Operator's Association (Reports/ Published Data/ Field Work)	Market Research Agencies (Reports/ Published Data)
Saturation Level (Household & Industry)	National Census Data, (1991, 2001 & 2011)	Major Trading Agencies, (Retailers)	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
Number of Household	National Census Data, (1991–2001 & 2011)		

Table 4.1: Tentative sources of data in Study Area

Data Source/ Item	National/ Local Government Agencies	Industry/ Trade/ Recyclers/ Waste Disposal Operator's Association (Reports/ Published Data/ Field Work)	Market Research Agencies (Reports/ Published Data)
Export Data	Not required	,	
Import Data	Not required		
Stock Data Private (Rural & Urban)	NSSO (1994 – 2010)	Industry Association, Scrap Dealers, Recyclers, EEE Retailers	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
Stock Data Industry	TRAI, MOCIT, Govt of India.	Industry Association, Scrap Dealers, Recyclers, EEE Retailers	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
Average Life Time, Technology Change	TRAI, MOCIT, Govt of India.	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications, Annual Reports of Major Brands
Storage Data		Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications, Newspapers
Reuse		Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications
Recycle		Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	
Disposal in Landfill	City Municipalities	Scrap Dealers, Recyclers, EEE Retailers	

A matrix describing inventory methodology versus data availability has been prepared after assessing the data obtained as per **Table 4.1** (based on data requirement methodology) and summarized in **Table 4.2**. The major inferences, which can be drawn from **Table 4.2** are given below.

Method ology/ Data Require ment	Satu Le House hold	ration evel Industr y	Numbe r of Househ old	Ca Export Data	lculated S Import Data	ales Manufac turing / Product ion	Stoc Priv ate	k Data Indus try	Avera ge Lifeti me	Stora ge data	Reu se	Recycl e / disma ntling	Land fill
Time Step Method	х		\checkmark	Х	Х	\checkmark	Х	Х					

Table 4.2: Data Matrix Vs Methodology

Method	Saturation Level		Numbe	Ca	lculated S	ales	Stoc	k Data	Avera			Recycl	
ology/ Data Require ment	House hold	Industr y	r of Househ old	Export Data	Import Data	Manufac turing / Product ion	Priv ate	Indus try	ge Lifeti me	ge data	Reu se	e / disma ntling	Land fill
Market						\checkmark							
Supply Method				Х	Х								
Carnegie Mellon Method				Х	Х				\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
Approxim ation 1	Х	Х	\checkmark			\checkmark	Х	Х	\checkmark				
Approxim ation 2				Х	Х	\checkmark							

Note: √ means 'Available'/"Can be derived"; X means 'Not Available'; NV means 'No value'

Since E-waste market in Chhattisgarh is a continuously growing market, which has not reached saturation levels, therefore Time Step Method, Approximation 1 & Approximation 2 Method have not been used. Further, market supply method can be applied since it requires at least one set of data related to EEE penetration & one set of data after E-waste generation. Carnegie Mellon method appears to give better estimates than Market Supply Method since data related to reuse and storage can be estimated while assessing, average life time based on primary & secondary data analysis. Further, only E-waste fractions of no economic value have been found in landfill sites in the study area.

Some of the findings of the secondary & primary data survey, which have been observed, are given below. These findings have been used for carrying out inventory assessment of E-waste from items mentioned in Schedule 1 of E-waste rules 2011.

- 1. The office automation industry has undergone radical shift around 2006-07. The differentiation or gap between "Copier" and "Printer" segment of the Office Automation Industry had been bridged around the year 2006-07. The multi Functions Products (MFPs), which is Printer / Scanner / Fax / Copier, (including color MFPs) are the key drivers of this industry. Therefore, for E-waste inventory assessment, items Printers including cartridges, Copying Equipment, & Facsimile mentioned in Schedule 1 of E-waste rules, have been clubbed under one head of **"Printers including Cartridges"** for inventory assessment.
- 2. It is pertinent to state that Bharat Sanchar Nigam Limited is the only Telecom. Service Provider providing Telegraph Services to the citizens of the country across the length and breadth of the nation. As per BSNL there has been steep decline in the usage of Telegraph Services due to large scale penetration of Fixed Line Telephony, Mobile Services and Internet Services. SMS and E-mails have gained greater importance in Message Transmission over the years. Realizing the declining usage of Telegraph Services, the Establishment branch of BSNL Corporate Office defined Telegraph Services as diminishing services vide circular No. 19 1/2009/TE-II dated 19-02-2010. BSNL in order to keep pace with technological developments introduced Web Based Telegraph Messaging System in all circles by 31-03-2010. Further no Telex machines had been encountered at any of the scrap dealer in the study area.
- 3. Typewriter production stopped in India in 2010. Godrej & Boyce was the only typewriter producing company in the world. Although primary survey in the five districts of the study area, indicated presence of mechanical typewriters in courts premises & few government offices. Further, primary survey at the scrap dealer also did not indicate any presence of electric or electronic typewriter coming into the dismantling or recycling chain.

- 4. NSSO data, Census data & data from research institution indicate temporal data compilation at national, state & district level for all types of TV (CRT, LCD & LED) clubbed together. Therefore, all the three items under consumer Electrical & Electronics under schedule 1 of E-waste rules have been clubbed under the head TV for E-waste inventory assessment.
- 5. Temporal data from Census, NSSO, MOCIT, TRAI, TEMA market research institutions & telecom operators is classified under fixed line and cellular subscribers at national, state & district level. Further, cellular subscribers consist of GSM & WLL categories. Therefore, Pay telephones, Cordless telephones and Answering systems have been considered as sub-segments under fixed line subscriber segment since the consumers choice of instrument cannot be accomplished without subscription to a telephone connection. Therefore, E-waste inventory assessment has been carried out based on temporal fixed line and cellular telephone subscription at district level consisting of both rural & urban consumers.
- 6. Temporal data from Census, NSSO, MOCIT, MAIT market research institutions & telecom operators is classified under Desktop, PC, Notebooks & servers at national, state & district level. Further, Notebook consumers consist of netbooks & notepad computers, servers have also been considered consisting of mainframes & minicomputers subscribers consist of GSM & WLL categories. Therefore, E-waste inventory assessment has been carried out under the head of "computers".
- 7. Among the white goods both households and commercial segments drive the air conditioner market, while households drive the refrigerator, washing machine and TV market.

4.3 Methodology / Approach & Instruments Used

Carnegie Mellon method has been identified for E-waste inventory assessment in study area. Major data requirements in order to use this method are given below.

- 1. Information about stakeholders i.e. recycler / dismantler, scrap dealer, consumer etc.
- 2. Stock and generation of E-waste
- 3. Origin of new electrical and electronic equipment i.e. mode of procurement
- 4. Life time of electrical and electronic equipment
- 5. End of life management of electrical and electronic equipment
- 6. Process involved during dismantling
- 7. Final destination of E-waste fractions

In order to get the required data, two approaches have been adopted. These approaches are depicted in **Figure 4.2** and cover all the identified stakeholders in study area. Salient features of these approaches are given below.

Approach 1: Combination of primary and secondary data collection

Different types of data required has been identified collected, Collated & analyzed from the sources given in **Table 4.1**.

Approach 2: E-waste tracer tracking

In this approach, E-waste tracers are identified at dumpsites, which lead to identification of stakeholders further up on the upstream side of the material flow chain as given in **Figure 4.2**. These stakeholders include dismantlers, junkyard owners, repair shops and retail shops. Different processes carried out by stakeholders are identified, photo-documented and quantified. A list of dismantlers / recyclers, scrap dealers, trading agents, landfill sites and other agencies surveyed is given in chapter 3 and related annexure 6.



4.4 Conclusion

Data matrix versus methodology used for E-waste inventory assessment indicates "Market Supply" method and "Carnegie Mellon" method can be applied for E-waste inventory assessment in five districts of Chhattisgarh in Durg division. However, a combination of Carnegie Mellon method & tracer tracking has been selected for inventory assessment since it covers all the aspects of material flow chain. Assessment of data from these stakeholders through tracer tracking has resulted in assessment of obsolescence rate or average life of equipment described in chapter 5.

Chapter 5: E-Waste Inventory Assessment

5.1 Introduction

This chapter describes the E-waste inventory and market scenario for the E-waste management system in Durg division. Since E-waste inventory forms the basis of planning for E-waste management system, an effort has been made to assess the E- waste inventory and market potential in the country. Following sections describe each of these items followed by pollution potential and risk profiling.

5.2 Market Size Assessment of Electrical and Electronic Equipment (EEE) in Durg Division

The time series data related to market size of each of the EEE items has been computed from data obtained from different agencies as well as from trend analysis. This data was compiled from data sources described in chapter 4. The EEE market size for Air Conditioners, refrigerator, washing machine, personal computers, cellular telephones, TVs and other items as per schedule 1 is shown in **Table 5.1** to **Table 5.8**.

Voor	Kabaardham	Dainandaaan	Dura	Balad	Borntoro
Ital	Kabeelullalli	Rajilallugaoli	Durg	Dalou	Dennara
2006	2351	4662	5322	2600	2279
2007	14561	28276	32112	15625	14180
2008	22240	42280	47769	23155	21773
2009	29942	55716	62624	30243	29492
2010	36473	66411	74260	35731	36171
2011	38683	72290	80982	38854	37424
2012	43569	79693	88815	42459	42360
2013	48354	86547	95956	45711	47278
2014	53118	93007	102586	48702	52269
2015	57917	99179	108829	51493	57405
2016	62796	105138	114773	54128	62750
2017	67792	110940	120482	56640	68365
2018	72935	116627	126004	59053	74307
2019	78255	122232	131379	61388	80641
2020	83777	127783	136635	63659	87430

Table 5.1: Installed base for Cellular Telephone in Study Area (in numbers)

Source: Census 1991, 2001 & 2011, Telecom Regulatory Authority of India (TRAI), Department of telecommunications (DOT)

Table 5.2: Installed base for Fixed Line	Telephone in Study	y Area (in numbers)
--	--------------------	---------------------

			1		,
Year	Kabeerdham	Rajnandgaon	Durg	Balod	Bemtara
2006	10053	19935	22756	11116	9744
2007	8597	16694	18958	9225	8372
2008	10117	19234	21731	10533	9905
2009	9398	17487	19655	9492	9256
2010	8771	15971	17859	8593	8699
2011	8326	15559	17430	8363	8055
2012	8175	14954	16666	7967	7949
2013	8030	14372	15935	7591	7851

Year	Kabeerdham	Rajnandgaon	Durg	Balod	Bemtara
2014	7889	13814	15236	7233	7763
2015	7753	13276	14568	6893	7684
2016	7621	12760	13929	6569	7616
2017	7494	12264	13319	6261	7557
2018	7371	11787	12735	5968	7510
2019	7253	11329	12176	5690	7474
2020	7139	10888	11643	5424	7450

Source: Census 1991, 2001 & 2011, Telecom Regulatory Authority of India (TRAI), Depart of Telecommunications (DOT)

Table 5.3: Installed base for Computers in Study Area (in numbers)

Year	Kabeerdham	Rajnandgaon	Durg	Balod	Bemtara
2006	502	1998	7117	770	710
2007	808	3217	11458	1240	1142
2008	1358	5404	19250	2083	1919
2009	2322	9241	32917	3562	3282
2010	3749	14924	53161	5752	5300
2011	5924	23580	83994	9088	8374
2012	9419	37492	133550	14450	13315
2013	15353	61112	217687	23553	21703
2014	24279	96640	344239	37246	34319
2015	39027	155344	553348	59872	55166
2016	62733	249709	889482	96241	88677
2017	100841	401395	1429799	154703	142545
2018	162097	645224	2298335	248677	229134
2019	260563	1037167	3694465	399737	368322
2020	418843	1667197	5938678	642559	592060

Source: Census 1991, 2001 & 2011, MAIT, NSSO

Table 5.4: Installed base for Printers in Study Area (in numbers)

Year	Kabeerdham	Rajnandgaon	Durg	Balod	Bemtara
2006	75	300	1068	116	106
2007	121	483	1719	186	171
2008	176	703	2502	271	249
2009	441	1756	6254	677	624
2010	900	3582	12759	1380	1272
2011	1066	4244	15119	1636	1507
2012	1413	5624	20033	2167	1997
2013	2149	8556	30476	3297	3038
2014	2407	9582	34133	3693	3403
2015	2696	10732	38229	4136	3811
2016	3020	12020	42817	4633	4269
2017	3382	13463	47955	5189	4781
2018	3788	15078	53710	5811	5355
2019	4243	16887	60155	6509	5997
2020	4752	18914	67373	7290	6717

Source: Census 1991, 2001 & 2011, MAIT, NSSO

Year	Kabeerdham	Rajnandgaon	Durg	Balod	Bemtara
2006	31028	70122	147260	34649	29805
2007	34242	74434	152318	36881	33391
2008	37692	78887	157428	39163	37333
2009	41393	83486	162597	41496	41670
2010	41486	86949	166377	43198	39274
2011	45365	91780	171631	45604	43503
2012	49520	96770	176957	48063	48134
2013	53969	101923	182359	50577	53212
2014	58733	107245	187841	53147	58789
2015	63833	112741	193406	55773	64921
2016	69292	118416	199059	58457	71675
2017	75136	124276	204801	61201	79125
2018	79213	127016	209094	62301	85210
2019	88086	136572	216571	66871	96462
2020	95252	143019	222603	69800	106557

Table 5.5: Installed base for TV in Study Area (in numbers)

Source: Census 1991, 2001 & 2011, ELCINA, NSSO

Table 5.6: Installed base for AC in Study Area (in numbers)

Year	Kabeerdham	Rajnandgaon	Durg	Balod	Bemtara
2006	135	440	1723	177	124
2007	154	470	1826	192	148
2008	175	500	1932	207	176
2009	199	531	2039	222	210
2010	187	556	2130	229	163
2011	212	589	2240	245	192
2012	239	622	2352	262	227
2013	269	656	2466	281	267
2014	303	691	2582	300	315
2015	340	728	2701	319	370
2016	381	765	2822	340	435
2017	427	804	2945	362	510
2018	477	843	3070	385	598
2019	533	884	3198	409	701
2020	595	926	3328	434	821

Source: Census 1991, 2001 & 2011, ELCINA, NSSO

Table 5.7: Installed base for Washing Machine in Study Area (in numbers)

Year	Kabeerdham	Rajnandgaon	Durg	Balod	Bemtara
2006	213	559	1635	157	201
2007	239	601	1753	171	232
2008	267	643	1869	186	267
2009	298	685	1984	202	306
2010	291	717	2079	208	265
2011	321	758	2190	224	301
2012	354	799	2299	240	341
2013	390	840	2406	256	386
2014	428	880	2511	272	437

Year	Kabeerdham	Rajnandgaon	Durg	Balod	Bemtara
2015	469	920	2615	289	495
2016	514	960	2716	306	561
2017	561	999	2814	324	635
2018	613	1038	2910	342	720
2019	668	1077	3004	360	816
2020	727	1116	3095	378	926

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Source: Census 1991, 2001 & 2011, ELCINA, NSSO

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Table 5.8: Installed base for Refrigerator in Study Area (in numbers)					
Year	Kabeerdham	Rajnandgaon	Durg	Balod	Bemtara
2006	326	944	3209	301	304
2007	379	1046	3567	340	366
2008	439	1154	3942	383	440
2009	507	1266	4336	430	529
2010	499	1366	4707	459	443
2011	572	1487	5136	511	526
2012	654	1614	5584	566	624
2013	748	1747	6053	625	742
2014	853	1886	6542	689	882
2015	972	2031	7054	757	1050
2016	1107	2183	7588	830	1249
2017	1259	2342	8146	909	1488
2018	1430	2507	8727	993	1772
2019	1624	2680	9333	1082	2111
2020	1842	2861	9964	1178	2515
Source: Census 1	991, 2001 & 2011, ELCIN	IA, NSSO			

Analysis of Table 5.1 to Table 5.8 shows that cell phone have the highest installed base followed by Computers, TV, printers, fixed line telephone, refrigerators, washing machines and Air Conditioners. In Durg cellular phone, fixed line phone, TV, Air condition, washing machine and refrigerator has the highest installed base followed by Kabeerdham, Rajnandgaon, Durg, Balod and Bemtara districts of Durg division.

5.3 **Obsolescence Rate / Average Life**

Obsolescence rate / Average life for electrical and electronic equipment (EEE) has been calculated based on results of the sampling carried out for consumers, dismantlers, retailers and dumpsites along the E-waste "trade value chain" described in chapter 3 & chapter 4 and summarized in Table 5.9. The storage time takes into account storage at owner's premises, collection agency (scrap dealer) & dismantler's premises.

Table 5.9: Average Life and Storage of E-waste					
EEE Item	Average Life & Reuse (Years)	Storage (Years)			
Cellular Phone	3	0.5 - 1			
Computer	7	0.5 - 1			
Printer	5	0.5 - 1.0			
Washing Machine	12	0.5 - 12			
TV	10	1			
Refrigerator	12	0.5 - 1			
Air Conditioners	12	1 - 2			
Fixed Line Telephone	5	0.5 - 1			

A conservative estimate of the average life of each EEE item has been prepared by considering highest values of average life and storage time considering the consumer behavior in five districts. This estimate has been summarized in Table 5.10.

Table 5.10: Obsolescence Rate of Tracer EEE								
Sr. No.	EEE	Average Life (Years)						
1	Cellular Phone	3						
2	Computer	7						
3	Printer	5						
4	Washing Machine	12						
5	TV	10						
6	Refrigerator	12						
7	Air Conditioner	12						
8	Fixed Line Telephone	5						

The average weights of each of the six items considered for computing E-waste inventory is given in Table 5.11.

I able 5.11: Average weight of EEE								
Item	Average Weight (Kg)							
Cellular Phone	0.100							
Computer / Laptop / Server	27.2 / 2.5 to 3 / 650							
Printer (MFP)	6.5 - 7							
Washing Machine	60							
TV (CRT) / LCD / LED	31.6 (CRT) / 12 – 15 (LCD / LED)							
Refrigerator	35							
Air Conditioner	55							
Fixed Line Telephone	0.5 - 1.5							

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5.4 Weee/E-Waste Inventory

The projected district wise E-waste inventory estimates both in numbers and weights for Durg division starting from 2011 till 2020 have been described in Table 5.12 to Table 5.21 and presented in Figure 5.1 to Figure 5.7.

Table 5.12: E-waste Inventory of Kabeerdham District (in numbers)

Year	Cellular Phone	Fixed Line Telephon e	Compute r	Printer	Washin g Machin e	TV	Refrigerat or	Air Condition er
2011	22240	10053	237	75	34	17989	51	57
2012	29942	8597	337	121	88	20234	111	60
2013	36473	10117	502	176	105	22649	137	70
2014	38683	9398	808	441	124	25245	167	82
2015	43569	8771	1358	900	144	28033	200	94
2016	48354	8326	2322	1066	165	31028	237	103
2017	53118	8175	3749	1413	188	34242	278	118
2018	57917	8030	5924	2149	213	37692	326	135
2019	62796	7889	9419	2407	239	41393	379	154
2020	67792	7753	15353	2696	267	41486	439	175

Year	Cellular Phone	Fixed Line Telephon e	Compute r	Printer	Washin g Machin e	TV	Refrigerat or	Air Condition er
2011	3.34	10.05	4.97	0.53	1.87	556.13	1.78	3.11
2012	4.49	8.60	7.05	0.85	4.83	625.54	3.88	3.29
2013	5.47	10.12	10.51	1.24	5.80	700.20	4.80	3.85
2014	5.80	9.40	16.92	3.09	6.83	780.44	5.83	4.48
2015	6.54	8.77	28.43	6.30	7.93	866.64	6.99	5.19
2016	7.25	8.33	48.61	7.46	9.10	959.22	8.28	5.64
2017	7.97	8.18	78.50	9.89	10.35	1058.60	9.74	6.48
2018	8.69	8.03	124.03	15.05	11.70	1165.25	11.39	7.42
2019	9.42	7.89	197.21	16.85	13.15	1279.67	13.26	8.46
2020	10.17	7.75	321.46	18.87	14.71	1282.53	15.37	9.63





Figure 5.1: Item wise E-waste Projection of Kabeerdham District

Year	Cellular Phone	Fixed Line Telephon e	Compute r	Printer	Washin g Machin e	TV	Refrigerat or	Air Condition er
2011	42280	19935	944	300	179	50509	267	287
2012	55716	16694	1341	483	300	54190	418	296
2013	66411	19234	1998	703	344	57986	496	323
2014	72290	17487	3217	1756	388	61903	578	351
2015	79693	15971	5404	3582	431	65947	664	379
2016	86547	15559	9241	4244	474	70122	753	384
2017	93007	14954	14924	5624	517	74434	846	412
2018	99179	14372	23580	8556	559	78887	944	440

2019	105138	13814	37492	9582	601	83486	1046	470
2020	110940	13276	61112	10732	643	86949	1154	500

Year	Cellular Phone	Fixed Line Telephon e	Compute r	Printer	Washin g Machin e	TV	Refrigerat or	Air Condition er
2011	6.34	19.93	19.77	2.10	9.83	1561.48	9.35	15.79
2012	8.36	16.69	28.08	3.38	16.49	1675.28	14.64	16.29
2013	9.96	19.23	41.83	4.92	18.92	1792.64	17.38	17.78
2014	10.84	17.49	67.35	12.29	21.32	1913.75	20.24	19.30
2015	11.95	15.97	113.15	25.07	23.70	2038.75	23.22	20.85
2016	12.98	15.56	193.48	29.71	26.07	2167.83	26.35	21.10
2017	13.95	14.95	312.47	39.37	28.42	2301.12	29.62	22.64
2018	14.88	14.37	493.71	59.89	30.75	2438.78	33.04	24.21
2019	15.77	13.81	784.99	67.08	33.08	2580.96	36.62	25.83
2020	16.64	13.28	1279.54	75.13	35.39	2688.03	40.37	27.50

Table 5.15: E-waste Inventory of Rajnandgaon District (in Tons)



Figure 5.2: Item wise E-waste Projection of Rajnandgaon District

Year	Cellular Phone	Fixed Line Telephon e	Compute r	Printer	Washin g Machin e	TV	Refrigerat or	Air Condition er
2011	47769	22756	3364	1068	732	122496	1094	1155
2012	62624	18958	4776	1719	908	127410	1401	1205
2013	74260	21731	7117	2502	1032	132333	1665	1307
2014	80982	19655	11458	6254	1154	137275	1943	1410
2015	88815	17859	19250	12759	1276	142249	2235	1515
2016	95956	17430	32917	15119	1397	147260	2544	1520
2017	102586	16666	53161	20033	1517	152318	2868	1621
2018	108829	15935	83994	30476	1635	157428	3209	1723

2019	114773	15236	133550	34133	1753	162597	3567	1826
2020	120482	14568	217687	38229	1869	166377	3942	1932

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Year	Cellular Phone	Fixed Line Telephon e	Compute r	Printer	Washin g Machin e	TV	Refrigerat or	Air Condition er
2011	7.17	22.76	70.43	7.47	40.27	3786.95	38.29	63.50
2012	9.39	18.96	100.01	12.03	49.94	3938.87	49.03	66.29
2013	11.14	21.73	149.01	17.52	56.74	4091.06	58.26	71.90
2014	12.15	19.66	239.90	43.78	63.49	4243.87	67.99	77.57
2015	13.32	17.86	403.04	89.31	70.19	4397.62	78.24	83.32
2016	14.39	17.43	689.20	105.83	76.83	4552.55	89.03	83.59
2017	15.39	16.67	1113.05	140.23	83.42	4708.91	100.38	89.13
2018	16.32	15.93	1758.62	213.33	89.94	4866.89	112.30	94.75
2019	17.22	15.24	2796.21	238.93	96.40	5026.67	124.83	100.46
2020	18.07	14.57	4557.83	267.61	102.79	5143.55	137.97	106.26

Table 5.17: E-waste Inventory of Durg District (in Tons)



Figure 5.3: Item wise E-waste Projection of Durg District

Year	Cellular Phone	Fixed Line Telephon e	Compute r	Printer	Washin g Machin e	TV	Refrigerat or	Air Condition er
2011	23155	11116	364	116	61	24208	91	108
2012	30243	9225	517	186	77	26204	117	110
2013	35731	10533	770	271	89	28245	142	121
2014	38854	9492	1240	677	102	30332	169	133
2015	42459	8593	2083	1380	115	32467	198	146
2016	45711	8363	3562	1636	129	34649	229	151
2017	48702	7967	5752	2167	143	36881	264	164
2018	51493	7591	9088	3297	157	39163	301	177

Table 5.18: E-waste Inventory of Balod District (in numbers)

2019	54128	7233	14450	3693	171	41496	340	192
2020	56640	6893	23553	4136	186	43198	383	207

Year	Cellular Phone	Fixed Line Telephon e	Compute r	Printer	Washin g Machin e	TV	Refrigerat or	Air Condition er
2011	3.47	11.12	7.62	0.81	3.37	748.38	3.20	5.92
2012	4.54	9.22	10.82	1.30	4.24	810.09	4.10	6.03
2013	5.36	10.53	16.12	1.90	4.92	873.20	4.96	6.67
2014	5.83	9.49	25.96	4.74	5.62	937.73	5.91	7.34
2015	6.37	8.59	43.61	9.66	6.34	1003.71	6.92	8.04
2016	6.86	8.36	74.57	11.45	7.08	1071.19	8.03	8.28
2017	7.31	7.97	120.43	15.17	7.84	1140.18	9.23	9.00
2018	7.72	7.59	190.28	23.08	8.62	1210.72	10.52	9.75
2019	8.12	7.23	302.55	25.85	9.42	1282.84	11.92	10.54
2020	8.50	6.89	493.15	28.95	10.25	1335.46	13.42	11.37

Table 5.19: E-waste Inventory of Balod District (in Tons)



Figure 5.3: Item wise E-waste Projection of Balod District

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
2011	21773	9744	335	106	23	16097	35	39
2012	29492	8372	476	171	74	18364	89	41
2013	36171	9905	710	249	90	20845	112	51
2014	37424	9256	1142	624	108	23561	139	62
2015	42360	8699	1919	1272	127	26539	171	75
2016	47278	8055	3282	1507	149	29805	208	86
2017	52269	7949	5300	1997	174	33391	252	103
2018	57405	7851	8374	3038	201	37333	304	124

Table 5.20: E-waste Inventory of Bemtara District (in numbers)

2019	62750	7763	13315	3403	232	41670	366	148
2020	68365	7684	21703	3811	267	44981	440	176

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air
2011	3.27	9.74	7.02	0.75	1.27	497.65	1.21	2.16
2012	4.42	8.37	9.97	1.20	4.05	567.72	3.11	2.27
2013	5.43	9.90	14.86	1.75	4.94	644.41	3.93	2.79
2014	5.61	9.26	23.92	4.36	5.93	728.40	4.87	3.41
2015	6.35	8.70	40.18	8.90	7.01	820.46	5.98	4.14
2016	7.09	8.05	68.71	10.55	8.21	921.43	7.28	4.72
2017	7.84	7.95	110.97	13.98	9.55	1032.29	8.82	5.68
2018	8.61	7.85	175.33	21.27	11.06	1154.14	10.64	6.81
2019	9.41	7.76	278.78	23.82	12.76	1288.22	12.82	8.14
2020	10.25	7.68	454.40	26.68	14.68	1390.59	15.41	9.71

Table 5.21: E-waste Inventory of Bemtara District (in Tons)



Figure 5.3: Item wise E-waste Projection of Bemtara District

Table 5.22: All E-waste Items Inventory of Durg Division (in Tons)									
Year	Kabeerdham	Rajnandgaon	Durg	Balod	Bemtara	Total			
2011	581.78	1644.60	4036.84	783.89	523.07	7570.17			
2012	658.53	1779.19	4244.52	850.35	601.11	8133.70			
2013	741.98	1922.66	4477.35	923.66	688.01	8753.67			
2014	832.79	2082.57	4768.41	1002.60	785.77	9472.14			
2015	936.78	2272.68	5152.89	1093.25	901.72	10357.31			
2016	1053.89	2493.07	5628.86	1195.81	1036.05	11407.68			
2017	1189.71	2762.53	6267.17	1317.12	1197.08	12733.61			
2018	1351.55	3109.63	7168.11	1468.29	1395.71	14493.29			
2019	1545.91	3558.15	8415.96	1658.47	1641.71	16820.20			
2020	1680.49	4175.88	10348.64	1908.00	1929.41	20042.42			



Figure 5.6: District wise Total E-waste Inventory Projection



Figure 5.7: Total E-waste Inventory Projection in Durg Division from 2011 to 2020

The results of E-waste inventory estimates in (Tons) for Durg division is given in **Table 5.22**. Major inferences, which can be drawn from E-waste inventory results, are given below.

- 1. Inventory estimates in Durg division indicate that E-waste generation ranges from **7570.17** tons in 2011 to **20042.42** tons in 2020.
- In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 88% of the total inventory followed by refrigerator (1%), Washing machine (1%), Air conditioner (1%), Cellular phone (1%), Computer (6%), Fixed Line Phone (1%) & Printer (1%) as shown in Figure 5.8.
- In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (59%), computer will constitute about 36% of the total inventory followed by Refrigerator (1%), Air conditioner (1%), Washing machine (1%), Cellular phone (0%), Printer (2%) & Fixed Line Phone (0%) as shown in Figure 5.9.



Figure 5.8: Item-wise E-waste in Percent for Durg Division in 2015



Figure 5.9: Item-wise E-waste in Percent for Durg Division in 2020

5.5 E-waste Processing in Durg Division

There are various processes involved for dismantling, recycling / reuse of E-waste in Durg division. These processes for different types of electronic items are given in **Table 5.23**. The photodocumentation of some of these processes observed. An analysis of the different processes observed to recover metals indicates that no chemical process is occurring in study area. Only physical processes, which prepare raw material for recycling industry is observed in the study area. Iron recovered from E-waste is recycled through induction arc furnace route in the study area.

Sr.	Process name	Process Status							
No.	Tiocess name	Kabeerdham	Rajnandgaon	Durg	Balod	Bemtara			
1	IC's Extraction from PCB	No	No	No	No	No			
2	Surface Heating of PCB and Extraction of components	No	No	No	No	No			
3	Dissembling of Monitor & TV and extraction of components	Yes	Yes	Yes	Yes	Yes			
4	Yoke core and Copper	No	No	No	No	No			
5	Metallic Core of Transformer and Copper	Yes	Yes	Yes	Yes	Yes			
6	Rare Earth Core of Transformer and Copper	No	No	No	No	No			
7	Rare Earth Core of Static Transformer	No	No	No	No	No			
8	Wire PVC and Copper	Yes	Yes	Yes	Yes	Yes			
9	Plastic Shredder	No	No	No	No	No			
10	Dismantling of Refrigerator and Compressor	Yes	Yes	Yes	Yes	Yes			
11	Gold Extractions from Pins and Comb	No	No	No	No	No			
12	Acid Bath for PCB	No	No	No	No	No			
13	Regunning CRT's	No	No	No	No	No			
14	Glass Recovery from CRT	No	No	No	No	No			
15	Gold Recovery	No	No	No	No	No			

Table 5.23: E-waste dismantling process occurring in the study area

Trade Economics

Trade economics has been studied in terms of various processes, which occur along the trade value chain. Each stakeholder in the processes studied is linked to the other and the trade between the two takes place based on value added. The fundamental parameters governing this trade are same as that of any other trade. These parameters are described below.

- 1. Input cost
- 2. Operating Margin

3. Selling price

Input costs have been classified into the following costs.

- 1. Raw material cost
- 2. Labour cost

Selling price is the price at which the products are sold. The difference between the selling price and the input costs gives the operating margin. Operating margin is an indicator of the profit and has been computed in terms of operating margin per kg of raw material.

The entire trade economics of each of the processes is summarized in **Table 5.24**. **Table 5.24** does not include capital, depreciation, taxation and transportation cost. Labour refers to workers involved in e-waste extraction industry only and only 300 working days in a year.

	Table 5.24. Trade continues of Durg Division D-waste market							
Item	Rate / piece	Input Cost per Kg.	Labour Cost per Kg.	Output Price per Kg.	Profitability	%		
TV	600	20.00	0.39	20.83	0.44	2.18		
Ref	1000	22.22	0.39	34.07	11.46	50.69		
WM	750	18.75	0.39	32.17	13.03	68.06		
AC	3000	54.55	0.39	73.33	18.40	33.49		
PC	1100	35.48	0.39	42.85	6.98	19.45		
Mobile	38	38.00	0.39	62.59	24.20	63.04		

Table 5.24: Trade economics of Durg Division E-waste market

Some major observations from Table 5.24 are as follows:

- 1. Operating margin for Television waste per kilogram is Rs. 0.44
- 2. Operating margin for waste refrigerator is Rs. 11.46 per kilogram
- 3. For that of Washing Machine is Rs. 13.03 per kilogram
- 4. For that of Air Conditioners is Rs. 18.40 per kilogram
- 5. For scrap old Personal Computer is Rs. 6.98 per kg and
- 6. For waste cellular phones is Rs. 24.20 per kg
- 7. The operating margin ranges from Rs. 0.44 to Rs. 24.20 per kilogram. Scrap of Mobile / cellular phones gives the maximum operating margin of Rs. 24.20 while scrap from television gives the minimum profit of Rs. 0.44 per kilogram. This indicates that informal sector if brought into formal sector considering taxation involved will only dismantle / recycle cellular phones followed by ACs and WMs to some extent. Therefore, there is a need to formulate financial instrument for making dismantling / recycling of white goods viable.

5.6 Market Risks

Market risks based on the assessment of demand, supply, collection and transportation primarily address availability (quantity) of raw material as E-waste. These risks have been assessed and described below based on duration (short term, long term) along with their intensities.

- 1. Risks of availability of raw material (E-waste)
- 2. Risk associated with collection
- 3. Risk associated with transportation

Risk profiling giving the intensities as part of market assessment has been highlighted in **Table 5.25** given below.

	I dole olaot hitdinet i	cion numerine		
Risks/ intensities		High	Medium	Low
Risks of availability	Short term			
of raw material	Long term			
Risk associated with	Short term			
collection	Long term			
Risk associated with	Short term			\checkmark
transportation	Long term			\checkmark
	Long term			

Table 5.25: Market Risk Matrix

The intensities have been fixed as per following analysis.

- 1. Risks of availability of raw material has been assessed as medium since enough E-waste potential exists in Durg division to be processed both in the short term and long term especially after 2014. This will depend on the implementation of regulatory regime, which will enable the E-waste generators to send the waste to dismantling / recycling facility.
- 2. Risk associated with collection is expected to be high in the short term as there is no formal collection mechanism in place in the study area. In this situation, the recycling facility will face the risk of collecting E-waste from the source, which could be geographically dispersed. In the long term this risks expected to be medium as collection and transportation mechanism is expected to be institutionalized. In the short term, the recycling facility is expected to be making their own arrangements for collection from vendors.
- 3 Risk associated with transportation is expected to be low in both short and long term as there is transportation mechanism in place both at the local and national level to carry hazardous waste. Since some E-waste is already being transported outside study area, therefore transportation risk is expected to be of low intensity

5.7 Conclusions

Market risks matrix highlight the availability of raw material, its collection and transportation as risks of high & medium intensities. Collection mechanism directly impacts the availability of raw material. Therefore, there is a need for both strict implementation of regulations as well as financial instrument for diverting E-waste inventory in to the formal sector.

Chapter 6: Conclusions & Recommendations

Major conclusions & recommendations, which have been arrived after assessment of E-waste regulations, E-waste material flow chain and inventory estimates are given below.

- Implementation of E-waste regulation is a major challenge
- There is no organized mechanism for collection, transportation and disposal of E-Waste in Durg division.
- No mechanism exists in the state to monitor and track its inventory, collection, transportation and disposal.
- Currently, a majority of producers use call centre as well as dealer's network for collection of E-waste.
- Electronic items go to mechanic shops from households for repairing, and mechanic replace damaged / defunct parts/components from it and then they sold it to scrap dealers.
- Major conclusions, which can be derived, include growing market of EEE in Durg division. This growth may lead to increasing E-waste generation, which may further lead to higher pollution loads, health impacts and loss of recoverable items.
- Mechanics sell E-waste to scrap dealer by weight / Pcs. mainly of ICT items (IT as per Schedule 1); TV circuit Rs. 15-45/kg; Compressor Rs. 300-400/Pcs.; Washing Machine Motor Rs. 200/Pcs.; Copper Rs. 200-350/kg; DVD Circuit Rs. 20-25/kg; Mobile kit Rs. 1000-2000/kg; SMPS Rs. 50/Pcs, Mother Board Rs. 90/Pcs.; Hard disk Rs. 120/Pcs.; CD Writer Rs. 35-40/Pcs.
- Scrap vendors sold E-waste to scrap dealer by weight at Rs. 150-250 per kg
- Scrap vendors sold damage mobile phone to scrap dealer as individual piece at Rs. 30-50 per piece
- Scrap dealer comes from Delhi yearly twice/thrice for collecting of E-waste.
- Since no mechanism exist for tracking purchase of EEE by bulk consumers and producers are not required to declare quantity of EEE placed in the market since 2012, E-waste inventory assessment has to rely on available historical market research data as well as data from collectors, dismantlers / recyclers.
- Data matrix versus methodology used for E-waste inventory assessment indicates "Market Supply" method and "Carnegie Mellon" method can be applied for E-waste inventory assessment in five districts of Durg Division in Chhattisgarh. However, a combination of Carnegie Mellon method & tracer tracking has been selected for inventory assessment since it covers all the aspects of material flow chain.
- Analysis shows that cell phone have the highest installed base followed by Computers, TV, printers, fixed line telephone, refrigerators, washing machines and Air Conditioners. In Durg cellular phone, fixed line phone, TV, washing machine and refrigerator has the highest installed base followed by Kabeerdham, Rajnandgaon, Durg, Balod and Bemtara districts of Durg division.
- Inventory estimates in Durg division indicate that E-waste generation ranges from **7570.17** tons in 2011 to **20042.42** tons in 2020.
- In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 88% of the total inventory followed by refrigerator (1%), Washing machine (1%), Air conditioner (1%), Cellular phone (1%), Computer (6%), Fixed Line Phone (1%) & Printer (1%).
- In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (59%), computer will constitute about 36% of the total inventory followed by Refrigerator (1%), Air conditioner (1%), Washing machine (1%), Cellular phone (0%), Printer (2%) & Fixed Line Phone (0%).

- An analysis of the different processes observed to recover metals indicates that no chemical process is occurring in study area. Only physical processes, which prepare raw material for recycling industry is observed in the study area. Iron recovered from E-waste is recycled through induction arc furnace route in the study area.
- Some major observations are that Operating margin for Television waste per kilogram is Rs. 0.44. Operating margin for waste refrigerator is Rs. 11.46 per kilogram. For that of Washing Machine is Rs. 13.03 per kilogram. For that of Air Conditioners is Rs. 18.40 per kilogram. For scrap old Personal Computer is Rs. 6.98 per kg and for waste cellular phones is Rs. 24.20 per kg. The operating margin ranges from Rs. 0.44 to Rs. 24.20 per kilogram. Scrap of Mobile / cellular phones gives the maximum operating margin of Rs. 24.20 while scrap from television gives the minimum profit of Rs. 0.44 per kilogram. This indicates that informal sector if brought into formal sector considering taxation involved will only dismantle / recycle cellular phones followed by ACs and WMs to some extent. Therefore, there is a need to formulate financial instrument for making dismantling / recycling of white goods viable.
- Market risks matrix highlight the availability of raw material, its collection and transportation as risks of high & medium intensities. Collection mechanism directly impacts the availability of raw material. Therefore, there is a need for both strict implementations of regulations as well as financial instrument for diverting E-waste inventory in to the formal sector.

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
	Television	LCD	BPL	Address Not Available Customer Care Number 1800 – 425 – 1800, 1800 – 425 – 2355
			Daenyx	A-30 & 31, Hosiery Complex, Phase II Extn. Noida - 201305 Uttar Pradesh (INDIA) Ph. No. +91-120- 3042721
			Haier	B-1/A-14, Mohan Co-operative Industrial Estate, Mathura Road, New Delhi-110044 Ph. No. 011-39496000/30674000 Toll Free No. 1800-200-9999 (24X7)
		Branch Offices	Hitachi	Hitachi India Pvt. Ltd. Units 802A and 802B, Tower 2, 8th Floor, Konnectus Building, Bhavbhuti Marg, Near Minto Bridge, Connaught Place, New Delhi – 110001 Ph. No. +91 (11) 30605252
				Hitachi India Pvt. Ltd Bangalore Branch Office Unit 103, 1st Floor, Shah Sultan Complex, No 17, Cunningham Road, Bangalore 560 052, India Ph. No. +91 (80) 2238 6986 / 987 / 984
				Hitachi India Pvt. Ltd. Mumbai Branch Office 508, Ascot Center, Next to Hilton hotel, Sahar Road, Andheri East, Mumbai 400099, India Ph. No. +91-22-28215625
				Hitachi India Pvt. Ltd. Chennai Branch Office 206, Apeejay House, No.12, Haddows Road, Nungambakkam, Chennai 600 006, India Ph. No. +91 (44) 2821 3108 / 3109
				Hitachi Ltd. Infrastructure Systems Company Mumbai Branch Office 707, Trade Centre, Opp. to MTNL Bldg Bandra-Kurla Complex,

Detailed Inventory of Producers- Annexure 1
Sr.	Product Name	Product Sub	Brand	Address / Contact Details
10.		Category		
				Bandra (East) Mumbai 400 098
				Ph. No. +91+22-2650-0031
				Allied JB Friction Private
				Limited
		Group		A-12, Site IV, Industrial Area,
		Companies		Sahibabad – 201010, Dist.
				Ghaziabad (UP), India.
				Ph. No. 0120 4539600 – 700
				Aloka Irivitron Medical
				Dist # A5 Signat Industrial Dark
				Plot # A5, Sipcot Industrial Park,
				Taluk Kanchingaram 602117
				Tanuk, Kancinpurani – 002117, TAMIL MADU
				Ph. No. 044-37183750
				Flyiac Logistics Pyt Ltd
				B = 1,205,2nd El. Boomerang.
				Chandivali Farm Road. Near
				Powai Andheri East, Mumbai 400
				072
				Ph. No. 022 – 3359 5900
				Hitachi Chemical India
				Private Limited
				708, 7th Floor, Time Tower, M G
				Road, Gurgaon – 122 002 Ph.
				No. 0124 - 4246498
				Hitachi Consulting Software
				Services India Private Limited
				Plot No 9, Gachibowli,
				Hyderabad – 500032, IndiaPh.
				No. 040 - 4034 3000
				Hitachi Consulting India
				Private Limited
				City SEZ Hadapaar Pood Dupo
				411013
				Ph No $020 - 6511 \ 1001/2$
				Hitachi Data Systems India
				Pvt. Ltd.
				#278/23. Trident Towers. 3rd
				floor, 10th Main, T. Mariappa
				Road, Javnagar 2nd Block,
				Bangalore 560 011, India
				Ph. No. +91 (80) 2657 6295
				Hitachi Hi-Rel Power
				Electronics Pvt. Ltd.B-52, 5th
				Floor, "Corporate House", Near
				Judges Bungalow, Bodakdev,

Sr. No.	Product Name	Product Sub	Brand	Address / Contact Details
		Category		Abreadabad 280.054 Civiarat
				Anniedabad – 580 054 Gujarat –
				$\begin{array}{c} \text{India} \\ \text{Ph} \ \text{No} \ \pm 91.79 \ 4900.2300 \end{array}$
				Hitachi High Technologies
				(Singapore) Pte I td
				± 602 6th floor
				Fros Corporate Towers Nehru
				Place
				New Delhi 110 019. India
				Ph. No. +91 (11) 4651 8450
-				Hitachi Home and Life
				Solutions (India) Ltd.
				10th floor, Abhijeet,
				Mithakhali Six Road,
				Ahmedabad 380 006 Gujarat,
				Ph. No. +91 (79) 3041 4800
				Hitachi Koki India Ltd.
				Plot No. 9A, 1st Phase, Peenya
				Industrial Area, Bangalore 560
				058, India
				Ph. No. +91 (80) 4117 0777
				Hitachi Lift India Pvt. Ltd.
				Units 304-306, 3rd Floor ABW
				Elegance Tower Jasola District
				Centre New Delhi 110 025, India
				Ph. No. +91 (11) 4060 5290
				Hitachi Maxell, Ltd. Chennai
				Liaison Office
				DBS Office Business Center
				Koom No. 105, 51A Cathedral
				Hotel Nuncembelliem Channel
				India
				Ph No ± 91 (44) 4264 9495
				Hitachi Maxell Ltd Mumbai
				Liaison Office
				No.401. 4th Floor "BANARASI
				HERITAGE" Mind Space, Link
				Road, Malad (West), Mumbai,
				India
				Ph. No. +91 (22) 3212 8193
				Hitachi Metals (India) Pvt.
				Ltd.
				Plot No. 94 & 95, Sector 8, IMT
				Manesar, Gurgaon - 122050 (HR)
				Ph. No. +91 (124) 4124800 /
				4812300 / 4812400

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
140.		Category		
				Hitachi Metglas (India) Pvt.
				Ltd.
				Plot No. 94 & 95, Sector 8, IMT
				Manesar, Gurgaon - 122050 (HR)
				Ph. No. +91 (124) 4124800 /
				4812300 / 4812400
				Hitachi NeST Control Systems
				Pvt. Ltd.
				No.103, First Floor, Shah Sultan
				Complex No.17, Cunningham
				Road, Bangalore -560 052
				Karnataka. India
				Ph. No. 080 - 6789 8700
				Hitachi Plant Technologies
				India Pvt. Ltd.
				DPC 101, 102 and 103, First
				Floor, Block No. 4A, DLF
				Corporate Park, MG Road, Phase
				- III, DLF City, Gurgaon, Haryana
				Ph. No. +91+12-4455-2344
				Hitachi Transport System
				India Pvt. Ltd.
				116 & 117, 1st floor, Rectangle -
				1, D-4, District Centre, Saket,
				New Delhi 110 017, India
				Ph. No. +91 (11) 4052 5200
				Tata Hitachi Construction
				Machinery Co. Ltd.
				Jubilee Building, 44 Museum
				Road, Bangalore – 560 025
				Ph. No. 080 – 6695 3301 ~ 03
				Toyo Machinery & Metal Co.,
				Ltd. (India Liason Office)
				Units 304-306, 3rd Floor, ABW
				Elegance Tower, Jasola District
				Centre, New Delhi-110025
				Ph. No. 011 – 4060 5252
				LG Electronics India Pvt. Ltd,
				Plot No. 51, Udyog Vihar,
			LG	Surajpur Kasna Road,
				Greater Noida: 201306
				Uttar Pradesh
				SGV Industries
				Plot No.41 & 42,
		Manufacturing	Maulzoon	Sector-6A, Sidcul Indl Area,
		Facilities	IVIATKSOII	Haridwar (Uttrakhand)
				Pin Code - 249401
				Ph. 01334-239662/63/64

Category Fax No. 01334- 239661 Email Id - store@sgvindustries.com Contact - Mr. Sunil Jain (Vice President) Mob. 9212669498 Mr. Rajender Sharma (Facility Incharge) Mob. 921260503 SNR Industries Plot No.6A & 6B, Gabriel Road, Sector-2, Parwanoo, (H.P.) Pin Code - 173220 Ph. 01792- 232711 Contact- Mr. Alok Kumar (Facility Incharge) Mob. 9212669513 SNR Electronics Ltd. Plot No.2, HPISDC Indl. Area, Baddi, Tehsil Nalagarh, Dist. Solan,(H.P.). Pin Ocde - 173205 Ph.01795- 244703 Fax - 01795- 244703 Fax - 01795- 70 Ph.01700 9212669513 PLOT No. 378, F.I.E,	Sr. No.	Product Name	Product Sub	Brand	Address / Contact Details
Fax No. 01334-239601Email Idstore@gsyindustries.comContact - Mr. Sunil Jain (VicePresident) Mob. 9212669498Mr. Rajender Sharma (FacilityIncharge) Mob. 9212669503SNR IndustriesPlot No.6A & 6B,Gabriel Road, Sector-2,Parwanoo, (H.P.)Pin Code - 173220Ph. 01792-232711Contact- Mr. Alok Kumar(Facility Incharge) Mob.9212669513SNR Electronics Ltd.Plot No.2, HPISDC Indl. Area,Baddi, Tehsil Nalagarh,Dist, Solan, (H.P.).Pin Code - 173205Ph.01795- 244703Fax - 01795- 244703Fax - 01795- 244703Contact - Mr. Alok Kumar(Facility Incharge) Mob.9212669513			Category		E NL 01224 220/(1
 Store@sgvindustries.com Store@sgvindustries.com Contact - Mr. Sunil Jain (Vice President) Mob. 9212669498 Mr. Rajender Sharma (Facility Incharge) Mob. 9212669503 SNR Industries Plot No.6A & 6B, Gabriel Road, Sector-2, Parwanoo, (H.P.) Pin Code - 173220 Ph. 01792- 232711 Contact - Mr. Alok Kumar (Facility Incharge) Mob. 9212669513 SNR Electronics Ltd. Plot No.2, HPISDC Indl. Area, Baddi, Tehsil Nalagarh, Dist. Solan,(H.P.). Pin Code - 173205 Ph.01795- 244703 Fax - 01795- 244703 Contact - Mr. Alok Kumar (Facility Incharge) Mob. 9212669513 Fax - 01795- 244703 Fortart - Mr. Alok Kumar (Facility Incharge) Mob. 9212669513 					Fax NO. 01554- 259661
Store(25.8) multisties.com Contact - Mr. Sunil Jain (Vice President) Mob. 9212669498 Mr. Rajender Sharma (Facility Incharge) Mob. 9212669503 SNR Industries Plot No.6A & 6B, Gabriel Road, Sector-2, Parwanoo, (H.P.) Pin Code - 173220 Ph. 01792- 232711 Contact- Mr. Alok Kumar (Facility Incharge) Mob. 9212669513 SNR Electronics Ltd. Plot No.2, HPISDC Indl. Area, Baddi, Tehsil Nalagarh, Dist. Solan,(H.P.). Pin Code - 173205 Ph.01795- 244703 Contact - Mr. Alok Kumar (Facility Incharge) Mob. 9212669513 Solan,(H.P.). Pin Code - 173205 Ph.01795- 244703 Contact - Mr. Alok Kumar (Facility Incharge) Mob. 9212669513 PLOT No. 378, F.I.E, PATPARGANJ, DEHLI - 110092					Ethan IC -
Contact - Mr. Sumi jan (vice President) Mob. 9212669498 Mr. Rajender Sharma (Facility Incharge) Mob. 9212669503 SNR Industries Plot No.6A & 6B, Gabriel Road, Sector-2, Parwanoo, (H.P.) Pin Code - 173220 Ph. 01792-232711 Contact - Mr. Alok Kumar (Facility Incharge) Mob. 9212669513 SNR Electronics Ltd. Plot No.2, HPISDC Indl. Area, Baddi, Tehsil Nalagarh, Dist. Solan,(H.P.). Pin Code - 173205 Ph.01795-244703 Fax - 01795- 244703 Fax - 01795- 244703 Contact - Mr. Alok Kumar (Facility Incharge) Mob. 9212669513					Contact Mr. Supil Jain (Vice)
Image: State of the state					Drosident) Meb. 0212660408
Incharge Incharge Incharge SNR Industries Plot No.6A & 6B, Gabriel Road, Sector-2, Parwanoo, (H.P.) Pin Code - 173220 Ph. 01792- 232711 Contact- Mr. Alok Kumar Contact- Mr. Alok Kumar (Facility Incharge) Mob. 9212669513 SNR Electronics Ltd. Plot No.2, HPISDC Indl. Area, Baddi, Tehsil Nalagarh, Dist. Solan,(H.P.). Pin Code - 173205 Ph.01795- 244703 Fax - 01795- 244703 Contact - Mr. Alok Kumar (Facility Incharge) Mob. 9212669513 PLOT No. 378, F.I.E, PATPARGANJ, DEHLI - 110092					Mr. Paiondor Sharma (Facility
Interlagy Motion 2212007305 SNR Industries Plot No.6A & 6B, Gabriel Road, Sector-2, Parwanoo, (H.P.) Pin Code - 173220 Ph. 01792- 232711 Contact- Mr. Alok Kumar (Facility Incharge) Mob. 9212669513 SNR Electronics Ltd. Plot No.2, HPISDC Indl. Area, Baddi, Tehsil Nalagarh, Dist. Solan,(H.P.). Pin Code - 173205 Ph.01795- 244703 Fax - 01795- 244703 Contact - Mr. Alok Kumar (Facility Incharge) Mob. 9212669513					Incharge) Mob. 0212660503
Plot No.6A & 6B, Gabriel Road, Sector-2, Parwanoo, (H.P.) Pin Code - 173220 Ph. 01792-232711 Contact- Mr. Alok Kumar (Facility Incharge) Mob. 					SNR Industries
Gabriel Road, Sector-2, Parwanoo, (H.P.) Pin Code - 173220 Ph. 01792- 232711 Contact- Mr. Alok Kumar (Facility Incharge) Mob. 9212669513SNR Electronics Ltd. Plot No.2, HPISDC Indl. Area, Baddi, Tehsil Nalagarh, Dist. Solan,(H.P.). Pin Code - 173205 Ph.01795- 244703 Fax - 01795- 244703 Contact - Mr. Alok Kumar (Facility Incharge) Mob. 9212669513Head OfficePLOT No. 378, F.I.E, PATPARGANJ, DEHLI - 110092					Plot No 6A & 6B
Parwanoo, (H.P.)Pin Code - 173220Ph. 01792- 232711Contact- Mr. Alok Kumar(Facility Incharge) Mob.9212669513SNR Electronics Ltd.Plot No.2, HPISDC Indl. Area,Baddi, Tehsil Nalagarh,Dist. Solan,(H.P.).Pin Code - 173205Ph.01795- 244703Fax - 01795- 244703Fax - 01795- 244703Contact - Mr. Alok Kumar(Facility Incharge) Mob.9212669513					Gabriel Road Sector-2
Pin Watko, (117) Pin Code - 173220 Ph. 01792- 232711 Contact- Mr. Alok Kumar (Facility Incharge) Mob. 9212669513 SNR Electronics Ltd. Plot No.2, HPISDC Indl. Area, Baddi, Tehsil Nalagarh, Dist. Solan,(H.P.). Pin Code - 173205 Ph.01795- 244703 Fax - 01795- 244703 Fax - 01795- 244703 Contact - Mr. Alok Kumar (Facility Incharge) Mob. 9212669513 PLOT No. 378, F.I.E, PATPARGANJ, DEHLI - 110092					Parwanoo (HP)
Ph. 01792- 232711Contact- Mr. Alok Kumar(Facility Incharge) Mob.9212669513SNR Electronics Ltd.Plot No.2, HPISDC Indl. Area,Baddi, Tehsil Nalagarh,Dist. Solan,(H.P.).Pin Code - 173205Ph.01795- 244703Fax - 01795- 244703Contact - Mr. Alok Kumar(Facility Incharge) Mob.9212669513Head OfficePLOT No. 378, F.I.E,PATPARGANJ, DEHLI -110092					Pin Code - 173220
Contact- Mr. Alok Kumar (Facility Incharge) Mob. 9212669513SNR Electronics Ltd. Plot No.2, HPISDC Indl. Area, Baddi, Tehsil Nalagarh, Dist. Solan,(H.P.). Pin Code - 173205 Ph.01795- 244703 Fax - 01795- 244703 Fax - 01795- 244703 Contact - Mr. Alok Kumar (Facility Incharge) Mob. 9212669513Head OfficeHead Office					Ph 01792-232711
Gondact Mit Hor Hama(Facility Incharge) Mob. 9212669513SNR Electronics Ltd. Plot No.2, HPISDC Indl. Area, Baddi, Tehsil Nalagarh, Dist. Solan,(H.P.). Pin Code - 173205 Ph.01795- 244703 Fax - 01795- 244703 Contact - Mr. Alok Kumar (Facility Incharge) Mob. 9212669513Head OfficeHead Office					Contact- Mr. Alok Kumar
Image: Provide the second system9212669513SNR Electronics Ltd. Plot No.2, HPISDC Indl. Area, Baddi, Tehsil Nalagarh, Dist. Solan,(H.P.). Pin Code - 173205 Ph.01795- 244703 Fax - 01795- 244703 Contact - Mr. Alok Kumar (Facility Incharge) Mob. 9212669513Head OfficeHead Office					(Facility Incharge) Mob.
SNR Electronics Ltd. Plot No.2, HPISDC Indl. Area, Baddi, Tehsil Nalagarh, Dist. Solan,(H.P.). Pin Code - 173205 Ph.01795- 244703 Fax - 01795- 244703 Contact - Mr. Alok Kumar (Facility Incharge) Mob. 9212669513Head OfficePLOT No. 378, F.I.E, PATPARGANJ, DEHLI - 110092					9212669513
Plot No.2, HPISDC Indl. Area, Baddi, Tehsil Nalagarh, Dist. Solan,(H.P.). Pin Code - 173205 Ph.01795- 244703 Fax - 01795- 244703 Contact - Mr. Alok Kumar (Facility Incharge) Mob. 92126695139212669513PLOT No. 378, F.I.E, PATPARGANJ, DEHLI - 110092					SNR Electronics Ltd.
Baddi, Tehsil Nalagarh, Dist. Solan,(H.P.). Pin Code - 173205 Ph.01795- 244703 Fax - 01795- 244703 Contact - Mr. Alok Kumar (Facility Incharge) Mob. 92126695139212669513PLOT No. 378, F.I.E, PATPARGANJ, DEHLI - 110092					Plot No.2, HPISDC Indl. Area,
Dist. Solan,(H.P.). Pin Code - 173205 Ph.01795- 244703 Fax - 01795- 244703 Contact - Mr. Alok Kumar (Facility Incharge) Mob. 9212669513 PLOT No. 378, F.I.E, PATPARGANJ, DEHLI - 110092					Baddi, Tehsil Nalagarh,
Pin Code - 173205 Ph.01795- 244703 Fax - 01795- 244703 Contact - Mr. Alok Kumar (Facility Incharge) Mob. 9212669513 PLOT No. 378, F.I.E, PATPARGANJ, DEHLI - 110092					Dist. Solan,(H.P.).
Ph.01795- 244703 Fax - 01795- 244703 Contact - Mr. Alok Kumar (Facility Incharge) Mob. 9212669513 PLOT No. 378, F.I.E, PATPARGANJ, DEHLI - 110092					Pin Code - 173205
Fax - 01795- 244703 Contact - Mr. Alok Kumar (Facility Incharge) Mob. 9212669513PLOT No. 378, F.I.E, PATPARGANJ, DEHLI - 110092					Ph.01795- 244703
Contact - Mr. Alok Kumar (Facility Incharge) Mob. 9212669513 PLOT No. 378, F.I.E, PATPARGANJ, DEHLI - 110092					Fax - 01795- 244703
(Facility Incharge) Mob. 9212669513 PLOT No. 378, F.I.E, PATPARGANJ, DEHLI - 110092					Contact - Mr. Alok Kumar
9212669513 PLOT No. 378, F.I.E, PATPARGANJ, DEHLI - 110092					(Facility Incharge) Mob.
PLOT No. 378, F.I.E, PATPARGANJ, DEHLI - 110092					9212669513
Head OfficePATPARGANJ, DEHLI - 110092					PLOT No. 378, F.I.E,
Head Office 110092					PATPARGANJ, DEHLI -
			Head Office		110092
Ph. No. +91-11-43086501-502,					Ph. No. +91-11-43086501-502,
22157662-63					22157662-63
43B, Okhla Industrial Estate,					43B, Okhla Industrial Estate,
Corporate d'a New Delhi - 110020. India.			Corporate do		New Delhi - 110020. India.
Head Office Moser Baer Tel +91 11 40594444, 91 11			Head Office	Moser Baer	Tel +91 11 40594444, 91 11
26911570 - 74			110au Office		26911570 - 74
Fax +91 11 41635211, 26911860					Fax +91 11 41635211, 26911860
Chennai					Chennai
Moser Baer India Ltd.					Moser Baer India Ltd.
81, IInd Floor					81, IInd Floor
Branch Offices Valluvarkottam High Road			Branch Offices		Valluvarkottam High Road
Nungambakkam,					Nungambakkam,
Chennai - 600 034					Chennai - 600 034
Tel: Ph.+91-44-42664358-59					1el: Ph.+91-44-42664358-59
M & ES Office					M & ES Office
Moser Baer India Ltd.					Moser Baer India Ltd.
16/-169, 11nd Floor, Anna Salai,					107-109, 11nd Floor, Anna Salai,
Saidapet, Chennai - 600 015 Tal. ±01 44 45050041 42 42					Satuapet, Chemiai - 000015 Tal. ± 0144450500414243

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Chennai Project Office
				Moser Baer Solar Limited
				07-2.07-3.07-4
				Hi-TECH-SEZ Sincot Industrial
				Part-3
				Oragadam Sriperampudur Taluk
				Kancheepuram District
				Tamil Nadu 602105
				Mumbai
				Maran Dara Estanta marat Ltd
				Moser Baer Entertainment Ltd
				Mukti Foundation Building,
				A Wing, 1st Floor,
				141- A, Model Town, Village
				Ambıvalı,
				Behind Kokilaben Dhirubhai
				Ambani Hospital,
				Four Bungalows, Andheri-West,
				Mumbai - 400053
				Domestic Marketing & CE
				Moser Baer India Ltd.
				510- Maker Chambers V
				5th Floor, Nariman Point
				Mumbai-400 021
				Telefax: +91-22-66157930-31
				Bangalore
				Moser Baer India Ltd.
				Raheja Plaza, Unit No.103
				17 Commissariat Road
				Bangalore - 560025
				Telefax : 080-41649712
				Kolkata
				Moserbaer Entertainment
				Limited
				1st Floor 13 FLT LT
				Tapan Chowdhury Avenue
				Mudiali
				Kolkata - 700026
				Tel: ± 91 33 65/199/15 5/
				Dolb:
				235 Okhla Industrial Estata
				255, Okilla Industrial Estate
				Now Dolb: 110.020
				Tab. 101 11 47(24100
				1e: +91-11-4/024100
				rune
				Moser Baer Photo Voltaic Ltd.
				311, Illrd Floor
				Connaught Place
				28 Bund Garden Road
				Pune - 411 001

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
10.		Category		
				USA Distributor
				Media Masters LLC
				#440, 2601 S. Minnesota
		Representative		Ave., Ste 105 Sioux Falls,
		& Distributor		SD 5/105-4/50 USA
				Phone: +1-(888)-243-4465
				Fax: $+1-(877)$ 835-2834
				E-mail: sales@mediamastersdisc
				.com
		M		BOM & M& ES
		Manufacturing		66, Udyog Vinar,
		Facilities		Greater Noida (U.P.) - 201 306
				1ei: 0120-4386000
				Solid State Media
				A-104, Sector - 80 ,
				Phase - II, Noida (UP)
<u> </u>				MDV & MD Solar
				KIDFV & MID Solar
				Greater Noide (U.P.) 201306
				$T_{el} = 0120 \ 4658000$
				BOM & SSM
				$A_{-1}64$ Sector - 80
				Phase - II Noida (UP) - 201 305
				Tel: 0120-4307000
				PV Technologies India Ltd.
				Oz-2, $Oz-3$, $Oz-4$
				Hi-Techsez, Sipcot Industrial
				Park-3 Oragadam, Sriperampudur
				Taluk
				Kancheepuram District
				Tamilnadu - 602105
				MIRC Electronics Ltd.
				Onida House, G-1, M.I.D.C,
				Mahakali Caves Road, Andheri
		Componato		(E), Mumbai - 400 093.
		Address	Onida	Tel: 022 - 28200435 / 66975777.
		2-1uuress		Email: response@onida.com
				For Institutional Sales:
				corporate.sales@onida.com
				For Service: service@onida.com
			Panasonic	Ph. No. 1800 108 1333 / 1860
				425 1860 / 1800 103 1333
				Samsung India Electronics
				6th, 7th & 8th Floors, Ifci Tower,
			Samsung	61, Nehru Place,
				New Delhi,
				Tel: 011 3030 8282

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Samsung Corporation
				Room No 355, Hotel Taj Palace,
				Chanakyapuri
				New Delhi, DL
				011 2688 9817
				Philips Electronics India
				Limited
				9th Floor, DLF 9-B,
			Philips	DLF Cyber City,
				Sector 25, DLF Phase - 3,
				Gurgaon - 122002, India
				Tel: +91 - 124 - 4606000
				Philips Electronics India
				Limited
				7, Justice Chandra Madhab Road,
				Kolkata - 700020, India
				Tel:+91-33-24753621/27
				Philips Electronics India
				Limited
				The Estate, 4th floor (North
				Wing), (Next to Manipal Centre),
				121, Dickenson Road,
				Bangalore - 560042, India
				Tel: +91 - 80 - 66929898
				Philips Electronics India Limited
				MFAR Manyata Tech Park,
				Nagavara, Bangalore - 560045,
				India
				Tel: +91 - 80 - 41890000
				Philips Electronics India
				Limited
				Temple Towers, 5th Floor,
				Old No : 476, New No : 672,
				Anna Salai, Nandanam,
				Chennai - 600035, India
				Tel : +91 - 44 - 66501000
				Philips Electronics India
				Limited
				6-3-1109/1/P/103, 3rd Floor,
				Jewel Pawani Towers,
				Raj Bhavan Road, Somajiguda,
				Hyderabad - 500082, India
L				Tel : +91 - 40 - 66467676
				Philips Electronics India
				Limited
				Technopolis Knowledge Park,
				Mahakali Caves Road,
				Chakala, Andheri (E),

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Mumbai - 400093, India Tel : +91 - 22 - 66912000
			Salora	D-13/4, Okhla Industrial Area, Phase-II New Delhi – 110 020, India Phone: +91-11-49207100 / 101
			Sansui	Adheshwar Arcade, Ist Floor, Andheri Kurla Road, Andheri East, Mumbai: 400 093
				No.62, 3rd floor, 1st main, 3rd cross, 2nd stage, Yeshwantpur Industrial Area, Bangalore – 560022
				Udyog Vihar Phase -2, Gurgaon – 122015
			Sharp	Sharp India Limited Gat No. 686/4, Koregaon Bhima, Tal: Shirur, Dist: Pune Pin – 412216 Phone: 02137-252417, 02137- 666520
			Sony	Sony India Registered Office A - 31, Mohan Co-operative Industrial Estate, Mathura Road New Delhi - 110044 Ph No : 66006600 Fax No : 26959141
				Sony India Branch Offices City Center, 3rd Floor, Plot A-5/1, Unit-IX, Sachivalaya Marg, Bhubaneswar Pin – 751022
				3rd Floor, NH Center Point Building, Opposite Bora Service, G S Road, Guwahati Ph No : 0361-2462858, 2462859
				White House, 2nd Floor, Block 2D, 119 Park Street, Kolkata - 700016 Ph No : 033-40071751/52/53/ 54/55 Fax No : 033 – 40071763
				4th Floor, Block-B, Sai Corporate Park, Rukanpura, Bailey Road,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Patna - 800 014
				Phone No : 0612-3269866
				3rd Floor, Adarsh Mall, Plot No
				50, Industrial and Business Park,
				Phase-2, Chandigarh - 160002
				Pn No: 01/2-00 555 55,
				Fax NO: 01/2-00 555 00
				$C_{\text{opin}} = \frac{403 - 407}{401 \text{ Floor}},$
				Lagola District Control
				Now Dolbing 110010
				Contact : $1800-103-7799$ (Toll
				E_{ree} Eav No : 011 42458844
				SCO 38-39 G. 1st Floor
				BRS Nagar Ludhiana -141 012
				Ph No : 0161-463 2222
				24 Advocate Chambers
				2nd Floor, RDC Rai Nagar
				Ghaziabad. Uttar Pradesh
				Ph No : $0120 - 4940150$
				Fax No : 0120 - 4940180
				C-7. Sultan House, 1st floor.
				Sawai Jai Singh Highway, Bani
				Park, Jaipur - 302016
				Ph No : 0141-4041896, 4041897
				Fax No : 0141-4041894
				4th Floor, Eldeco Corporate
				Chambers, Vibhuti Khand
				Opposite Kisan Mandi Bhawan,
				Phase 1 Gomti Nagar
				Lucknow Ph No: 0522-
				4041231/32/33/34/35
				U & I : VR 1 Centre , IInd Floor
				Plot No. 83, Sector 29,
				City Centre, Gurgaon,
				Haryana - 122002
				Ph No : 0124 - 4896200,
				Fax: 0124 - 4896220
				No.768, 100 Feet Main Road
				HAL, IInd Stage, 12th Main,
				Indira Nagar, Bangalore - 560038
				Ph No : 080-66605555
				Fax No : 080-25294987
				#2-1-2/6(2), First Floor,
				Hill Groove, Chilimbi Hills, 2nd
				Cross, Mangalore - 5/5006
				2nd Floor, Hameedia Centre,
1	1		1	No 14/43, Haddows Road,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Nungambakkam,
				Chennai - 600006
				Ph No : 044 - 28242571
				Fax No : 044-28234853
				2nd Floor, Muscat Tower
				S.A.Road, Kadavanthara
				Cochin - 682 020
				Ph No : 0484-2318616, 2318618,
				2318619, Fax No : 0484-2318629
				III Floor, 1025/1 Skanda Square,
				Avinashi Road
				Coimbatore - 641018
				Ph No : 0422-4334455
				Fax No : 0422-4334456
				6-3-676/A/2/3/4,
				Punjagutta X Roads, Punjagutta
				Hyderabad - 500082
				Ph No : 040-66115000
				Fax No : 040-23400014
				Door No. 59-10-1/A,
				Matha Towers, 4th Floor,
				Ring Road, Patamatalanka,
				Vijayawada-520 010
				Mohans Arcade, 1st Floor, 47-
				11-5, Dwarka Nagar
				Vishakhapatnam - 530016
				101, Parth Complex, Ground
				floor, Swastik Cross Road
				Navrangpura
				Ahmedabad - 380009
				Ph No : 079-26441040,
				26441041
				Fax No : 26460839
				25/1 Ground Floor,
				Yashwant Niwas Road,
				Shirish Chamber
				Indore - 452003
				Ph No : 0731-4055762, 4042013,
				4042033
				2nd floor, Crimpage
				Corporation,
				Plot No. 57, Street No.17, MIDC,
				Andheri East,
				Mumbai - 400093
				Ph No : 022-6128 8000
				Fax No : 28312935
				Office No.2, 3rd floor
				G.O.Square, Aundh-Hinjewadi

Sr. No.	Product Name	Product Sub	Brand	Address / Contact Details
		Category		
				Koad, Near Mankar Square
				Pune - 411057 $Ph N_0 \cdot 020 \ 67017200$
				Fit No : $020-07917200$
				Pax INO: 020-0/91/299
				Emprove Mall
				Bahind Raman Science Contro
				Sir Bezoniji Mehta Marg
				Nacour $= 440018$
				Ph No \cdot 0712-6471533-557
				TCL India Holding Pyt Ltd
				Sco 254 2nd Floor Sector 44 C
			TCL	Chandigarh CH
				Tel: 0172 464 6211
				TCL India Holding Pyt. Ltd.
				B-8/3. Uppal Industrial Area.
				Uppal, Hyderabad, AP
				Tel: 040 2344 9350
				TCL India Holding Pvt. Ltd.
				302, Vidhyapati, 17, Race Course
				Road, Race Course Road
				Indore, MP
				Tel: 0731 400 3365
				TCL India Holding Pvt. Ltd.
				82, Phase 3, Okhla Industrial
				Estate, New Delhi, DL
				011 3082 3011
				Laxbro Manufacturing Company
			T-Series	W-53, MIDC Area, Bhosari Indl.
			1 benes	Estate, PMC – 411026,
				Maharashtra
				TOSHIBA INDIA PVT. LTD.
				3rd Floor, Building No. 10 Tower
			77 1 H	- B, Phase - II
			Toshiba	DLF Cyber City,
				Gurgaon - 122 002,
				Haryana, India $\mathbf{P}_{\text{rest}} = \mathbf{N}_{\text{rest}} + \mathbf{O}_{\text{rest}} + \mathbf{O}_{$
				Board No. $+ 91-124-4996600$
				Con Service Problem (th Eleven
				C&B Square Building, oth Floor,
				Plot No 001, 127, Andheri Kuria Road Chakla Andhori (East)
				Mumbei 400059
				Tel: $+ 91_{-}22_{-}61911500$
				TOSHIBA INDIA DVT I TD
				284 Hothur Square 2nd Floor
				100 Feet Road Indiranagar
				Bangalore - 560038.

Sr.	Broduct Name	Product	Brand	Address / Contact Details
No.	Floduct Ivallie	Category	Drand	Address / Contact Details
				Karnataka, India
-				1ei: + 91-80-25190800
				Losniba India Pvt. Ltd.,
				Chiramal Chambers, Kurisupally
				Road Ravipuram Kochi 682 015
				Tel: $+ 91-484-2357107$
				Toshiba India Pyt. Ltd.
				Plot No 1-4 Vatika Business
				center, 3rd Floor, NSL Icon.
				Road No 12, Banjara Hills,
				Hyderabad-500034
				Tel: + 91-40-44311152
				Toshiba India Pvt. Ltd.,
				219, Regus Centre, 3rd Floor,
				Altius Olympia Technology
				Park, Sidco Industrial Estate,
				Guindy, Chennai - 600032, India
				Tel: + 91-44-42994353
				Videocon Industries Ltd.
				14 Kms Stone, Aurangabad-
			Videocon	Paithan Road,
				Dist Auropophad 421 105
				(India)
				Corporate Office
				Fort House 2nd Floor
				221.Dr. DN Road. Fort. Mumbai-
				400 001(INDIA)
				Corporate Office (Marketing,
				Service & Support):
				296, Udyog Vihar Phase-II,
				Gurgaon, Haryana. Phone No.:
				0124-3273091
				Westway Electronics Limited
				B-102, Phase – II, Noida –
			Weston	201305 (U.P)
				Phone: 0120 4543114
				Fax: 0120 4545115
				C 180 Naraina Industrial Area
				Dese-I
				New Delhi 110028
				Phone: 011 45035222
				Fax: 011 41411110
		LED	LG	Given Above
			Samsung	Given Above
			Panasonic	Given Above

Sr. No.	Product Name	Product Sub	Brand	Address / Contact Details
		Category	Toshiha	Given Above
			Opida	Given Above
			Ollida	Corporate office
				Global Brands Enterprise
				Solutions Pyt. Ltd.
			Akai	Plot No. 97. Sector-44. Gurgaon -
			1 mai	122 002. INDIA
				Phone No: 0124-4305000. Fax
				No.: 0124-4305020
				Global Brands Enterprise
				Solutions Pyt. Ltd.
				Flat No. 31, 3rd Floor,
				Harihar Apartment, Vishnu Dev
				Path, East Boring Canal Road,
				Patna - 800 001.
				Tel No: 0612 2524302
			Haier	Given Above
			Hitachi	Given Above
			Philips	Given Above
			Sony	Given Above
			T-series	Given Above
			Salora	Given Above
			Videocon	Given Above
		Plasma and HDTV	Hitachi	Given Above
			LG	Given Above
			Panasonic	Given Above
			Samsung	Given Above
			Sansui	Given Above
		Flat	BPL	Given Above
			Daenyx	Given Above
			Haier	Given Above
			LG	Given Above
				Next Retail India Limited,
				3rd Floor, Aadeshwar Arcade
				Above Loop Gallary,
			Next	Opp. Sangam Cinema,
				Andheri Kurla Road,
				Mumbai 400 102
				Phone: +91-7498218860
			Onida	Given Above
			Panasonic	Given Above
			Samsung	Given Above
			Philips	Given Above
			Salora	Given Above
			Sansui	Given Above
			Sharp	Given Above
			Sanyo	SANYO India Pvt. Ltd.,

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
140.		Category		
				'Jubilee Building', 2nd Floor,
				45, Museum Road,
				Bangalore 560025, India,
				Tel: +91-80-43418200,
			/TIOT	Fax: +91-80-43418222
			ICL	Given Above
			T-Series	Given Above
				TEXLA ELETROVISION
			2T' 1	A-72, OKHLA INDUSTRIAL
			Texia	AREA, PHASE-II, New Delni -
				110020, India 01 11 26394590/26397153
			Videogon	91-11-20304309/2030/133
			Wester	Given Above
		CTV	Deepwy	Given Above
-		CIV	Daenyx	Given Above
			Haier	Given Above
			LG	Given Above
-			Markson Magar Baar	Given Above
			Dependencia	Given Above
			Fanasonic	Novt Poteil India Limited
				3rd Eleor Andeshwar Arcade
				Above Loop Gallary
			Nevt	Opp Sangam Cinema
			INCAL	Andheri Kurla Road
				Mumbai 400 102
				Phone: +91-7498218860
			Philips	Given Above
			Salora	Given Above
-			TCL	Given Above
			T-Series	Given Above
			Videocon	Given Above
			Weston	Given Above
		Semi	DDI	Given Above
	Washing Machine	Automatic	BPL	
				BELTEK INDIA LTD.
			Daltal	B-89 SEC-5 201301
			Denek	NOIDA - UTTAR PRADESH
				Phone No.:- 0091 95 1202421676
			Daenyx	Given Above
				PE Electronics Ltd.
				Corporate Centre, 5th Floor,
			Electrolux	Andheri Kurla Road, Andheri
				(East), Mumbai – 400059
L				Phone No. +91-22-61171000
				Gem Equipments Pvt. Ltd.
			Gem	S.F. No. 103, Avanashi Road,
				Arasur

Sr.		Product	D 1	
No.	Product Name	Sub	Brand	Address / Contact Details
		Category		Coimbatore – 641407
				Ph. No. +91 422 2363800
				Godrej Industries Limited.
				Pirojshanagar, Eastern Express
				Highway,
			Godrei	Vikhroli, Mumbai - 400079,
			Obdiej	INDIA.
				Tel: +91-22-2518 8010 / 2518
				8020 / 2518 8030
				Fax: +91-22-2518 80/4
				Godrej & Boyce
				Manufacturing Company
				Limited.
				Mumbai 400079 INDIA
				Tel: $+91_{-}22_{-}6796_{-}5656_{-}5959_{-}5959_{-}5656_{-}5959_{-}59$
			Haier	Given Above
			Kelvinator	
			Kenstar	
			LG	Given Above
			Onida	Given Above
			Samsung	Given Above
			TCL	Given Above
			T-Series	Given Above
			Videocon	Given Above
			Weston	Given Above
			Whirlpool	Given Above
		Fully Automatic	BPL	Given Above
			Daenyx	Given Above
			Electrolux	
			Godrej	Given Above
			Haier	Given Above
				Corporate Address: IFB
				Industries Limited
			TED	Corporate Off.: Flat No.IND-5,
			IFB	Sector-1,East Kolkata Township,
				R_{0} Rolkata = 700 107
				Pn: $\pm 91.33.39849524/398494/5$ Eax: $\pm 01.33.39849676$
				Kolkata Factory: IEB Industries
				Limited
				No.14 Taratolla Road Kolkata -
				700 088.
				Ph: +91 33 30489299
				Fax: +91 33 30489230
				Bangalore Factory: IFB Industries
				Limited

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
No.		Category		
				16/17, Visveswaraiah Indl.
				Estate,
				Off.Whitefield road, Bangalore -
				560048.
				Ph: + 91 80 30589620
				GM: +91 80 30589604
				MKTG: +91 80 30589641
			77.1	Fax:+91 80 30589611
			Kelvinator	
			LG	Given Above
			Kenstar	
			Unida .	Given Above
			Panasonic	Given Above
			Samsung	Given Above
			Toshiba Widaaaa	Given Above
			Videocon	Given Above
			Whiripool	Given Above
				Kasturi Buildings
				Mohan T Advani Chowle
	Air Conditioner	Window	Blue star	Jamshadii Tata Road
	All Collutioner	window	Dide stai	Mumbai 400.020
				Tel: (91) (22) 66654000
				Fax: (91) (22) 66654151
				Divisional Headquarters
				Chennai
				9 Bazullah Road
				T Nagar
				Chennai - 600 017
				Tel: (91) (44) 4344 4000
				Fax: (91) (44) 28158015 / 4344
				4072
				Mumbai
				Bandbox House
				4th Flr, 254 D
				Dr Annie Besant Road
				Worli
				Mumbai - $400\ 030$
				I el: (91) (22) 66544000
				Fax: (91) (22) 66544001
				Regional Headquarters
				No 104 Old No. 46
				Garuda Buildings Cathodral
				Road
				Chennai - 600.086
				Tel· (91) (44) 42444000
				Fax: (91) (44) 42444190

Sr. No.	Product Name	Product Sub	Brand	Address / Contact Details
		Category		Mumhai
				Blue Star House
				9A Ghatkopar
				Link Road
				Sakinaka
				Mumbai - 400 072
				Tel: (91) (22) 66684000
				Fax: (91) (22) 66684004
				Kolkata
				7, Hare Street
				Kolkata - 700 001
				Tel: (91) (33) 22134000
				Fax: (91) (33) 22134102
				New Delhi
				Block 2-A, DLF Corporate Park
				DLF Qutab Enclave
				Phase III
				Gurgaon - 122 002 (Haryana)
				Tel: (91) (124) 4094000
				Fax: (91) (124) 4094004
				Manufacturing Facilities
				Ahmedabad
				501/3, 503/2, Tejpur Road
				Sarkhej Baula Highway
				Changodar,
				Ahmedabad- 382213
				Tel : (91) (2717) 294490
				Bharuch
				Plot Nos. 4 and 5
				GIDC Industrial Estate
				Narmada Nagar post
				Bharuch - 392 015
				Tel: (91) (2642) 246116
				Fax: (91) (2642) 246026
				Dadra
				Survey No. 265/2
				Demni Road
				Dadra 396 191
				U.T. Of Dadra & Nagar Haveli
				Tel: (91) (0260) 2668617 /
				2668618
				Fax: (91) (0260) 2668503
				Kala Amb
				Nahan Koad, Kanpur Jattan
				Kala Amb
				District Sirmour
				Himachal Pradesh $1/3030$
				1et: (91) (01702) 238760 E _{222} 461
	1	1	1	rax : (91) (01/02) 2.58461

Sr. No.Product NameProduct Sub CategoryBrandAddress	s / Contact Details
Kala Amb	
Nahan Roa	.d
Village Ogl	1
Kala Amb	
District Sire	mour
Himachal F	Pradesh 173030
Tel : (91) 9	8160 13443
Fax : (91) ((01702) 238761
Thane	
IInd Pokhr	an Road
Majiwada	
Thane - 400	0 601
Tel: (91) (2	22) 67924000
Fax: (91) (2	22) 67924020
Wada	
Village-Vas	buri Khurd,
Khanivali F	Road,
PO - Khup	ari,
Taluka - W	ada,
Dist - Thar	ne, 421312
India	
Sales and	Service Offices
Ahmedaba	ad
Abhishree .	Avenue,
3rd Floor, I	Near Nehru
Nagar Cros	ss Roads,
Ambawadi	Road,
Ahmedabad	d - 380 006
Tel: (91) (7	(9) 4022 4000
Bengaluru	
Ozone Mar	hay Technology Park,
Sy.No 50/1	18 & 55/9
Hongasand	ira Village
Begur Hob	11 · 1
Garvednav	ipaiya
$\mathbf{T}_{\mathbf{T}} = \mathbf{T}_{\mathbf{T}} $	- 560 068
	60) 41854000
	war
SA, Satya P	Nagar
	751 007
Tale (01) (d	(ar / 51 00/
	2570024
East (01) (1	237002 4 (74) 2570544
Tax: (91) (Chandian	•h
	.11
Adaish Ma	11
Ath Floor 1	ll, Plot No. 50
4th Floor, 1 Industrial 8	ll, Plot No. 50, & Business Park

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
10.		Category		
				Chandigarh - 160 002
				Tel: (91) (172) 5024000
				Fax: (91) (172) 5004007
				Chennai
				Blue Star Limited
				620, Anna Salai,
				Modern School Road,
				Chennai - 600006
				Tel: (91) (44) 40444000
				Fax: (91) (44) 40444001
				Ghaziabad
				C 53A, Third Floor,
				Raj Nagar District Center
				(RDC), Raj Nagar,
				Ghaziabad - 201001.
				Uttar Pradesh
				Tel: (91) (120) 2821400
				Guwahati
				2nd Floor, New Star Freeze
				Bldg., Opp. Kunjalata Bibah
				Bhawan, G S Road,
				Guwahati - 781005
				Tel: (91) (361) 2340620
				Ist Floor, Shri Krishna
				Classic, 139,
				Fadnis Colony, A B Road,
				Indore - 452 010 T_{-1} (01) (721) 4001211 (
				1et: (91) (751) 40012117
				A 10 First Floor
				A-19, First Floor, Main Scholzer Dath
				Nr. Sahakar Bhayan
				Laipur
				T_{el} (91) (141) 4141100/
				2744033/35
				Kochi
				Millenium Plaza
				Alinchuvadu
				MKK Nair Road
				Near Palarivattom Junction
				Kochi - 682024
				Tel: (91) (484) 4499000
				Fax: (91) (484) 4499190
				Lucknow
				177/4,Faizabad Road
				Lucknow 226 007

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
No.		Category		
				Tel: (91) (522) 4034000
				Fax: (91) (522) 4034004
				Mumbai
				59 Forbes Street
				Mumbai 400 001
				Tel: (91) (22) 22844660
				Mumbai
				Unit G-2
				Shalimar Ind. Estate
				Dharavi Road
				Matunga M 1 : 100.010
				Mumbai = 400 019
				Tel: (91) (22) 24042098
				Mumbai
				Unit I Prabhadevi
				Drobbedori
				Mumbai 400025
				T_{a1} (01) (22) 24227305
				Fer: (91) (22) 24227303 Fer: (01) (22) 24376041
				Nacour
				219 Bajaj Nagar 1st Floor South
				Ambazari Road Namur 440010
				Tel· (91) (712) 6624000
				Fax: (91) (712) 6624002
				New Delhi
				$F_{44}/12$ Okhla Industrial
				Area Phase IL
				New Delhi - 110 020
				Tel: (91) (11) 41494000
				Fax: (91) (11) 41494001
				Panjim (Goa)
				First Floor, Buddhaseth
				Apts, Tonca, Caranzalem,
				Goa - 403 002.
				Tel: (91) (832) 2462789
				Pune
				201/A, Nityanand Complex
				247/A Bund Garden Road
				Pune - 411011
				Tel: (91) (20) 4104 4000
				Fax:(91) (20) 4104 4001
				Raipur
				Alaska Corporates,
				3rd Floor, Opp VIP Road,
				Jivan Vihar Colony,
				G E Road, Raipur,
1			1	Chattisgarh - 492 006

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
10.		Category		
				Tel: (91) (771) 6544000
				Secunderabad
				207 Sikh Road
				Bantia Estate
				Secunderabad - 500 003
				Tel: (91) (40) 4400 4000
				Fax: (91) (40) 4400 4001 / 4190
				Thane
				IInd Pokhran Road
				Majiwada
				Thane - 400601
				Tel: (91) (22) 67154500
				Fax:(91) (22) 67924020
				Thiruvananthapuram
				TC IV/962, Chandrika,
				Sree Chitra Nagar,
				Pipe line Road, Kawdiar,
				Thiruvananthapuram - 695 003
				Tel: (91) (471) 2435025
				Fax: (91) (471) 2434065
				Vadodara
				Ramkrishna Chambers
				Productivity Road
				Alkapuri
				Vadodara
				Tel: (91) (265) 6614000
				Visakhapatnam
				D. No. 49-24-65/1,
				Resapuvani Palem Village,
				Madhura Nagar Mandal,
				Near Sankarmattam Road,
				Vishakapatnam 530 016
				Tel: (91) (891) 274 8405
				Fax: (91) (891) 270 1041
				INDIAN HEADQUARTERS :
				Carrier Airconditioning &
				Delhi Jalour Highway Narsingour
			Carrier	Gurgaon
				Harvana, 122 004. India
				Ph. No. +91-124-4825500
				Fax No. +91- 124- 2373 241
				Carrier Airconditioning &
				Refrigeration Ltd
				U & I Building,Plot No-83,
				Sector-29,
				Inear Bikaner Sweets
				$T_{el} = 0.124 - 4707333$
				Fax:- 0124 - 2565050

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
		8,		Carrier Airconditioning &
				Refrigeration Ltd
				Carrier Complex
				Vill. Narsinghpur, Kherki Daula
				Post,
				Gurgaon – 122 004
				Tel:- 0124 - 482 5500
				Fax:- 0124 - 237 2230
				Carrier Airconditioning &
				Refrigeration Ltd
				Shop No # 201 E, 2nd Floor,
				Mahagun Metro Mall,
				Near Ansal Plaza, Vaishali,
				Ghaziabad (Uttar Pradesh)
				Tel:- 0120-4183260
				Fax:- 0120 - 4183266
				Carrier Airconditioning &
				Refrigeration Ltd
				Unit No.402 B & 403,
				4th floor, Shalimar Square,
				126/3 B B.N.Road,Lalbagh,
				Lucknow - 226001
				Tel:- 0522 - 2202346, 2230598
				Fax:- 0522 - 2230050
				Carrier Airconditioning &
				Refrigeration Ltd
				SCO 301/302, 1st Floor ,
				Sector – 38 D, Chandigarh - 160 036
				Tel:- 0172 - 500 7548/ 50
				Fax:- 0172 - 5007160
				Carrier Airconditioning &
				Refrigeration Ltd
				1st Floor, S.S.Tower, New Colony
				Behind Jyanti Market,
				Jaipur - 302 001
				Tel Nos :- 0141 - 511 3444, 511 3999
				Carrier Airconditioning &
				Ketrigeration Ltd
				C/o Bhairav Distributors,
				Shop No:- 5 & 6, Victor Bldg
				Cujira - St Cruz
				Panaji - Margao Highway,
				Panjim, Goa - $403\ 005$
				1 el: - 0832 - 244 / 028
				Fax:- 0832 - 244 /02/
				Carrier Airconditioning &
				Kerrigeration Ltd
				Lokmat Sunaro, Varilia Paril
				Lokmat Square, Vardna Koad,
				Kamdas Peth, Nagpur
				$1 \text{ et:- } 0/12 - 663 \ 0214, 645 \ 3/90$
				Fax:- 0/12 - 645 3/90
1	1	1		Carrier Airconditioning &

Refrigeration Ltd C/o Suman Enterprises Behind ITI, Sham Nagar Raipur – 492 006 Tel:- 0771 - 401 3245 Carrier Airconditioning & Refrigeration Ltd 1st Floor, Milestone, Drive In Road Thaltej, Ahmedabad – 380 052 Tel:- 079 - 4026 7777 Fax:- 079 - 4026 7799 Carrier Airconditioning &	Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
C/o Suman Enterprises Behind ITI, Sham Nagar Raipur – 492 006 Tel:- 0771 - 401 3245 Carrier Airconditioning & Refrigeration Ltd 1st Floor, Milestone, Drive In Road Thaltej, Ahmedabad – 380 052 Tel:- 079 - 4026 7777 Fax:- 079 - 4026 7799 Carrier Airconditioning &			•••		Refrigeration Ltd
Behind ITI, Sham Nagar Raipur – 492 006 Tel:- 0771 - 401 3245Carrier Airconditioning & Refrigeration Ltd 1st Floor, Milestone, Drive In Road Thaltej, Ahmedabad – 380 052 Tel:- 079 - 4026 7777 Fax:- 079 - 4026 7799Carrier Airconditioning & Carrier Airconditioning &					C/o Suman Enterprises
Raipur - 492 006Tel:- 0771 - 401 3245Carrier Airconditioning & Refrigeration Ltd1st Floor, Milestone, Drive In RoadThaltej, Ahmedabad - 380 052Tel:- 079 - 4026 7777Fax:- 079 - 4026 7799Carrier Airconditioning &					Behind ITI, Sham Nagar
Tel:- 07/1 - 401 3245Carrier Airconditioning & Refrigeration Ltd 1st Floor, Milestone, Drive In Road Thaltej, Ahmedabad – 380 052 Tel:- 079 - 4026 7777 Fax:- 079 - 4026 7799Carrier Airconditioning & Carrier Airconditioning &					Raipur – 492 006
Carrier Airconditioning & Refrigeration Ltd 1st Floor, Milestone, Drive In Road Thaltej, Ahmedabad – 380 052 Tel:- 079 - 4026 7777 Fax:- 079 - 4026 7799 Carrier Airconditioning &					Tel:- 0771 - 401 3245
Refrigeration Ltd1st Floor, Milestone, Drive In RoadThaltej, Ahmedabad – 380 052Tel:- 079 - 4026 7777Fax:- 079 - 4026 7799Carrier Airconditioning &					Carrier Airconditioning &
Ist Floor, Milestone, Drive In Koad Thaltej, Ahmedabad – 380 052 Tel:- 079 - 4026 7777 Fax:- 079 - 4026 7799 Carrier Airconditioning &					Act Flags Milestere Drive In Dead
Trailey, Annetabad = 500 052 Tel:- 079 - 4026 7777 Fax:- 079 - 4026 7799 Carrier Airconditioning &					Theltei Abmedebed 380.052
Fax:- 079 - 4026 7799 Carrier Airconditioning &					Thate, $71111100000000000000000000000000000000$
Carrier Airconditioning &					Fax:= 079 = 4026 7799
					Carrier Airconditioning &
Refrigeration Ltd					Refrigeration Ltd
Shreeprasad, Office No.4, 4th floor					Shreeprasad, Office No.4, 4th floor
Plot No.74, Sheela vihar colony					Plot No.74, Sheela vihar colony
Opp. Planet ford, Paud Road					Opp. Planet ford, Paud Road
Pune -411 038					Pune -411 038
Tel:- 020 - 41051000/ 02025437741					Tel:- 020 - 41051000/ 02025437741
Fax:- 020-25437742					Fax:- 020-25437742
Carrier Air-conditioning &					Carrier Air-conditioning &
Refrigeration Ltd.,					Refrigeration Ltd.,
Unit No.4, 3rd Floor					Unit No.4, 3rd Floor
Phoenix Market City,					Phoenix Market City,
15 L.B.S. Marg, Kurla (West)					15 L.B.S. Marg, Kurla (West)
MUMBAI – 400 070.					MUMBAI – 400 070.
Telephone: 022-61700700					Telephone: 022-61700700
Carrier Airconditioning &					Carrier Airconditioning &
Refrigeration Ltd					Refrigeration Ltd
315-316, Shagun tower,					315-316, Shagun tower,
7 Commercial Sector PU 4, Scheme					7 Commercial Sector PU 4, Scheme
No 54,					No 54,
Vijay Nagar Square, A.B. Road,					Vijay Nagar Square, A.B. Road,
Indore -452010 T ₋₁ , 0721 4070279					Indore -452010 T ₋₁ , 0721 4070278
Eav: 0731-252 6365					$\begin{array}{c} 1 \text{ ele:} - 0/31 - 40/03/8 \\ \text{ Ease: } 0731 - 252.6365 \end{array}$
Carrier Airconditioning &					Carrier Airconditioning &
Refrigeration Ltd					Refrigeration Ltd
C/o Om Sai Enterprises.					C/o Om Sai Enterprises.
Pushpanjali Complex,					Pushpanjali Complex,
Second Floor, Lake Road,					Second Floor, Lake Road,
Ranchi – 834 001					Ranchi – 834 001
Tel:- 0651 –645 2488					Tel:- 0651 –645 2488
Fax:- 0651 – 246 1818					Fax:- 0651 – 246 1818
Carrier Airconditioning &					Carrier Airconditioning &
Refrigeration Ltd					Refrigeration Ltd
C/o, Candida Enterprises					C/o, Candida Enterprises
R.G. Baruha Raod, Sunderpur					R.G. Baruha Raod, Sunderpur
Guwahati - 781 005					Guwahati - 781 005
Tel:- 0361 - 259 5003					Tel:- 0361 - 259 5003
Fax:- 0361 - 220 3508					Fax:- 0361 - 220 3508
Carrier Airconditioning & Definition I tol					Carrier Airconditioning & Refrigoration I td
204 Adarshila Complex					204 Adarshila Complex

No. Fronder (Name) South Category South Gandhi Maidan Patan = 800 001 Patan = 800 001 Tele-0612 - 232 3517 Teleface: 0612 - 232 3517 Teleface: 0612 - 266 8591 Carrier Airconditioning & Refrigeration Lid P-33971, CIT Road, Scheme VI-M, PhuBagan, Kolkata - 700 054 Tele-033 - 0201 300 Fax: 033 - 2364 9766 Carrier Airconditioning & Refrigeration Lid Refrigeration Lid Patro - 800 01 Tele-033 - 02164 9766 Carrier Airconditioning & Refrigeration Lid Refrigeration Lid Patro - 201, Sharti Niwas Housing Plot No: 331/1747, Rasulgath Bhuyaneshwar - 75100 Tele-0674 - 258 7178 Carrier Airconditioning & Refrigeration Lid 6-2-976, Raj Bhawan Road Khairatabad, Hyderabad - 500 004 Tel: -0410 - 4546 2888 Fax: 040 - 0401 18146 Carrier Airconditioning & Refrigeration Lid 6-2-976, Raj Bhawan Road Khairatabad, Hyderabad - 500 029 Tel: -0410 - 4546 2888 Fax: 040 - 0401 8146 Carrier Airconditioning & Refrigeration Lid Refrigeration Lid Sold Floor, Block-III, Prestige Blae Chip, No.9, Hosur Road, Bangalore - 560 029 Tel: -0418 4432000 Fax: -044 - 404 - 4544 288 Tel: -042 - 458 4151, 438 5403 Fax: 0422 - 2436485 Carrier Airconditioni	Sr.	Product Name	Product	Brand	Address / Contact Details
South Gandhi Maidan Patna - 800 001 Tel:- 0612 - 232 3517 Telefax:- 0612 - 266 8591 Carrier Airconditioning & Refrigeration Ltd P-35971, CIT Road, Scherne VI-M, Phulbagan, Kolkatta - 700 054 Tel:- 033 - 4020 1300 (ax:- 033 - 4264 9766 Carrier Airconditioning & Refrigeration Ltd Flat Nor- 201, Sharti Niwas Housing Plot Nor- 33/1747, Rasulgath Bhuvaneshwar - 751010 Tel:- 0674 - 258 7178/ 258 593 Fax:- 0674 - 258 7178/ 258 593 Fax:- 0674 - 258 7178/ 258 593 Fax:- 0674 - 258 7178 Carrier Airconditioning & Refrigeration Ltd 6-2-976, Raj Bhawan Road Kharattabad, Hyderabad - 500 004 Tel:- 040 - 4546 2888 Fax:- 040 - 4011 8146 Carrier Airconditioning & Refrigeration Limited 3rd Floor, Block-III, Prestige Blue Chip, No.9, Hosur Road, Bangalore - 560 029 Tel:- 918 00 43542200 Fax:- 9180 41321222 Carrier Airconditioning & Refrigeration Ltd Shivas Comples 263/5, Mettupalayam Road Combatore - 641 043, Tel:- 0422 - 2436485 Carrier Airconditioning & Refrigeration Ltd Shivas Comples 263/5, Mettupalayam Road Combatore - 641 043, Tel:- 0422 - 2436485 Carrier Airconditioning & Refrigeration Ltd Shivas Comples 263/5, Mettupalayam Road Combatore - 641 043, Tel:- 0422 - 0434 4134 345 403 Fax:- 0422 - 2436485 Carrier Airconditioning & Refrigeration Ltd Shivas Comples 263/5, Mettupalayam Road Combatore - 641 043, Tel:- 0422 - 0434 4134 345 403 Fax:- 0422 - 2436485 Carrier Airconditioning & Refrigeration Ltd Graft Arconditioning & Refrigeration Ltd Graft Arcondition Ltd Graft Arc	No.	Product Name	Category	Drand	Address / Contact Details
Patna = 800 001 Telc-0612 - 226 3517 Telefax: - 0612 - 266 8591 Carrier Airconditioning & Refrigeration Lad P-339/1, CIT Road, Scheme VI-M, Phulbagian, Kolkatta - 700 054 Philbagian, Kolkatta - 700 054 Tel: - 033 - 4020 1300 Fax: - 033 - 2364 9766 Carrier Airconditioning & Refrigeration Lid Flat Noz-201, Shanti Niwas Housing Piot Noz-33/1747, Rasulgath Bhuvaneshwar - 751010 Tel: - 0674 - 258 7178/258 5893 Fax: - 0674 - 258 7178/258 5893 Fax: - 0674 - 258 7178/258 5893 Fax: - 0674 - 258 7178/258 5893 Fax: - 0674 - 258 7178/258 5893 Fax: - 0674 - 258 7178/258 5893 Fax: - 0674 - 258 7178/258 5893 Fax: - 0674 - 258 7178/258 5893 Fax: - 0674 - 258 7178/258 5893 Fax: - 0474 - 258 7178/258 5893 Fax: - 040 - 4011 8146 Garrier Airconditioning & Refrigeration Lid Garrier Airconditioning & Refrigeration Lid Garrier Airconditioning & Refrigeration Lid Garrier Airconditioning & Refrigeration Lid Sthivas Complex Cohort Adva 2000 1/0					South Gandhi Maidan
1 101-232-3317 Telefax-0612-268 591 1012-265 1					Patna – 800 001
1 1					1e!:-0612 - 232 3517
Carrier Airconditioning & Refrigeration Ltd P-3339/1, CTI Road, Scheme VI-M, Phulbagan, Kolkatta – 700 054 Tel: 033 - 4020 1300 Fax: -033 - 2364 9766 Carrier Airconditioning & Refrigeration Ltd Flat Nor- 33/1747, Rasulgarh Bhuvaneshwar – 751010 Tel: -0674 - 258 7178/ 258 5893 Fax: -064 - 4518 1446 Carrier Airconditioning & Refrigeration Ltd 6 - 2-976, Raj Bhawan Road Khairatabad, Hyderabad – 500 004 Tel: -040 - 4546 2888 Fax: -040 - 4011 8146 Carrier Airconditioning & Refrigeration Limited 3 de Floor, Block-III, Prestige Blue Chip, No.9, Hosur Road, Bangalore – 560 029 Tel : +91 80 4324200 Fax: +91 80 4324200 Fax: -91 80 4324222 Carrier Airconditioning & Refrigeration Ltd Shivas Complex 263/5, Mettupalayann Road Coimbatore – 641 043. Tel: -0422 - 438 4151, 438 5403 Fax: -042 - 2436485 Carrier Airconditioning & Refrigeration Ltd 39/6641, Perumanoor, M.G. Road, (Opp. Cochin Shipyard) Cochin – 682 015 Tel: -0484 - 402 9001 / 0 Fax: -0484 - 402 901 / 0 Fax: -0484 - 402 901 / 0 Fax: -0484 - 202 5921 / 1 Carrier Airconditioning & Refrigeration Ltd 37/12, Maraimalai Adigal Slaii Pondicherry – 605 001 / 0 Fax: -0484 - 202 901 / 0	-				Carrier Airconditioning &
P-339/1, CIT Road, Scheme VI-M, Phulbagan, Kolkatra - 700 054 Tcl: 033 - 4020 1300 Fax:- 033 - 2364 9766 Carrier Airconditioning & Refrigeration 1.td Flat No:- 201, Shanti Niwas Housing Plot No:- 33/1747, Rasulgarh Bhuvaneshwar - 751010 Tcl:- 0674 - 258 7178/ 258 5893 Fax:- 040 - 4014 8146 Carrier Airconditioning & Refrigeration Ltdu 6 -2-976, Raj Bhawan Road Khiaintabad, Hyderabad - 500 004 Tcl:- 040 - 4011 8146 Carrier Airconditioning & Refrigeration Limited 3rd Floor, Block-III, Prestige Blue Chip, No.9, Hosur Road, Bangalore - 560 029 Tcl : +91 80 4342000 Fax:- 91 80 41321222 Carrier Airconditioning & Refrigeration Ltd Shivas Complex 263/5, Mettupalayam Road Coimbatore - 641 043. Tcl:- 0422 - 243(485) Carrier Airconditioning & Refrigeration Ltd Shivas Complex 263/5, Metupalayam Road Coimbatore - 641 043. Tcl:- 0422 - 243(485) Carrier Airconditioning & Refrigeration Ltd 39/6641, Perumanoor, M.G. Road, (Opp. Cochin Shipyard) Cochin - 682 015 Tcl:- 0484 - 402 901/0 Fax:- 0484 - 402 901/0 Fax:- 0484 - 402 901/0 Fax:- 0484 - 402 901/0 Fax:- 0484 - 205 92(14) Carrier Airconditioning & Refrigeration Ltd GRR Zone 271/2, Mariamalai Adgal Salai Pondicherry - 060 5001 Cri. 0.002 Cri.					Refrigeration Ltd
Phulbagin, Kolkaria – 700 054 Tel: 033 - 4020 1300 Fasc: 033 - 2364 9766 Carrier Airconditioning & Refrigeration Ltd Flat No- 201, Shani Nivas Housing Plot No- 33/1747, Rasugarh Bluvaneshwar – 751010 Tel: 0674 - 258 7178 Carrier Airconditioning & Refrigeration Ltd 6-2-976, Raj Bhawan Road Khariatabad, Hyderabal – 500 004 Tel: -040 - 4546 2888 Fax: -040 - 4011 8146 Carrier Airconditioning & Refrigeration Limited 3rd Floor, Block-III, Prestige Blue Chip, No.9, Hosur Road, Bangalore – 560 029 Tel - +91 80 4432000 Fax: +91 80 41321222 Carrier Airconditioning & Refrigeration Ltd Shivas Complex 263/5, Metupalayam Road Coimbatore - 641 043. Tel: -0422 - 438 4151, 438 5403 Fax: -0422 - 2346485 Carrier Airconditioning & Refrigeration Ltd Shivas Complex 263/5, Metupalayam Road Corimer Airconditioning & <t< td=""><td></td><td></td><td></td><td></td><td>P-339/1, CIT Road, Scheme VI-M,</td></t<>					P-339/1, CIT Road, Scheme VI-M,
Tel: 033 - 420 1300 Fax: 033 - 2364 9766 Carrier Airconditioning & Refrigeration Lid Flat No: 201, Shanti Nivas Housing Plot No: -33/1747, Rasugarh Bhuvaneshwar - 751010 Tel: -074 - 258 7178 Carrier Airconditioning & Refrigeration Lid 6-2-976, Raj Bhawan Road Khairatabad, Hydreabad - 500 004 Tel: -040 - 4540 2888 Fax: -042 - 4364 2000 Fax: -042 - 4364 2000 Fax: -042 - 4364 284 Carrier Airconditioning & Refrigeration Lid Shivas Complex					Phulbagan, Kolkatta – 700 054
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Carrier Airconditioning & Refrigeration Ltd Hat No:- 201, Shanti Niwas Housing Plot No:- 3371747, Rasulgarh Bhuvaneshwar - 751010 Tel:- 0674 - 258 7178/ 258 5893 Fax:- 0674 - 258 7178/ 258 5893 Fax:- 0674 - 258 7178 Carrier Airconditioning & Refrigeration Ltd 6-2-976, Raj Bhawan Road Khaintabad, Hyderabad - 500 004 Tel:- 040 - 4506 2888 Fax:- 040 - 4016 18146 Carrier Airconditioning & Refrigeration Limited 3rd Floor, Block-III, Prestige Blue Chip, No.9, Hosur Road, Bangalore - 560 029 Tel: - 491 80 43442000 Fax:- 491 80 4344200 Carrier Airconditioning & Refrigeration Ltd Shivas Complex 263/5, Mettupalayam Road Coimbatore - 641 043. Tel:- 0422 - 438 4151, 438 5403 Fax:- 0422 - 2436485 Carrier Airconditioning & Refrigeration Ltd Shivas Complex 263/5, Mettupalayam Road Coimbatore - 641 043. Tel:- 0422 - 2436485 Carrier Airconditioning & Refrigeration Ltd Shivas Complex 263/5, Mettupalayam Road Coimbatore - 641 043. Tel:- 0422 - 2436485 Carrier Airconditioning & Refrigeration Ltd Shivas Complex 263/5, Metupalayam Road Coimbatore - 641 043. Tel:- 0422 - 2436485 Carrier Airconditioning & Refrigeration Ltd Shivas Complex 263/5, Metupalayam Road Coimbatore - 641 043. Tel:- 0484 - 402 9001/ 0 Fax:-					Fax:- 033 - 2364 9766
Flat No:- 201, Sharti Nivas Housing Plot No:- 33/1747, Rasulgarh Bhuvanesbwar - 751010 Tel:- 0674 - 258 7178 Carrier Airconditioning & Refrigeration Ltd 6-2-976, Raj Bhawan Road Khairatabad, Hyderabad - 500 004 Tel:- 040 - 4546 2888 Par:- 040 - 401 8146 Carrier Airconditioning & Refrigeration Limited 3rd Floor, Block-III, Prestige Blue Chip, No.9, Hosur Road, Bangalore - 560 029 Tel:+ 191 80 43422000 Par:- +91 80 41321222 Carrier Airconditioning & Refrigeration Ltd Shivas Complex 263/5, Mettupalayam Road Coimatoser = 641 043.					Carrier Airconditioning &
Piot No:- 33/1747, Rasulgarh Bhuvaneshvar – 751010 Tel:- 0674 - 258 7178 Carrier Airconditioning & Refrigeration Ltd 6-2-976, Raj Bhawan Road Khairatabad, Hyderabad – 500 004 Tel:- 040 - 4546 2888 Fax:- 040 - 4546 2888 Teax:- 040 - 4546 2888 Fax:- 040 - 4546 2888 Teax:- 040 - 4546 2888 Fax:- 0413 - 203 Fax Fax:- 0422 - 438 4151, 438 5403 Fax:- 0422 - 438 4151, 438 5403 Fax:- 0422 - 2436485 Carrier Airconditioning & Refrigeration Ltd Shivas Complex 263/5, Mettural Shivas Complex 263/5, Mettural 263/5, Mettural 271/2, Maraimalai Adigal Salai Pondicherry - 065 001 Teb:- 0422 - 24563 2026 (76					Flat No: 201 Shapti Niwas Housing
Bhr aneshwar – 751010 Tel:- 0674 - 258 7178/ Fax:- 0674 - 258 7178/ Carrier Airconditioning & Refrigeration Ltd 6-2-976, Raj Bhavan Road Khairatabad, Hyderabad – 500 004 Tel:- 040 - 4011 8146 Carrier Airconditioning & Refrigeration Limited 3rd Floor, Block-III, Prestige Blue Chip, No.9, Hosur Road, Bangalore – 560 029 Tel: + 91 80 4342000 Fax:- + 91 80 41321222 Carrier Airconditioning & Refrigeration Lid Shivas Complex 263/5, Metupalayam Road Coimbatore – 641 0433. Tel:- 0422 - 438 4151, 438 5403 Fax:- 0422 - 0430425 Carrier Airconditioning & Refrigeration Ltd 39/6641, Perumanoor, M.G. Road, (Opp. Cochin Shipyard) Cochin – 682 015 Tel:- 0484 - 402 9011/0 Fax:- 0484 - 402 9011/0 Fax:- 0484 - 402 9021/0 Fax:- 0484 - 402 9021/0 Fax:- 0484 - 235 9214					Plot No:- 33/1747 Rasulgarh
Tel:- 0674 - 258 7178/ 258 5893 Fax:- 0674 - 258 7178 Carrier Airconditioning & Refrigeration Ltd 6-2-976, Raj Bhawan Road Khairatabad, Hyderabad - 500 004 Tel:- 040 - 4546 2888 Fax:- 047 - 0111 8146 Carrier Airconditioning & Refrigeration Limited 3rd Floor, Block-III, Prestige Blue Chip, No.9, Hosur Road, Bangalore - 560 029 Tel: + 918 04342000 Fax: + 918 0434200 Fax: + 918 043420 Storige Complex 263/5,					Bhuvaneshwar – 751010
Fax:- 0674 - 258 7178 Carrier Airconditioning & Refrigeration Ltd 6-2-976, Raj Bhawan Road Khairatabad, Hyderabad - 500 004 Tcl:- 040 - 4546 2888 Fax:- 040 - 4011 8146 Carrier Airconditioning & Refrigeration Limited 3rd Floor, Block-III, Prestige Blue Chip, No.9, Hosur Road, Bangalore - 560 029 Tcl: - +91 80 4342000 Fax:- 918 0 41321222 Carrier Airconditioning & Refrigeration Ltd Shivas Complex 263/5, Mettupalayam Road Coimbatore - 641 043. Tcl:- 0422 - 438 4151, 438 5403 Fax:- 0422 - 436485 Carrier Airconditioning & Refrigeration Ltd 39/6641, Perumanoor, M.G. Road, (Opp, Cochin Shipyard) Cochin - 682 015 Tcl:- 0484 + 402 9001 / 0 Fax:- 0484 + 02 9001 / 0 Fax:- 0484 + 02 9001 / 0 Fax:- 0484 - 402 9001 / 0 Fax:- 0484 - 402 9001 / 0 Fax:- 0484 - 402 9001 / 0 Fax:- 0484 - 235 9214 Carrier Airconditioning & <					Tel:- 0674 - 258 7178/ 258 5893
Carrier Airconditioning & Refrigeration Ltd 6-2-976, Raj Bhawan Road Khairatabad, Hyderabad – 500 004 Tel:- 040 - 4546 2888 Fax:- 040 - 4011 8146 Carrier Airconditioning & Refrigeration Limited 3rd Floor, Block-III, Prestige Blue Chip, No.9, Hosur Road, Bangalore – 560 029 Tel: - 491 80 43342000 Fax:- 491 80 43321222 Carrier Airconditioning & Refrigeration Ltd Shivas Complex 263/5, Mettupalayam Road Coimbacre – 641 043. Tel:- 0422 - 438 4151, 438 5403 Fax:- 0422 - 2436485 Carrier Airconditioning & Refrigeration Ltd 39/6641, Perumanoor, M.G. Road, (Opp. Cochin Shipyard) Cochin – 682 015 Tel:- 0484 - 402 9001/ 0 Fax:- 0484 - 425 9214 Carrier Airconditioning & Refrigeration Ltd GRR Zone 271/2, Maraimalai Adigal Salai Pondichery – 605 001 Trid:- 0435 5853 - 0226 / 76					Fax:- 0674 - 258 7178
Refrigeration Ltd 6-2-976, Raj Bhawan Road Khairatabad, Hyderabad – 500 004 Tel: -040 - 4546 2888 Fax: -040 - 4011 8146 Carrier Airconditioning & Refrigeration Limited 3rd Floor, Block-III, Prestige Blue Chip, No.9, Hosur Road, Banglore - 560 029 Tel: - +91 80 43442000 Fax: - 491 - 80 4342000 Fax: +91 80 41321222 Carrier Airconditioning & Refrigeration Ltd Shivas Complex 263/5, Metupalayam Road Coimbatore - 641 043. Tel: -0422 - 438 4151, 438 5403 Fax: -0422 - 2436485 Carrier Airconditioning & Refrigeration Ltd 39/6641, Perumanoor, MG. Road, (Opp. Cochin Shipyard) Cochin - 682 015 Tel: -0422 - 4364 - 325 9214 Carrier Airconditioning & Refrigeration Ltd GRZ Area Garrier Airconditioning & Refrigeration Ltd GD (Opt. Cochin Shipyard) Cochin - 682 015 Tel: -0484 - 235 9214 Carrier Airc					Carrier Airconditioning &
6-2-976, Raj Bhawan Koad Khairatabad, Hyderabad – 500 004 Tel:-040 - 4546 2888 Fax:-040 - 4011 8146 Carrier Airconditioning & Refrigeration Limited 3rd Floor, Block-III, Prestige Blue Chip, No.9, Hosur Road, Bangalore - 560 029 Tel :- +91 80 43442000 Fax:- 91 80 4432000 Fax:- 91 80 4342000 Fax:- 91 80 4132122 Carrier Airconditioning & Refrigeration Ltd Shivas Complex 263,5, Mettupalayam Road Coimbatore - 641 043. Tel:- 0422 - 438 4151, 438 5403 Fax:- 0422 - 2436485 Carrier Airconditioning & Refrigeration Ltd 39/6641, Perumanoor, M.G. Road, (Opp. Cochin Shipyard) Cochin - 682 015 Tel:- 0484 - 402 9001/0 Fax:- 0484 - 235 9214					Retrigeration Ltd
Image: Second					6-2-976, Kaj Bhawan Road Khairatahad
Tel: -040 - 4546 2888 Fax: -040 - 4011 8146 Carrier Airconditioning & Refrigeration Limited 3rd Floor, Block-III, Prestige Blue Chip, No.9, Hosur Road, Bagalore - 560 029 Tel: - 491 80 4342000 Fax: + 91 80 4342000 Fax: + 91 80 41321222 Carrier Airconditioning & Refrigeration Ltd Shivas Complex 263/5, Metupalayam Road Coimbatore - 641 043. Tel: -0422 - 438 4151, 438 5403 Fax: -0422 - 236485 Carrier Airconditioning & Refrigeration Ltd Shivas Complex 263/5, Metupalayam Road Coimbatore - 641 043. Tel: -0422 - 2436485 Carrier Airconditioning & Refrigeration Ltd 39/6641, Perumanoor, MG. Road, (Opp. Cochin Shipyard) Cochin - 682 015 Tel: -0484 - 202 9001/ 0 Fax: -0484 - 235 9214 Carrier Airconditioning & Refrigeration Ltd GRR Zone 271/2, Maraimalai Adigal Salai Pondicherry - 605 001 Tel:					Hyderabad – 500 004
Fax:- 040 - 4011 8146 Carrier Airconditioning & Refrigeration Limited 3rd Floor, Block-III, Prestige Blue Chip, No.9, Hosur Road, Bangalore - 560 029 Tcl :- +91 80 43442000 Fax:- +91 80 43342202 Carrier Airconditioning & Refrigeration Ltd Shivas Complex 263/5, Mettupalayam Road Coimbatore - 641 043. Tcl:- 0422 - 438 4151, 438 5403 Fax:- 0422 - 2436485 Carrier Airconditioning & Refrigeration Ltd 39/6641, Perumanoor, M.G. Road, (Opp. Cochin Shipyard) Cochin - 682 015 Tcl:- 0484 - 402 9001/ 0 Fax:- 0484 - 235 9214 Carrier Airconditioning & Refrigeration Ltd GRift Acone 271/2, Maraimalai Adigal Salai Pondicherry - 605 001 Tcl:- 0413 - 2726 677					Tel:- 040 - 4546 2888
Carrier Airconditioning & Refrigeration Limited 3rd Floor, Block-III, Prestige Blue Chip, No.9, Hosur Road, Bangalore – 560 029 Tel :- +91 80 43442000 Fax:- +91 80 41321222 Carrier Airconditioning & Refrigeration Ltd Shivas Complex 263/5, Mettupalayam Road Coimbatore – 641 043. Tel:- 0422 - 438 4151, 438 5403 Fax:- 0422 - 2436485 Carrier Airconditioning & Refrigeration Ltd 39/6641, Perumanoor, M.G. Road, (Opp. Cochin Shipyard) Cochin – 682 015 Tel:- 0484 - 402 9001/ 0 Fax:- 0484 - 235 9214 Carrier Airconditioning & Refrigeration Ltd GRR Zone 271/2, Maraimalai Adigal Salai Pondicherry – 605 001 Tel:- 0413, 2726 677					Fax:- 040 - 4011 8146
Refrigeration Limited 3rd Floor, Block-III, Prestige Blue Chip, No.9, Hosur Road, Bangalore – 560 029 Tcl :- +91 80 43442000 Fax:- +91 80 41321222 Carrier Airconditioning & Refrigeration Ltd Shivas Complex 263/5, Metupalayam Road Coimbatore – 641 043. Tel:- 0422 - 438 4151, 438 5403 Fax:- 0422 - 2436485 Carrier Airconditioning & Refrigeration Ltd 39/6641, Perumanoor, M.G. Road, (Opp. Cochin Shipyard) Cochin – 682 015 Tel:- 0484 - 402 9001 / 0 Fax:- 0484 - 235 9214 Carrier Airconditioning & Refrigeration Ltd GRR Zone 271/2, Maraimalai Adigal Salai Pondicherry – 605 001 Tel: 0.021 8953 2026 676					Carrier Airconditioning &
3rd Floor, Block-III, Prestige Blue Chip, No.9, Hosur Road, Bangalore - 560 029 Tel :- +91 80 43442000 Fax:- +91 80 41321222 Carrier Airconditioning & Refrigeration Ltd Shivas Complex 263/5, Mettupalayam Road Coimbatore - 641 043. Tel:- 0422 - 438 4151, 438 5403 Fax:- 0422 - 2436485 Carrier Airconditioning & Refrigeration Ltd 39/6641, Perumanoor, M.G. Road, (Opp. Cochin Shipyard) Cochin - 682 015 Tel:- 0484 - 402 9001/ 0 Fax:- 0484 - 235 9214 Carrier Airconditioning & Refrigeration Ltd GRR Zone 271/2, Maraimalai Adigal Salai Pondicherry - 605 001 Tel:- 0451 - 222 6556					Refrigeration Limited
Prestige Blue Chip, No.9, Hosur Road, Bangalore – 560 029 Tel :- +91 80 43442000 Fax:- +91 80 41321222 Carrier Airconditioning & Refrigeration Ltd Shivas Complex 263/5, Mettupalayam Road Coimbatore – 641 043. Tel:- 0422 - 2436 485 Carrier Airconditioning & Refrigeration Ltd 39/6641, Perumanoor, M.G. Road, (Opp. Cochin Shipyard) Cochin – 682 015 Tel:- 0484 - 402 9001/ 0 Fax:- 0484 - 235 9214 Carrier Airconditioning & Refrigeration Ltd GRR Zone 271/2, Maraimali Adigal Salai Pondicherry – 605 001 Tak. 0421 - 222 582 - 226 676					3rd Floor, Block-III,
Image: Construct of the second sec					Prestige Blue Chip, No.9, Hosur
Tel:- +91 80 43442000Fax:- +91 80 43342000Fax:- +91 80 43321222Carrier Airconditioning & Refrigeration Ltd Shivas Complex 263/5, Mettupalayam Road Coimbatore - 641 043. Tel:- 0422 - 438 4151, 438 5403 Fax:- 0422 - 2436485Fax:- 0422 - 2436485Carrier Airconditioning & Refrigeration Ltd 39/6641, Perumanoor, M.G. Road, (Opp. Cochin Shipyard) Cochin - 682 015 Tel:- 0484 - 402 9001/ 0 Fax:- 0484 - 402 9001/ 0 Fax:- 0484 - 235 9214Carrier Airconditioning & Refrigeration Ltd GRR Zone 271/2, Maraimalai Adigal Salai Pondicherry - 605 001Tel:- 0413 - 232 5853 - 2326 676					Bangalore $= 560.029$
Fax:- +91 80 41321222 Carrier Airconditioning & Refrigeration Ltd Shivas Complex 263/5, Mettupalayam Road Coimbatore – 641 043. Tel:- 0422 - 438 4151, 438 5403 Fax:- 0422 - 2436485 Carrier Airconditioning & Refrigeration Ltd 39/6641, Perumanoor, M.G. Road, (Opp. Cochin Shipyard) Cochin – 682 015 Tel:- 0484 - 402 9001/ 0 Fax:- 0484 - 235 9214 Carrier Airconditioning & Refrigeration Ltd GRR Zone 271/2, Maraimalai Adigal Salai Pondicherry – 605 001 Tel:- 0422 - 235 921 (77)					Tel :- +91 80 43442000
Carrier Airconditioning & Refrigeration Ltd Shivas Complex 263/5, Mettupalayam Road Coimbatore – 641 043. Tel:- 0422 - 438 4151, 438 5403 Fax:- 0422 - 2436485 Carrier Airconditioning & Refrigeration Ltd 39/6641, Perumanoor, M.G. Road, (Opp. Cochin Shipyard) Cochin – 682 015 Tel:- 0484 - 402 9001/0 Fax:- 0484 - 235 9214 Carrier Airconditioning & Refrigeration Ltd GRR Zone 271/2, Maraimalai Adigal Salai Pondicherry – 605 001 Tel:- 0412 - 222 5853 - 2226 676					Fax:- +91 80 41321222
Refrigeration LtdShivas Complex263/5, Mettupalayam RoadCoimbatore - 641 043.Tel:- 0422 - 438 4151, 438 5403Fax:- 0422 - 2436485Carrier Airconditioning &Refrigeration Ltd39/6641, Perumanoor,M.G. Road, (Opp. Cochin Shipyard)Cochin - 682 015Tel:- 0484 - 402 9001/ 0Fax:- 0484 - 235 9214Carrier Airconditioning &Refrigeration LtdGRR Zone271/2, Maraimalai Adigal SalaiPondicherry - 605 001Tel:- 0413 - 222 5853 - 2226 676					Carrier Airconditioning &
Shivas Complex 263/5, Mettupalayam Road Coimbatore – 641 043. Tel:- 0422 - 438 4151, 438 5403 Fax:- 0422 - 2436485 Carrier Airconditioning & Refrigeration Ltd 39/6641, Perumanoor, M.G. Road, (Opp. Cochin Shipyard) Cochin – 682 015 Tel:- 0484 - 402 9001/ 0 Fax:- 0484 - 235 9214 Carrier Airconditioning & Refrigeration Ltd GRR Zone 271/2, Maraimalai Adigal Salai Pondicherry – 605 001 Tab. 0413, 222 5853, 2207 676					Refrigeration Ltd
26.5/5, Mettupalayam Koad Coimbatore – 641 043. Tel:- 0422 - 438 4151, 438 5403 Fax:- 0422 - 2436485 Carrier Airconditioning & Refrigeration Ltd 39/6641, Perumanoor, M.G. Road, (Opp. Cochin Shipyard) Cochin – 682 015 Tel:- 0484 - 402 9001/ 0 Fax:- 0484 - 235 9214 Carrier Airconditioning & Refrigeration Ltd GRR Zone 271/2, Maraimalai Adigal Salai Pondicherry – 605 001 Tel: 0412 - 225 9553 2226 676					Shivas Complex
Tel:- 0422 - 438 4151, 438 5403 Fax:- 0422 - 2436485 Carrier Airconditioning & Refrigeration Ltd 39/6641, Perumanoor, M.G. Road, (Opp. Cochin Shipyard) Cochin – 682 015 Tel:- 0484 - 402 9001/ 0 Fax:- 0484 - 235 9214 Carrier Airconditioning & Refrigeration Ltd GRR Zone 271/2, Maraimalai Adigal Salai Pondicherry - 605 001 Tel:- 0413 - 2025 585 - 2026 676					Compatore 641.043
Fax:- 0422 - 2436485 Fax:- 0422 - 2436485 Carrier Airconditioning & Refrigeration Ltd 39/6641, Perumanoor, M.G. Road, (Opp. Cochin Shipyard) Cochin - 682 015 Tel:- 0484 - 402 9001/ 0 Fax:- 0484 - 235 9214 Carrier Airconditioning & Refrigeration Ltd GRR Zone 271/2, Maraimalai Adigal Salai Pondicherry - 605 001 Tel:- 0412 - 232 5853 - 2326 676					Tel:- 0422 - 438 4151 438 5403
Carrier Airconditioning & Refrigeration Ltd 39/6641, Perumanoor, M.G. Road, (Opp. Cochin Shipyard) Cochin – 682 015 Tel:- 0484 - 402 9001/ 0 Fax:- 0484 - 235 9214 Carrier Airconditioning & Refrigeration Ltd GRR Zone 271/2, Maraimalai Adigal Salai Pondicherry – 605 001 Tab. 0413 - 222 5853 - 2226 676					Fax:- 0422 - 2436485
Refrigeration Ltd 39/6641, Perumanoor, M.G. Road, (Opp. Cochin Shipyard) Cochin – 682 015 Tel:- 0484 - 402 9001/ 0 Fax:- 0484 - 235 9214 Carrier Airconditioning & Refrigeration Ltd GRR Zone 271/2, Maraimalai Adigal Salai Pondicherry – 605 001 Tel: 0413 - 222 5853 - 2226 676					Carrier Airconditioning &
39/6641, Perumanoor, M.G. Road, (Opp. Cochin Shipyard) Cochin - 682 015 Tel:- 0484 - 402 9001/ 0 Fax:- 0484 - 235 9214Carrier Airconditioning & Refrigeration Ltd GRR Zone 271/2, Maraimalai Adigal Salai Pondicherry - 605 001 Tel:- 0413 - 222 5853 -2226 676					Refrigeration Ltd
M.G. Road, (Opp. Cochin Shipyard) Cochin – 682 015 Tel:- 0484 - 402 9001/ 0 Fax:- 0484 - 235 9214 Carrier Airconditioning & Refrigeration Ltd GRR Zone 271/2, Maraimalai Adigal Salai Pondicherry – 605 001 Tab. 0413 - 222 5853 - 2226 676					39/6641, Perumanoor,
Cocnin – 682 015 Tel:- 0484 - 402 9001/ 0 Fax:- 0484 - 235 9214 Carrier Airconditioning & Refrigeration Ltd GRR Zone 271/2, Maraimalai Adigal Salai Pondicherry – 605 001 Tel:- 0413 - 222 5853 - 2226 676					M.G. Road, (Opp. Cochin Shipyard)
Fax:- 0484 - 235 9214 Carrier Airconditioning & Refrigeration Ltd GRR Zone 271/2, Maraimalai Adigal Salai Pondicherry – 605 001 Tab. 0413 - 222 5853 - 2226 676					Cocnin $- 682.015$ Tel: 0484 402.9001/0
Carrier Airconditioning & Refrigeration Ltd GRR Zone 271/2, Maraimalai Adigal Salai Pondicherry – 605 001 Tal. 0413 222 5853 2226 676					Fax:- 0484 - 235 9214
Refrigeration Ltd GRR Zone 271/2, Maraimalai Adigal Salai Pondicherry – 605 001 Tab. 0413 - 222 5853 - 2226 676					Carrier Airconditioning &
GRR Zone 271/2, Maraimalai Adigal Salai Pondicherry – 605 001 Tal. 0413 - 222 5853 - 2226 676					Refrigeration Ltd
271/2, Maraimalai Adigal Salai Pondicherry – 605 001 Tal. 0413 – 222 5853 – 2226 676					GRR Zone
Pondicherry – 605 001					271/2, Maraimalai Adigal Salai
					Pondicherry $-605\ 001$
$F_{av-0413} = 222 \ 5055, 2220 \ 070$					Fax:- 0413 - 234 4695

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Carrier Airconditioning & Refrigeration Ltd
				Old No. 248, New No.114
				Royapettah High Road,
				Royapettah, Chennai – 600 014. Phone : 044 – 42222888
			Daenyx	Given Above
				ETA General Pvt Ltd
				ETA House ,3rd Floor
			General (ETA)	#71/63,Opp.Loyola College
				Sterling Road, Nungambakkam,
				Chennai.6000034 . Tamilnadu
				044-43402345
				ETA General Pvt. Ltd.Flat no -
				642 D, Ram AppartmentsOpp.
				PalavamCoimbatore 641.037Tel
				#:0422 - 2554732
				ETA General Pvt Ltd
				ETA House, Behind Green Park
				Hotel
				7-1-27/5, Plot No:9,
				Greenlands, Ameerpet
				HYDERABAD - 500 016
				Tel.#:040 - 66103530 / 31
				ETA General Pvt. Ltd.
				D NO.40-1-119, Old BATA
				GodownOpp. Jyothi Mahal Benz
				VIIAVAWADA 522.010
				Tel \cdot 0866 - 6460278 / 3074029
				ETA General Pvt. Ltd.
				PLot No.153, 2nd Floor, 9th
				Main Road
				3rd Block, Jayanagar
				BANGALORE - 560 011
				Tel: 080-40926531 / 40926538
				ETA General Pvt. Ltd.
				Bldng #:30/2001-D, 'Atham'
				1st Floor, Opp.Gold Souk
				Bonnumun Pood
				Poppuruppi Vytilla P.O
				Cochin - 682 019
				Telefax : 0484 - 4011623
				ETA General Pvt. Ltd.
				101-102, 1st Floor, Grotto
				Heritage,
				Opp.Orlem Church, Marve Road,

Sr.	Des des et Nieures	Product	Duond	Address / Contract Details
No.	Product Name	Sub Category	Brand	Address / Contact Details
				Malad – West,
				Mumbai - 400 064
				Tel: 022 - 42455300 / 02
				ETA General Pvt. Ltd.
				203, 2nd Floor, Sankalp Square
				Near Gurukul Temple
				Drive In Road
				AHMEDABAD - 380 054
				Tel: 0/9-2/46/991,40058991
				ETA General Pvt. Ltd.
				SCO 24/5 - 76, Sector 22, C. 2nd Elsen
				Sector 22 - C, 2nd Floor
				$CHANDIGARH - 100 022$ $T_{a}! 0172 = 5087288 - 4421121$
				ETA Conoral Data Ltd
				C 10 Sector I
				Aligani
				$I \cup I \cup$
				Tel: 0522 - 4006879
				ETA General Private Limited
				Sunrise Mall. 2nd Floor.
				Sector - 11. Vasundhara- 201 012
				Tel: 0120-4291121
				ETA General Pvt. Ltd.
				221, Ist floor,
				Okhla Indl. Area,
				New Delhi-110020
				# 011-43127777
				ETA General Pvt. Ltd.
				203, 2nd Floor
				Krishna Enclave, Plotno-SB-52
				Opp.SMS Stadium, Tonk Road,
				JAIPUR - 302015(Rajasthan)
				Ph. No: 0141-4012684
				ETA General Pvt. Ltd.
				1st Floor,Unit 1 F
				"Sree Ganesh Centre",
				216, AJC Bose Road
				T_{c1} , 022 40602006
			Codroi	Given Above
			Haier	Given Above
			Hitachi	Given Above
			IG	Given Above
			Onida	Given Above
			Samsung	Given Above
			Videocon	Given Above
			TCL	Given Above

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Voltas Limited
				Voltas House
	Corporate			'A' Block
	Headquarters		Voltas	Dr. Babasaheb Ambedkar Road
	1			Chinchpokli
				Mumbai 400 033
				Tel: 022-66656 666
	. .			2nd, Pokhran Road,
	Factories			Thane - 400 601
				Tel: 022-67920111
				Dadra Plant (EM&RBG)
				Shreenath Industrial Estate, C
				Building
				Survey NO.197. Nr. Dadra Check
				Post Pin – 396230
				Tel: 0260-6619999 / 2669648
				Uttarakhand Plant
				(EM&RBG)
				Plot No.1. Sector 8
				I.I.E. Pant Nagar Industrial Area
				Dist U.S. Nagar, Rudrapur
				Pin – 263145
				Tel: 05944-250006 / 8
-				Uttarakhand Plant (UPBG)
				Plot NO.2-5. Sector 8
				I.I.E. Pant Nagar Industrial Area
				Dist U.S. Nagar, Rudrapur
				Pin – 263153
				Tel: 05944-250009
-			Whirlpool	Given Above
-		Split	Blue star	Given Above
		1	Carrier	Given Above
			Daenvx	Given Above
			General (ETA)	Given Above
			Godrei	Given Above
			Haier	Given Above
			Hitachi	Given Above
-			IG	Given Above
			Opida	Given Above
			Onida	Gurgaon Head Office
				2nd Floor Tower A & B DI F
				Cyber Greens Dlf Cyber City
				DI F Phase -III Gurgaon-122002
			Mitsubishi	India
				Phone: $+91(124)463-0300+91$
				$(124) 673_{-}9300 East + 91 (124)$
				463-0399 / 398
				Delhi Registered Office

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
		Category		M-38/1 Middle Circle
				Connaught Place. New Delhi-
				11000, India
				Please contact Gurgaon head
				office for Delhi inquiries.
				Bangalore Sales Office
				Prestige Emerald, 6th Floor,
				Municipal No. 2, Madras Bank
				Road (Lavelle Road), Bangalore
				560001, India
				Phone: +91 (80) 4020-1600 Fax:
				+91 (80) 4020-1699
				Pune FAID Head Office
				Emerald House, EL-3, J block
				M.I.D.C Bhosari, Pune -411026,
				Phone: $+91(20) 2/10-2000$ Fax:
				+91 (20) 2/10-2100
				301 302 Lupkad sky Station poor
				HDEC Bank Viman Nagar
				Pupe-411 014 India
				Phone: ± 91 (20) 4131-4868 Fax:
				+91 (20) 4131-4851
				Pune Sales Office
				F-2, Gurutej Bahadur, Housing
				Society, Aundh Road, Khadki,
				Pune - 411003, India
				Phone: +91 (20) 2582-0447/448
				/ 449 Fax: +91 (20) 2582-0450
				Mumbai Sales Office
				305-306, 3rd Floor, "Windfall",
				Sahar Plaza Complex, Next to
				Kohinoor Hotel, Andheri Kurla
				Road, J. B. Nagar, Andheri (E.)
				Mumbai-400 059, India
				Phone: +91 (22) 6611-6200 Fax:
				+91 (22) 6611-6299
				Chennal Sales Office
				Vivalananda Road Srinivasa
				Nagar Chepet Cheppsi 600.021
				Tamilnadu India
				Phone: +91 (44) 4923-2222 Fav.
				+91 (44) 4923-2249
				Hyderabad Sales Office
				4th Floor, Unit No.407, Ashok
				Bhopal Chamber S.P. Road,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Secunderabad, A.P-500 003, Andhra Pradesh, India
				Phone: +91 (40) 4343-8888 Fax: +91 (40) 4343-8899
				Chandigarh Sales Office
				SCO 176, First Floor, Sector 38
				C, Chandigarh – 160036, India
				Phone: +91 (172) 460-1645
				Jaipur Sales Office
				111, Ground Floor, Apex Mall,
				Tonk Road, Jaipur, India
				Phone: +91 (141) 401-1109
				Anmedabad Sales Office
				Bungalow Cross Road, Bodakdev,
				Coimbatore Sales Office
				No 551A West Lokmanya Street
				DB Road RS Puram Comptore
				- 641002. India
				Phone: +91 (422) 438-5600
				Vadodara Sales Office
				A - $1/2$, 2nd Floor, Status Plaza,
				Opp Relish Resort Aksar Square,
				O.P Road, Vadodara -390020,
				India
				Phone: +91 (265) 231-4699/ 235-
				8137 Fax: +91 (265) 233-3307
				Kochi Sales Office
				Room No G9, Building Door No
				CC: 39/5102-A-6 , Netage
				Arcade Church Landing Road
				Ernaculum, Kochi-682016, India
				Phone: +91-9846013451 / +91- 8129445670
				Mitsubishi Elevator ETA India Part I td
				Chennai Citi Centre 5th Floor
				10 & 11 Dr R K Salai Mylapore
				Chennai - 600004 India
				Phone: +91 (44) 2847-7370 Fax:
				+91 (44) 2847-7374
			Panasonic	Given Above
			Samsung	Given Above
			Sanyo	Given Above
			TCL	Given Above
			Toshiba	Given Above
			Videocon	Given Above
			Voltas	Given Above

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
No.	I fouuet ivallie	Category	Dialid	Address / Contact Details
			Whirlpool	Given Above
	Refrigerators	Direct Cool	BPL	Given Above
			Electrolux	Given Above
			Gem	Given Above
			Godrej	Given Above
			Haier	Given Above
			Kelvinator	
			LG	Given Above
			Panasonic	Given Above
			Samsung	Given Above
			Videocon	Given Above
			Whirlpool	Given Above
		Frost Free	BPL	Given Above
			Electrolux	
			Godrej	Given Above
			Haier	Given Above
			Hitachi	Given Above
			Kelvinator	
			LG	Given Above
			Panasonic	Given Above
			Samsung	Given Above
			Videocon	Given Above
			Whirlpool	Given Above
			Toshiba	Given Above
			Sharp	Given Above
				Registered & Corporate Office
				130, Pandurang Budhkar Marg,
			Siemens	Worli, Maharashtra,
			Siemens	Mumbai 400 018.
				Tel: +91 22 3967 7000
				Fax: +91 22 3967 7500
				Acer India Private Limited
			Acer	Ground Floor, B- 28, Okhla
	Mobile Phones		11001	Phase - I, New Delhi -
				110020, Delhi, India
				Tel: +(91)-(11)-40568000
				India Office
				TCT Mobile International
			A1 . 1	Limited,
			Alcatel	Elegance Tower, Regus Business
				Ventre, 2nd Floor, Room
				110025
				Distributors
				Encon Imper Drivate Limited
				Super Distributor
				Encon Impey Private Limited
				No.45, 2nd Floor, Vinayaka

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
140.		Category		
				Electronic Plaza, 1st Cross, S.P
				Road, Bangalore - 560 002
				Kochi,Kerala
				Talktime Telesystems,Super
				Distributor
				Talktime Telesystems, 48/425B,
				Main road, Elamakkara,Kochi- 682026.
				Tirunelveli,Tamil Nadu
				KM Enterprises,Super
				Distributor
				KM Enterprises, No 41 E/3,
				Vasanthapuram, South Bye-Pass
				road, Tirunelveli-627005
				Karimnagar, Andhra Pradesh
				SK Technologies, Micro
				SP Technologies No 1 5 90
				Arayingh Nagar Jactic
				Karimpagar Andhra Pradesh
				Amazon Development Center
				India Pvt Ltd
				O-city. 2nd Floor-Block A &
				Block B
				Survey Number-109,110,111/2,
			Amazon	Nanakramguda Village
				Serlingamplayy Mandal, Ranga
				Reddy Dist.
				Hyderabad - 500032
				Ph: 040 39921111
				Divyashree Building, Ground
				Floor, Plot No: 6
				Hi-Tech City Layout, Survey No.
				64(Part), Madhapur Village
				Serilingampally Mandal
				Hyderabad - 500081
				Ph: 040 43451000
				9th & 10th Floor, Balding #0 Bala Mind
				Madhapur
				Huderabad 500081
				Ph. 040 40005111
				#40 3rd Floor SP Infocity
				M G R Salai Perupoudi
				Kandanchavady
				Chennai-600096
				Ph: 044 30883088
				2nd Floor Safina Towers

Sr. No.Product NameProduct Sub CategoryBrandAddress	ss / Contact Details
Opposite]	J.P. Techno park
No.5, Alt A Bangalore	- 560052
Ph- 080 41	1970000
Brigade G	ateway 6th floor
26/1, Dr.	Rajkumar Road
Malleshwa	iram(W)
Bangalore-	-560055
	ia Private Limited
19 Floor. (Concorde Tower C.
Apple UB City N	lo 24 Vittal Mallya
Road	
Bangalore	560-001
Presented	c GmbH
Große Elt	ostraße 117
Benefon DE-22/6/	$\frac{1}{10} + \frac{1}{10} $
F_{ax} : +49 ((0)40 300 6683 29
BenO Ind	ia Pvt. Ltd.
B Q 3rd Floor,	9B Building,
BenQ DLF Cybe	er City, DLF Phase 3,
Gurgaon 1	122002, Haryana.
Ningbo Bi	ird Co.,Ltd.
No.999, D	Dacheng East Road,
P R China	ity, Zhejiang Province,
Bird Tel : +86	574 88953465, +86 755
36878286	····, ····,
Fax: +86 5	574 88951025, +86 755
36878284	
Postcode:	315500
US & Lat	111 Americas 74 88953465
Mobile: +8	6 13738470409
Corporate	Head Office
BlackBerry	y B
2200 Univ	rersity Ave. E
BlackBerry Waterloo,	ON, Canada
N2K 0A2	888 7465
Fax: (519)	888-7884
BlackBerry	v United States
BlackBerry	y y
5000 River	rside Drive,
Irving,	
TX 75039	272 4700
Tel: (9/2)	3/3-1/00 650-2006

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
110.		Category		
				BlackBerry Europe
				BlackBerry
				200 Bath Road
				Slough, Berkshire
				United Kingdom SL1 3XE
				Tel: +44 (0)1753 667000
				Fax: +44 (0)1753 669970
				Manufacturing Facility
				BlackBerry
				451 Phillip Street
				Waterloo, Ontario
				Canada N2L 3X2
				Tel: (519) 888-7465
				Fax: (519) 888-0021
				Ottawa
				BlackBerry
				4000 Innovation Drive
				Kanata, Ontario
				Canada K2K 3K1
				Tel: (613) 599-7465
				Fax: (613) 599-1922
				Mississauga
				BlackBerry
				4701 Tahoe Boulevard
				Mississauga, Ontario
				Canada L4W 0B5
				Tel: (905) 629-4746
				Fax: (905) 629-4869
				BLU Products
			DIII	10814 NW 33 rd St# 100
			DLU	Doral, FL 33172
				(305) 715 - 7171
				Bosch Sicherheitssysteme GmbH
				Robert-Bosch-Ring 5
			Bosch	85630 Grasbrunn
				GERMANY
				Tel: +49 (0) 89 6290-0
				Bosch Security Systems
				130 Perinton Parkway
				Fairport, New York, 14450
				USA
				Tel: +1 585 223 4060
				Bosch Security Systems Pte Ltd
				11 Bishan Street 21
				Singapore 573943
				SINGAPORE
				Tel: +65 6571 2808

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Bosch Security Systems B.V.
				Postfach 80002
				5600 JB Eindhoven
				THENETHERLANDS
				Tel: +31 (0) 40 25 77 284
				Casio India Co. Private Ltd.
				210, 1st Floor, Okhla Industrial
			o :	Estate, Phase-III,
			Casio	New Delhi-110020
				Tel: 011-66999200
				Fax: 011-41054330
				601, 6th Floor, Crescent Plaza,
				Telly Gulli, Andheri(E),
				Mumbai-69,
				Ph.: 022-60605005
				No.7, Shah Complex, 2nd Floor,
				9th Main, 5th Block Javanagar,
				Bangalore- 41.
				Ph.: 080-60605005
				3rd Floor, Heera Panna Complex.
				124/1. G.N.Chetty Road.
				T.Nagar, Chennai-17.
				Ph.: 044-60605005
				3rd Floor, 3-4-630.
				Padma Plaza, Opposite Ratna
				College
				Naravanguds Hydrabad-29
				Ph · 040-60605005
				4C. Lansdowne Place
				2nd Floor, Kolkata-29
				Ph.: 033-60605005
				CELKON IMPEX PVT LTD.
				3rd floor, 2nd block, MY HOME
				HUB.
			Celkon	Madhapur, Hyderabad - 500081
				Andhra Pradesh India
				Contact : $+91\ 90523\ 45678$
				Spectrum House, Dunstable
				Road Redbourn Hertfordshire
				AL3 7PR
			Chea	Tel: 01923 383828
				International: $+44 (0)1923$
				383828
				Dell Computer Corporation
				One Dell Way
			Dell	Round Rock, Texas 78682
				Tel: (888) 560-8324
				(800) 915-3355

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
			Ericsson	ERICSSON INDIA PRIVATE LIMITED Ericsson Forum DLF Cyberciti Sector-25A, Gurgaon Haryana Postal code: 122 002 Phone: +91 124 4080808, +91 124 2701001
			Fujitsu Siemens	Shiodome City Center 1-5-2 Higashi-Shimbashi, Minato- ku Tokyo 105-7123, Japan Tel: +81-3-6252-2220
			Gigabyte	Gigabyte Technology India Private Limited +91-22-40633222
			Haier	Given Above
			НР	Hewlett-Packard India Sales Pvt.Ltd 24, Salarpuria Arena Adugodi Hosur Road Bangalore - 560 030 Phone: (080) 33824000 / 33829000
				Hewlett-Packard India Sales Pvt. Ltd 501, 5th Floor, Satkar Complex Behind Swagath Building Off C.G.Road, Navrangpura Ahmedabad - 380 001
				Hewlett-Packard India Sales Pvt. Ltd. 24, Salarpuria Arena Building Adugodi, Hosur Road Bangalore - 560 030
				HP GR Tech Park Facility 10th & 11th floor, B wing, Akash Block, 6-9 floor, B wing, Akash Block, 0-3rd Floor, B wing, Akash Block, Salarpuria GR Tech Park, Sy No.69/3, Whitefield Road, Next to ITPL, Bangalore - 560 066. India. Hewlett-Packard GlobalSoft
				Limited HP Avenue

Sr		Product		
No.	Product Name	Sub	Brand	Address / Contact Details
		Category		
				39/40, Electronics City-I
				Hosur Road
				Bangalore - 560 100
				Global e-Business Operations
				Pvt. Ltd.
				Wind Tunnel Road
				Tower 1, GVH, Murugeshpalya
				Murugeshpalya
-				Bangalore - 560 017
				Hewlett-Packard India Sales Pvt.
				Ltd.
				No. 66/2, Ward No. 83,
				Bagmane Tech-Park
				4th Floor, Wing A,
				Embassy Prime, CV Raman
				Nagar,
				Bangalore - 560 093
				Survey No. 192,
				Whitefield Road,
				Mahadevpura Road,
				Bangalore - 560 048
				III Floor, Khanija Bhavan,
				49, Race Course Road,
				Bangalore - 560 001
				Surya Park 2,
				No.100, Ring road,
				Bangalore - 560 100
				Surya Wave,Sy # 61(p),
				Electronic City, Hosur Road
				Bangalore - 560 100
				Prathik Tech Park,
				Survey No 93/1, Veerasandra
				village,
				Attibele Hobli, Anekal Taluk,
				Electronic City Extension
				Bangalore - 560 100
				Hewlett-Packard India Sales
				Pvt.Ltd
				No.2, KRM Plaza,
				Harrington Road,
				Chetpet,
				Chennai - 600 031
				Plot 1, Olympia Technology park,
				Citius block, SIDCO industrial
				estate,
				Guindy,
				Chennai - 600 032
				Block 1, 4F - 6F
Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
------------	--------------	----------------------------	-------	---
				Block 1, G - 3F
				First Software Park,
				110 Mount Poonamalle Road,
				Porur
				Chennai - 600 116
				Ground floor, Crowne Plaza,
				New Friends Colony.
				New Delhi - 110065.
				Hewlett-Packard India Sales Pvt.
				Ltd.
				No 18 ilabs Centre
				4th Floor D-Block
				5th Floor, C - Block
				5th Floor, D - Block
				Madhapur
				Hyderabad 500.081
				Howlett Dackard India Salas
				Drivate Limited
				Building No: 02 DIE
				Cubananaan
				Lat to Ath floors Torrow D & E
				Ist to 4th moors, Towers D \propto E,
				DLF Cyber City, Phase III,
				Gurgaon – 122 022, Haryana,
				Phone:(0124) 3886000
				Fax: (0124) 3886941
				Hewlett-Packard India Sales Pvt
				Ltd.
				Plot No. 9-11A & 35-37A,
				Sector-V
				Integrated Industrial Estate,
				Pantnagar (SIDCUL),
				Rudrapur, US Nagar - 263 153.
				Uttaranchal State, India
				No 08, Major Arteral Road,
				Block -AF New Town 1st Floor,
				Rajarhat,
				Kolkata- 700 156,
				West Bengal.
				Unit No. 16N & 17, 16th & 17th
				Floor,
				Oberoi Commerz, International
				Business Park,
				Oberoi Garden City, Off.
				Western Express Highway,
				Goregoan,
				Mumbai - 400 063
				Maharastra.

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Hewlett-Packard India Sales
				Pvt.Ltd.
				Level 6, Pentagon P-2, Magamatta City
				Hadapsar
				Pupe - 411.028
			НТС	1800 266 3566
				Huawei Telecommunication
				(INDIA) Co. Pvt Ltd.
				7th Floor, Tower A,
			Huawei	Spaze I-Tech Park, Sohna Road,
			Tittawei	Sector-49
				Gurgaon, Haryana-122001 India
				Tel: +91-124-4774700
				Fax: +91-124-4//4863
				Huawei
				No. 9 Capton Road Tsim Sha
				Tsui
				Kowloon, Hongkong
				Tel: 00852-21253888
				Fax: 00852-21253889
				Karbonn Mobiles
				#39/13, off 7th main, HAL 2nd
			Karbonn	stage
				Appareddy Palya, Indiranagar,
				Bangalore – 560038
				Tel: 080 40894888
				D 170 Okhla Industrial Area
				Phase-1
				New Delhi $- 110020$
				011 46604660
-				KYOCERA Corporation
				Cutting Tool Group
				6 Takeda, Tobadono-cho,
			Kyocera	Fushimi-ku, Kyoto 612-8501,
				Japan
				Phone: +81-/5-604-34/3
				Fax: +81-/5-004-34/2
				Pvt. Ltd.
				1001A, 1001B, 1002, 10th Floor
				JMD Regent Square, M.G. Road
				Gurgaon-122 002 Haryana, India
				Phone: +91-124-402-5000
				Fax: +91-124-402-5001
			Lenovo	Lenovo India Pyt.Ltd

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Ferns Icon, Level -2, Doddenakund Village, Marathhalli Outer Ring Road.
				Marathhalli Post, Kr Puram Hobli,
				Bangalore-560037 Phone No. :080-30533000
				Lenovo India Pvt.Ltd Vatlka Business Park 1st
				floor,Badshah Pur Road, Sec-49.
				Sohna Road,
				Phone No. : 0124-4315600
				Lenovo India private ltd MLS Business Centres India Pvt.
				Ltd. 6th Floor, Block A, 22, Camac
				Street Kolkata - 700 016.
				MPh no: 033 - 4019-2234 TO 4019-2239
				FAX - 033 - 40192240 #1011-12, Solitaire Corporate
				Park, Building No.10,1st Floor,Andheri
				Ghatkopar Link Road, Chakala, Andheri (East),
				Mumbai-400093 Phone No. : 022- 30847000/100
				Lenovo India Pvt Ltd 2nd Eloor Kuppu Arcade 4
				Venkatanarayana Road,
				Phone No. : 044-39159273
			LG	Given Above Maxon CIC Europe Ltd
				Maxon House Cleveland Road
			Maxon	Hemel Hempstead Herts HP2 7EY
				United Kingdom Tel: +44 (0) 1442 267777
				Future Technology Enterprise Ltd.
			Meizu	Unit 01-02, 19/F, Hollywood Plaza, 610 Nathan Road,
				Mongkok, Kowloon, Hong Kong Tel: (852) 2388 8022

Sr. No.	Product Name	Product Sub	Brand	Address / Contact Details
		Category		Micromay House
				00B Sactor 18 Currenon
			Micromax	Din Code 122015
			MICIOIIIAX	Tal: $\pm 01, 124, 4811000$
				F_{ax} : +91-124-4009603
				Micromax House
				90B Sector-18 Gurgaon
				Pin Code - 122015
				Tel: $+91-124-4811000$
				Fax: +91-124-4009603
				Micromax House,
				90B,Sector-18,Gurgaon
				Pin Code - 122015
				Tel: 18605008286
				Fax: +91-124-4009603
				Micromax Informatics Ltd, Plot
				No.234, HPSIDC Industrial Area,
				Tehsil Nalagarh, Distt Solan
				(HO)-173205
				Microsoft Corporation
			Microsoft	One Microsoft Way
				Redmond, WA 98052-6399
				MiTAC products or general
			Mitac	company enquiries
				Tel: 886-2-26525888
			Mitsubishi	Given Above
				Motorola Mobility, Inc.
			Motorola	600 North U.S. Highway 45
				Libertyville, Illinois 60048 USA

01 N	Nama	A 11	I	Latitud	e	Longitude		
51. INO.	Iname	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.
		Durg			<u> </u>			
1	Coman India Electronic	Ward No5, Main Market, Dhamdha, Durg - 491331	21	27	37.7	81	19	51.5
2	Jangel Electronic	Bemitra Road, Dhamdha, Durg-491331	21	27	58.7	81	19	58.4
3	Sangam Electronic	Ajad Chock, Patan, Durg - 491111	21	2	10.3	81	32	34.0
4	Anil Enterprise	Bharat Chock, Patan, Durg - 491111	21	2	13.3	81	32	31.1
5	Sheetal Traders	Shop No. 11/A, Indira Market, Durg - 491001	21	11	17.9	81	16	40.6
6	Shreezee	Shop No. 10/A, Indira Market, Durg - 491001	21	11	18.2	81	16	40.5
7	Sigma Enterprise	Indira Market Rd., Durg - 491001	21	11	21.9	81	16	43.3
8	Naresh Treding & Co.	Santra Badi Area, Durg - 491001	21	11	44.8	81	17	2.1
		Bemetara	1	1	1			
9	Bajaj Electronic	Sindhi Colony, Bemetara- 491335	21	43	8.4	81	32	16.0
10	Kabra Electronic	Sadar Rd., JN Kabra Complex, Bemetara - 491335	21	43	2.4	81	31	57.8
11	Rajesh Electronic	Sabji Market, Nawagarh, Bemetara-491337	21	54	23.1	81	36	27.9
12	Sir Sai Electronic	Ward No11, Pathan Para, Than Khamarie, Bemetara - 491338	21	47	45.1	81	20	2.1
13	Sandeep Furniture	Purani Sabji Mandi, Ward No4, Than Khamarie, Bemetara - 491338	21	47	59.8	81	20	5.4

Partial List of Distributor, Trader & Retailer in Durg Division – Annexure 2

SI No	Name	Address	I	Latitud	e	Longitude		
01. 1 40.	i vanic	nuicss	Deg.	Min.	Sec.	Deg.	Min.	Sec.
14	Shjad Mall	Gol Bajar, Than Khamarie, Bemetara - 491338	21	48	9.4	81	20	13.8
15	Soni Bartan	Ward No10, Bajar Chock, Saja, Bemetara	21	39	52.7	81	18	48.7
16	Gurukripa Sales	Than Kamarie Rd., Saja, Bemetara	21	39	52.2	81	18	43.2
		Kawardha - Kabirdham			<u> </u>	ļ		<u> </u>
17	Gupta Appliances	Rishabda Chock, Kawardha	22	0	24.5	81	14	4.6
18	Simran Electronics	Ajad Chock, Kawardha	22	0	17.9	81	14	4.3
19	Mutreja Sales	Ajad Chock, Kawardha	22	0	17.9	81	14	4.3
20	Aman Electronics & Furniture	Bajrang Chock, Khanna Tower, Kawardha	22	0	17.6	81	13	59.3
21	Mahamaya Electronics	Masjid Chock, Bodla, Kawardha	22	9	43.7	81	13	10.1
22	Chabra Enterprices	Larmi Rd., Pandariya, Kawardha	22	13	10.8	81	24	38.8
23	Bham Enterprices	Ward No9, Pandariya, Kawardha	22	13	11.0	81	24	28.2
24	Narkar Enterprices	Ward No9, Pandariya, Kawardha	22	13	9.5	81	24	28.8
25	Himesh Electronics	Sahaspur, Ward No11, Lohara, Kawardha	21	50	6.6	81	7	38.5
26	Sahu Electronics	Mahavir Complex, Ward No 9, Lohara, Kawardha	21	50	8.1	81	7	37.4
		Rajnandgaon		I		I		
27	Soni Electronics	Bartan len, Chhuikhadan, Rajnanndgaon	21	31	19.1	80	59	48.0
28	Anmol Gift Corner	Bajar Lain, Chhuikhadan, Rajnanndgaon	21	31	18.9	80	59	51.1
29	Tramakar Electronics	Gol Bajar, Khairagarh, Rajnanndgaon	21	25	1.8	80	58	48.3

SI No	Name	Name Address		e	Longitude				
51. 140.	Ivanic	nuiress	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
	A diama dia General	Mariid Charle Khaimarah							
30	Adnumk Store	Rajnanndgaon	21	25	5.1	80	58	49.7	
21	Vicky Electricals &	Deevan Bada Rd., Khairagarh,	21	25	17	20	FO	E1 2	
51	Electronics	Rajnanndgaon	21	25	1.7	80	58	51.5	
32	Ashish Store	Deevan Bada Rd., Khairagarh, Rajnanndgaon	21	25	0.5	80	58	52.9	
33	Shri Ariyant Enterprices	Bajar Chock, Chhuriya, Rajnanndgaon	21	0	19.7	80	37	39.9	
34	Veshnoi Electronics	Old Bus Stand Chock, Chhuriya, Rajnanndgaon	21	0	22.4	80	37	25.0	
35	Ram Enterprices	Main, Rd., Dungargaon, Rajnanndgaon	20	58	14.1	80	51	2.7	
36	Shama Electronics	Shulekha Market, Dongargaon, Rajnanndgaon	20	58	16.2	80	51	0.1	
37	Bindal Electronics	Budhwari Park, Dongargarh, Rajnanndgaon	21	11	18.2	80	45	27.9	
38	S P Electronics	Gurudwara Rd., Dongargarh, Rajnanndgaon	21	11	18.5	80	45	26.2	
39	Shri Pitambar Sales	Budhwari Park, Dongargarh, Rajnanndgaon	21	11	18.5	80	45	22.4	
40	Suresh Electronics	Gol Bajar, Dongargarh, Rajnanndgaon	22	11	16.8	80	45	10.8	
41	Kishori Computers	Ganj Line, Rajnanndgaon	21	5	32.7	81	2	17.5	
42	Jhalak Enterprise	Ramadin Marg, Rajnanndgaon	21	5	42.3	81	2	14.7	
43	Shri Ram Marketing	Manav Mandir Chock, Rajnanndgaon	21	5	41.3	81	2	1.2	
44	Panasonic Distributers	Ramadin Marg, Rajnanndgaon	21	5	50.8	81	2	15.7	
45	Bagadi Brothers	Ramadin Market, Rajnanndgaon	21	5	46.9	81	2	15.3	
46	Anshdeep Electronics	G E Rd., Opp. New Bus Stand, Rajnanndgaon	21	5	47.9	81	1	42.7	

SI No	Name	Address	I	Latitud	e	Longitude		
	- tunic	11001000	Deg.	Min.	Sec.	Deg.	Min.	Sec.
		Balod				<u></u>	<u> </u>	<u> </u>
47	Vikas Electronics & Furniture	Fuhara Chock, Balod	20	43	51.3	81	12	20.5
48	Sahu Electronics	Budhwari Bajar, Balod	20	44	1.6	81	12	30.7
49	Sanjeev Enterprices	Budhwari Bajar, Balod	20	44	0.2	81	12	28.8
50	Dhahiya Brothers	Sadar Rd., Balod	20	44	0.0	81	12	28.3
51	Krishna TV & Mobile Shop	Bhakt Mata Karma Complex, Balod	20	43	49.5	81	12	17.3
52	Mahavir Electronics	Purana Bus Stand, Balod	20	43	50.9	81	12	20.0
53	Sharyansh Enterprise	Viveka Nand Chock, Dondilohara, Balod	20	47	24.9	81	3	16.9
54	Nisha Electrical	Main Rd., Dondilohara, Balod	20	47	25.2	81	3	16.5
55	Ganesh Enterprices	Balod Rd., Gunderdehi, Balod	20	56	30.8	81	17	39.5
56	Preeti TV & Fridge	Gulab Market, Gunderdehi, Balod	20	56	54.6	81	17	40.3
57	Sourab Electricals	Main RD., Gunderdehi, Balod	20	56	38.1	81	17	40.1
58	Kirti Eletricals	Main RD., Gunderdehi, Balod	20	56	38.3	81	17	40.2
59	Ma Gayatri Electricals	Gulab Market, Gunderdehi, Balod						
60	Vinay Mobile & Laptop House	Gulab Market, Gunderdehi, Balod	20	56	53.3	81	17	40.8
61	National Traders	Main Rd., Gurur, Balod	20	41	0.6	81	24	12.6
62	Raj Electricals & Electronics	Ward No4, Gurur, Balod	20	41	1.6	81	24	12.9

Partial List of Bulk Consumers in Durg Division- Annexure 3

Sl. No.	Name	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
		Durg						
1	Collectrate office	Patel Chock, Collectrate Parisar Durg - 491001	21	11	3.0	81	16	32.7
2	Tahsil Office	Patel Chock, Durg - 491001	21	11	8.0	81	16	33.0
3	Nagar Palika	M. C. Head Office, Letai Rd., Durg - 491001	21	11	8.5	81	16	39.1
4	PWD Office	Near Bus Stand, N.H. Rd., Durg-491001	21	11	13.0	81	16	52.7
5	RTO Office	Civil Line, Malvi Nagar Chock, Durg - 491001	21	11	24.6	81	17	36.0
6	Collectrate office	Kabai Bhata, Collectrate Parisar, Bemetara, Durg - 491335	21	41	22.8	81	33	4.8
-		Bemetara				1		1
7	Tahsil Office	Tahsil Office, Bemetara- 491335	21	43	7.9	81	32	10.7
8	Nagar Palika	Singori, Durg Rd., Bemetara- 491335	21	42	1.2	81	32	2.3
9	PWD Office	Ward No4. Bemetara-491335	21	43	6.5	81	32	11.0
10	RTO Office	Village Khobia, Bemetara- 491335	21	41	43.6	81	32	52.0
11	Tahsil Office	Tahsil Parisar, Nawagarh, Bemetara-491337	21	54	18.8	81	36	47.8
12	PWD Office	Ward No15, Shankar Nagar, Nawagarh, Bemetara-491337	21	53	57.6	81	36	46.0
13	Nagar Palika	Near Bus Stand, Nawagarh, Bemetara-491337	21	54	19.0	81	36	26.4
		Kawardha - Kabirdham				•		
14	Nagar Palika	Ward No9, Kawardha	22	0	32.6	81	13	40.7

SI No	Name	Address	Latitude			Longitude		
01. 1 40.	ivanic	induites:	Deg.	Min.	Sec.	Deg.	Min.	Sec.
15	Tahsil Office	Ward No8, Proffecer Colony, Kawardha	22	0	26.9	81	12	58.6
16	RTO Office	Chir Pali Colony, Kawardha	22	0	22.6	81	13	9.0
17	PWD Office	Ward.∖ No5, Kawardha	22	0	23.4	81	13	48.4
18	Tahsil Office	Pondi Rd., Bodla, Kawardha	22	9	36.2	81	13	29.8
19	PWD Office	Pondi Rd., Bodla, Kawardha	22	9	36.2	81	13	29.8
20	Nagar Panchayat	Ward No7, Bodla, Kawardha	22	9	46.2	81	13	7.7
21	PWD Office	Lormi Rd., Pandariya, Kawardha	22	13	10.5	81	24	56.3
22	Nagar Panchayat	Ward No8, Pandariya, Kawardha	22	13	7.0	81	24	38.2
23	Tahsil Office	Berak Pura, Pandariya, Kawardha	22	13	28.6	81	24	17.1
		Rajnandgaon		<u></u>	ļ	Į	<u></u>	<u></u>
24	Nagar Palika	Ward No12, Dongargarh, Rajnanndgaon	21	11	11.5	80	45	15.3
25	Tahsil Office	Civil Line, Dongargarh, Rajnanndgaon	21	11	26.1	80	44	53.1
26	SDM Office	Civil Line, Dongargarh, Rajnanndgaon	21	11	26.1	80	44	53.1
27	PWD Office	Sub Division Office, Dongargarh, Rajnanndgaon	21	11	31.2	80	44	54.0
28	Collectrate office	Karyalya Collectrate, Rajnanndgaon	21	5	51.4	81	1	13.8
29	DIC Office	Sayukt Karyalya Bhawan, Rajnanndgaon	21	5	53.0	81	1	16.4
30	RTO Office	Outer Rd., Rajnanndgaon	21	6	8.7	81	0	3.0
31	Nagar Palika	Imam Chock, Rajnanndgaon	21	5	54.4	81	2	4.0
32	Tahsil Office	Baldev Ward, Rajnanndgaon	21	6	2.6	81	1	55.4

Sl. No.	Name	Address	Ι	Latitud	e	Longitude					
			Deg.	Min.	Sec.	Deg.	Min.	Sec.			
33	PWD Office	Kelash Nagar, Rajnanndgaon	21	5	54.0	81	2	30.7			
Balod											
34	Collectrate office	Jila Karyalya, Balod	20	43	44.2	81	12	12.0			
35	RTO Office	Civil Line, Balod	20	43	44.3	81	12	9.4			
36	PWD Office	Civil Line, Balod	20	43	44.8	81	12	9.3			
37	Nagar Palika	Sadar Rd. Near Budhwari Bajar, Balod	20	44	5.4	81	12	33.8			
38	Tahsil Office	Madhu Chock, Balod	20	43	45.9	81	12	9.6			
39	Nagar Panchayat	Ward No8, Dondilohara, Balod	20	47	11.2	81	3	15.9			
40	Tahsil Office	Tahsil Parisar, Dondilohara, Balod	20	47	11.4	81	3	11.1			

Partial List of Service centers in Durg Division- Annexure-4

Sl. No	Name of Shops	Address	Ι	Latitud	e	Longitude				
			Deg.	Min.	Sec.	Deg.	Min.	Sec.		
		Durg								
1	Coman India Electronic	Ward No5, Main Market, Dhamdha, Durg - 491331	21	27	37.7	81	19	51.5		
2	Jangel Electronic	Bemitra Road, Dhamdha, Durg-491331	21	27	58.7	81	19	58.4		
3	Sangam Electronic	Ajad Chock, Patan, Durg - 491111	21	2	10.3	81	32	34.0		
4	Singh Refrigration	Polsai Para, Durg - 491001	21	11	30.7	81	17	0.8		
5	Shubham Refrigration	Ward No27, Polsai Para, Durg-491001	21	11	30.7	81	17	0.8		
6	Mhobia Electronic	Polsai Palra, Station Rd., Durg - 491001	21	11	34.4	81	16	57.5		
Bemetara										
7	Veshno T.V. Center	New Market, Bemetara - 491335	21	42	59.6	81	31	53.5		
8	Ashok T.V. Center	Ward No10, Nawagarh, Bemetara -491337	21	54	27.4	81	36	35.0		
9	Shitla Electronic	Gaurav Path Rd., Nawagarh, Bemetara-491337	21	54	23.3	81	36	25.9		
10	Sir Sai Electronic	Ward No11, Pathan Para, Than Khamarie, Bemetara - 491338	21	41	45.1	81	20	2.1		
11	Nand Shakti TV Center	Ward No8, Saja, Bemetara	21	39	54.5	81	18	42.5		
	L	Kawardha - Kabirdham	I	1	I	1				
12	The Dawar Refirigation	Sinchai Colony, Kawardha	22	0	17.3	81	13	47.6		
13	R K Electronics	Bajrang Chock, Kawardha	22	0	17.4	81	13	59.4		
14	Chaya Electronics	Janpad Complex, Bodla, Kawardha	22	9	47.9	81	12	59.6		
15	Patil TV Center	Ward No9, Kondhi House,	22	9	49.4	81	12	55.2		

SI No	Name of Shops	Address	I	atitud	e	Longitude		
51. 140.	Traine of Shops	nuicss	Deg.	Min.	Sec.	Deg.	Min.	Sec.
		Bodla, Kawardha						
16	Mahamaya Electronics	Masjid Chock, Bodla, Kawardha	22	9	43.7	81	13	10.1
17	Devedi Radios	Ward No.10, Pandariya, Kawardha	22	13	22.9	81	24	23.8
18	Rupali Electronics	Ward No10, Pandariya, Kawardha	21	31	20.4	80	59	55.3
		Rajnandgaon						
19	Vicky Electricals & Electronics	Deevan Bada Rd., Khairagarh, Rajnanndgaon	21	25	1.7	80	58	51.3
20	Naman Electronics	Mahavir Chock, Chhuriya, Rajnanndgaon	21	0	22.9	80	37	52.3
21	Jyoti Electronics	Fuhara Chock, Dongargaon, Rajnanndgaon	20	58	12.8	80	51	1.6
22	Maateshvari Electronics	Ward No1, Dongargarh, Rajnanndgaon	21	11	25.1	80	45	5.0
23	Chauhan TV Center	Marvadi Dharmshala Market, Dongargarh, Rajnanndgaon	21	11	12.6	80	45	16.5
24	Shir Balaji Electronics	Loguli Naka Chock, Rajnanndgaon	21	5	24.2	81	2	37.4
25	Miland Electronics	Ranadin Marg, Rajnanndgaon	21	5	43.6	81	2	15.7
26	Bharat Electronic & Electricals	Kanchana Chock, Rajnanndgaon	21	5	15.1	81	3	5.8
		Balod				1		
27	Shakil Electronics	Musalman Para, Ward No8, Balod	20	43	59.5	81	12	27.7
28	Harish Electronics	Opp. New Bus Stand, Gurur, Balod	20	41	0.7	81	24	9.2
29	Ganjir Electronics	Sahu Sadan, Kaliya Marg, Gurur, Balod	20	40	59.3	81	24	25.3

Sl No.	Name	Address
1.	M/s Navrachna Recycling Pvt. Ltd.	Plot No 1B, Somni Industrial Area, Rajnandgaon
2.	M/S ADV Metal Combine Private Limited	Borai Industrial Growth Center, Durg

Inventory of Physically established Collection Centers- Annexure-5

Partial inventory of Scrap Vendors/ Dismantler Annexure -6

01 31	SI No Nomo Addross		I	Latitude			Longitude		
51. No.	Name	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
		Dura							
1	Pathan	Motin Pur Road, Dhamdha, Durg-491331	21	27	52.1	81	20	1.5	
2	Mr. Rafiq Menan	Muslim Para, Ward No 2, Dhamdha, Durg - 491331	21	27	46.4	81	19	52.0	
3	Ramu Dhankar	Satwani Mohalla, Pandar, Durg - 491111	21	2	45.1	81	31	14.1	
4	Neeraj Tiwari	Ward No9, Patan - 491111	21	2	11.8	81	32	40.5	
5	Vijay Devangan	Nagar Panchayat Road, Patan, Durg - 491111	21	2	13.3	81	31	42.7	
6	Mannu Chakkardhari	Ward No8, Purana Hospital Chock, Patan, Durg - 491111	21	2	14.0	81	32	46.1	
7	Babbu Khan	Green Chock, Durg - 491001	21	11	59.6	81	17	14.8	
8	Sanjay Sahu	Ward No25, Durg - 491001	21	11	59.0	81	17	17.1	
9	Anil Kumar	Green Chock, Durg - 491001	21	11	58.5	81	17	17.8	
10	Nurdin / Sakir	Ward. No8, Takia Para, Durg - 491001	21	11	27.7	81	16	46.9	
11	M. B. Saddam	Luchki Talab, Durg - 491001	21	11	32.9	18	16	44.5	
		Bemetara		,					
12	Kush Senik	Ward No2, Bemetara - 491335	21	43	12.3	81	32	10.5	
13	Mohd. Salim	Ward No17, Bajar Para, Bemetara -491335	21	42	54.9	81	31	47.9	
14	Vijay Sharma	Naya Para, Ward No16, Bemetara -491335	21	42	32.7	81	31	50.7	
15	Arjun Nimalkar	Ward No11, Shankar Nagar Nawagarh, Bemetara -491337	21	54	14.6	81	36	47.3	
16	Santosh Agarwal	Ward No13,Rayan Bhata, Than Khamarie, Bemetara -	21	41	31.6	81	20	13.3	

SI No	Name	ame Address		Latitude			Longitude		
01. 1 (0.	i tuine	induite 55	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
		401338							
		+71350							
17	Mansur Ahmad Khan	Naurani Chock, Than	21	47	48 1	81	20	32	
17		Khamarie, Bemetara - 491338	21	• *	10.1	01	20	5.2	
10	Sitaram Netam	Ward No2, Bharat Pur, Saja,		10	• •	0.1	10		
18		Bemetara - 491993	21	40	3.0	81	19	8.6	
		Kawardha - Kabirdham				<u> </u>			
10	Babbu Khan	Jama Masjid, Wardn NO18,							
19		Kawardha	22	0	21.2	81	14	1.9	
20	Rakesh Kr. Gupta	Ward No6, Kawardha	22	0	19.0	81	13	50.4	
	Mahd Hanif	Ward NIE 5 Adamsh Niesen							
21	Mond. Hanii	Ward No-5, Adarsh Nagar, Kawardha	22	0	18.1	81	13	43.5	
		i sa wardina							
22	Ashok Manipuri	Ward No9, Shetan Chock,	22	9	50.0	81	12	53.7	
		Bodla, Kawardha							
23	Sarvan Gupta	Bania Para, Bodla, Kawardha	22	9	49.9	81	13	8.5	
24	Lal Gupta	Mosinpur, Pandariya, Kawardha	22	13	2.5	81	24	21.7	
		ixawaittiia							
25	Shafiq Mohd.	Bajar Para, Pandariya,	22	13	15.5	81	24	37.8	
		Kawardha						0.10	
2 ć	Rustam Khan	Bandha Tala, Pandariya,		10	7.0	04		20.2	
26		Kawardha	22	13	7.0	81	24	38.2	
	Mohd Mukhtar	Ward No. 10 Pandariya							
27	Wond. Wuxinai	Ward 10010, 1 andariya, Kawardha	22	13	21.0	81	24	26.8	
28	Akim Khan	Barak Para, Pandariya, Kawandha	22	13	25.3	81	24	20.9	
		Kawaruna							
Rajnandgaon									
20	Shekh Majid	Kandara Para, Chhuikhadan,	21	31	23.1	<u>81</u>	0	8.0	
29		Rajnanndgaon	-1	51	23.1	01	0	0.0	
	Nasir Shah	Kalimandir Rd., Chhuikhadan							
30		Rajnanndgaon	21	31	18.8	80	59	53.0	
31	Santosh	Ward No17, Khairagarh, Raianndoaon	21	25	4.2	80	58	38.4	
		ixajainiugaon							

SI No	Name	Address		atitud	e	Longitude		
01. 1 10.	ivanic	induite 55	Deg.	Min.	Sec.	Deg.	Min.	Sec.
32	Mohd. Jakaria	Nikesh Yadav Ward, khairagarh, Rajnanndgaon	21	24	52.6	80	38	39.9
33	Hira Lal Sahu	Rani Durgavati Chock, Chhuriya, Rajnanndgaon	21	0	23.6	80	38	4.0
34	Sagar Mahile	Fuhara Chock, Dongargaon, Rajnanndgaon	20	58	12.3	80	51	3.0
35	Asgar Khan	Bhodi Tola, Dongargaon, Rajnanndgaon	20	58	27.3	80	51	13.8
36	Mohd. Sartaj	Mahavir Para, Dongargarh, Rajnanndgaon	21	11	15.5	80	45	9.3
37	Ilakat Seth	Ward No17, Dongargarh, Rajnandgaon	21	11	27.6	80	45	6.7
38	Mohd. Raja	Sola Para, Dongargarh, Rajnanndgaon	21	11	24.2	80	45	7.4
39	Ilmuddin	Bharkha Para, Rajnanndgaon	21	5	37.5	81	2	21.3
40	Gani Bhai	Purana Ganj Chock, Rajnanndgaon	21	5	25.7	81	2	22.8
41	Mohd. Salim	Lakori, Rajnanndgaon	21	5	13.5	81	3	10.1
42	Halan Bhai	kanchan Bag, Rajnanndgaon	21	5	22.4	81	3	12.4
43	Mohd. Rafi	Mamta Nagar, Rajnanndgaon	21	5	559.0	81	1	88.1
44	Basir Khan	Chikhli Kharagarh Rd., Rajnanndgaon	21	6	31.2	81	2	16.7
		Balod						
45	Nawab Khan	Jawahar Para, Balod	20	43	46.3	81	12	26.6
46	Ashok Kumar	Jawahar Para, Balod	20	43	49.3	81	12	24.1
47	Ghanshyam Jeswal	Village Jhalmila, Balod	20	42	53.3	81	14	21.5
48	Mathura Prasad	Village Jhalmila, Balod	20	42	55.4	81	14	16.4
49	Ramnarayan Malekar	Ward No11, Dondilohara, Balod	20	47	17.0	81	3	30.4

Sl. No.	Name	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
50	Prahlad Malekar	Society Para, Dondilohara, Balod Society Para	20	47	18.2	81	3	31.0
51	Jamna Prasad	Ganesh Para, Gurur, Balod	20	40	58.4	81	24	28.5









Sample Photo Documentation Annexure-8





Annexure - 9

Methods for Inventory Assessment

The Time Step Method

The calculation of WEEE/E-waste is made on the basis of private and industrial stock and sales data. Mathematically, the time step method is given below.

WEEE generation (t) =Stock (t1) – Stock (t)] private + [Stock (t1) - Stock (t)] industry + • Sales (n) - • WEEE (n) n=t1+1 to t-1 n=t1+1 to t with t1 < t

Stock private = Number of households * (saturation level of households / 100)

= Population / average size of household * (saturation level of households / 100)

Stock industry = number of work places * (saturation level in the industry / 100)

= number of employees / number of users per appliance *saturation level in the industry/100

The Market Supply Method

The calculation of WEEE/ E-waste is made from sales data, together with typical lifespan. The waste potential during collection phase at time t is calculated from sales figures and information about consumption patterns. Mathematically, the market supply method is given below.

WEEE generation (t) = sales $(t - d_N)$ + reuse $(t - d_S)$ Where,

- dN Average lifetime of new items
- dS Average lifetime of second-hand items

The Carnegie Mellon Method

This method is a variation of "market supply method", where the calculation of WEEE/E-waste is made from sales data, assumptions about typical lifetimes, recycling and storage. The model considers consumer behaviour when disposing of end-of-life EEE. This method defines the pathways of electrical and electronic equipment from purchase to end-of-life. At the point of obsolescence, there are four options of reuse, storage, recycling & landfill available to the owner.

Approximation 1

The calculation of WEEE is estimated on the basis of stock and average lifetime data. This method has also been referred to as the 'Consumption and Use' method. This method was used to calculate WEEE/ E-waste in the Netherlands. Mathematically, the method is represented by the following equation.

WEEE generation (t) = [Stock private (t) + Stock industry (t)] / average lifetime

Stock private = Number of households *saturation level of the households / 100

= Population / average size of household *saturation level of the households / 100

Stock industry = number of work places *saturation level in the industry / 100

= number of employees/number of users per appliance *saturation level in the industry /

100

Approximation 2

This method is based on the assumption, that with the sale of a new appliance, an old appliance has to be disposed of. Mathematically, it can be represented as given below.

WEEE generation (t) = sales (t)

Methodology/Features	Requirements	Constraints	Advantages
The Time Step Method	 Information about domestic sales. Appliance stock levels for household. Industrial stock levels. 	 Household saturation levels are based on predetermined stock levels Industrial stock levels are assumed in the calculations because they are difficult to obtain and require assumptions. Assumption that all the WEEE/E- waste generated is collected and transferred to treatment and disposal facility. 	 Calculations can be carried out very easily. Method gives good results in a saturated market.
The market Supply Method	 Information about domestic sales. Average life of new and second hand items. 	 The average life is to a large extent is subjective because in most of the developed countries electrical and electronic equipment is often replaced and disposed of before it reaches its technical end-of-life. WEEE/ E-waste are often stored for years. Assumed that all appliances produced in the same year will be in line for disposal after exactly the average life. Assumption that the average variance in life of items of EEE does not change very much, whereas, in reality, lifetimes may 	 Necessary data need not be very wide-ranging Calculations can be carried out very easily using a simple formula Sales data is derived from official statistics from market research institutes or trade organisations and are of good quality and available for a large number of products.

Features of the five inventory assessment methods

Methodology/Features	Requirements	Constraints	Advantages
		become shorter in the future. Therefore, this method is not especially useful in the calculation of WEEE for a dynamic market where technology and life are changing rapidly.	
The Carnegie Mellon Method	Sales data, date for typical life times, recycling & storage.	 Assumptions are made regarding the pathways or "material flow" during reuse, storage, recycling and landfilling. These assumptions are both product and country specific and therefore demand a good knowledge of consumer behaviour and the disposal position. This model also requires a full coverage of sales data as early as possible in the WEEE/E-waste trade value chain. 	 The model allows for an electrical and electronic equipment to be purchased, reused, stored and finally recycled or landfilled representing "material flow" more precisely. This method is ideal for more extensive examination of individual products. Because of the larger amount of input data, the calculation of WEEE is
Approximation 1	The required input data for application of this method is stock data and assumptions about average lifetime of appliance.	 A product's constant mean lifespan is assumed in this method. This method is suitable for estimating WEEE in widely saturated markets with no major deviations from the mean lifespan, 	Clearly more extensively structured. This method is particularly useful when reliable stock data for an appliance is available

Methodology/Features	Requirements	Constraints	Advantages
Methodology/Features Approximation 2	Requirements Sales statistics is used to calculate WEEE/E-waste generation in a particular year assuming a saturated market.	Constraints which is a subjective variable. 1. This method is only suitable in a fully saturated market where the purchase of a product leads to the same quantity of waste from the old product. Therefore, this method has limited application in dynamic and developing markets because in these markets a larger part of the sales serves to increase stock and does not initially contribute to waste. 2. This method is unsuitable if the temporary storage or second use of old	 Advantages This method is suitable for carrying out an initial assessment. Very limited range of input data required for application of this method. No historical data is required, only sales figures for a particular period of time are required.
		temporary storage or second use of old appliances plays a significant role in consumer behaviour.	

Methodology/	Satur	ration Level	Number of		Calc	ulated Sales	Stock Data		Average	e Storage			
Data Requirement	Household	Industry	Household	Export Data	Import Data	Manufacturing /Production	Private	Industry	Lifetime	data	Reuse	Recycle	Landfill
Time Step Method	\checkmark	\checkmark		V	V		V	V					
Market Supply Method				V	\checkmark	\checkmark			V				
Carnegie Mellon Method				V	\checkmark	\checkmark			\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
Approximation 1	\checkmark		$\overline{\mathbf{v}}$						V				
Approximation 2				V	V	\checkmark							

Data Requirements for E-waste Inventory Assessment

Note: √ means 'Yes'



Generic E-waste material flow chain

Methodology

A two-prolonged approach was adopted for the collection of relevant data and arriving at the results. Firstly, a primary survey was undertaken for data collection from the end users side. The information was then projected to the all-India level using robust projection techniques. Secondly, All-India estimates were validated by the feedback obtained from the vendors and the trade channel members.



End User Survey

Two broad user segments were covered in this phase of data collection viz. business establishments (having at least a telephone connection) and households (SEC A, B, C and D/E households). The following paragraphs explain the method of arriving at the final estimates from the end users route.

Business Establishments

A representative sample of establishments was contacted personally by our trained field personnel and relevant information on the IT products installed in the establishment during April 2012 to March 2013 and the number of units of each installed etc. was obtained. This information was then projected to the universe of establishment stratified by the Principal activity carried out at the respective establishment and the number of employees working in the respective establishment.

The detailed sampling process is as explained below:

Stratification of the Universe of Establishment

The universe of establishment was stratified on the basis of "Principal Activity carried out at the respective establishment" Classified by "Employee size" (ACE), which has been ascertained through an extensive telephonic survey conducted as a part of ITOPS' 97 – the baseline study in the ITOPS series. During the survey, 32000 telephonic contacts ware made in the Top 22 cities to determine the distribution of telephone owning establishments among different (nature of) Activity X Employee size (ACE) cells. This provided the ACE grid distribution for each of the 22 cities.

The universe of establishment as well as the ACE grid obtained from ITOPS' 97 is continuously updated and used for this study.

On the basis of the ACE grid composition thus obtained for each of the 22 centres covered, sample quota were set for the number of establishments that had to be contacted for each cell formed by the intersection of the nature of activity and numbers of employees as in the ACE grid.

Random starting addresses were selected from the telephone directory and at each starting address, 5 interviews were conducted with telephone owning establishments.

The variables used in ACE grid are robust indicator, which explains consumption of IT and Office automation products.

The market size for establishments has been obtained by applying product acquisition rate in each employee band to the respective size of universe of establishments in each city.



Households

With the growing awareness of the benefits of using IT at home, this segment has grown well in the last 3-4 years and offers a huge potential for such products. A representative sample of affluent households (SEC A, B and C & D/E) was personally contacted and relevant information was obtained. The universe of households for projection purpose has been taken from National Readership Survey 2006.

The steps involved in the household sampling and the purpose of these steps have been explained in the following table:

Step	Purpose
Random Listing	 To identify the target group household (SEC A/B/C/D/E) To determine the penetration of PC and other IT products in the households To stratify the household universe into 2 broad categories Pure households Home offices
Detailed interview with the Target Group Household	 To determine the market size and profile of the owners and non-owners To determine the brand share To determine the usage of IT products among the owners

Step	Purpose
	 To determine the intention to own IT products among the non-owners And to obtain there relevant information as needed for the study.

For the market size estimation for home offices and households, the acquisition rate in each SEC class in home offices and households were applied to their respective universe strata.

Validation from Vendors and Trade Channel

Major IT manufacturers of each of these products were contacted and their views and facts & figures on the sales during April 2012 to March 2013 and their likely share of the market were collected. This information was used to validate the findings of the End User Survey.

List of Sources of Data in the Study Area- Annexure 10

Industry/ Trade/ Recyclers/ Waste			
National/ Local Government Agencies	Disposal Operator's Association (Reports/ Published Data/ Field Work)	Market Research Agencies (Reports/ Published Data)	
National Census Data, (1991, 2001 & 2011)	Major Trading Agencies, (Retailers)	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands	
National Census Data, (1991, 2001 & 2011)			
NSSO (1994 – 2010)	Industry Association, Scrap Dealers, Recyclers, EEE Retailers	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands	
TRAI, MOCIT, Govt of India.	Industry Association, Scrap Dealers, Recyclers, EEE Retailers	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands	
TRAI, MOCIT, Govt of India.	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications, Annual Reports of Major Brands	
	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications, Newspapers	
	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications	
	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers		
City Municipalities	Scrap Dealers, Recyclers, EEE Retailers		

FINAL REPORT

E-Waste Inventorization of Raipur Division





2016

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Executive Summary

E-waste is one of the fastest growing waste streams in the world. In developed countries, it equals 1% of total solid waste generation on an average. In this context, Ministry of Environment & Forest, Government of India at first notified E-waste guidelines followed by Hazardous Waste (Management, Handling & Transboundary) Rules in 2008. This was followed by formulation of E-waste (Management & Handling) Rules 2011, which came into effect from 1st May 2012. In order to implement these regulations, each state mandated to prepare their E-waste inventory which can assist State Pollution Control Boards (SPCB) to monitor & regulate E-waste Management as per E-waste rules. Each of the State Pollution Control Board's have been assigned the responsibility for inventorization of E-waste in their State, grant and renewal of authorization, registration of recyclers, monitoring of compliances of authorization and registration conditions and action against violation of these rules. In view of the dues and responsibility defined under the E-waste rule, 2011, Chhattisgarh Environment Conservation Board (CECB) has planned for inventorization of E-waste in the five divisions of this State. IRG Systems South Asia Pvt. Ltd. has been assigned the task to carryout the inventorization in the five districts of Raipur Division. The current effort will assist to prepare an inventory of E-waste generated in the state so that an action plan can be formulated for future interventions.

The objective of the E-waste Assessment is to identify and quantify the E-waste generation for reuse, recycle and final disposal in the study area by adopting uniform approach and methodology. SoW as per ToR includes assessment of E-waste generation, present handling practices, storage, and channelization for its recycling or disposal, by producers, consumer, or bulk consumers. The report shall also include the detail list of producers, consumer or bulk consumers, collection centers, dismantlers and recyclers with the name, address contact no. and their practices for E-waste handling & management. Finally, the inventorization of E-waste shall be done for different categories (Information Technology and Telecommunication and consumer / household appliances) listed in schedule – 1 of E-waste Rules 2012. The study area includes Baloda Bazar, Dhamtari, Gariaband, Mahasmund and Raipur districts of Chhattisgarh.

This **Final Inventory Assessment Report** has been compiled in six chapters. This report is being compiled giving inventory of various stakeholders and present handling practices, storages & channelization for recycling.

Some of the major features of E-waste regulation having implication on E-waste inventory assessment indicate that no target has been fixed to collect E-waste from the time of enforcement. Producer is not bound by any collection target. There are no mandatory provisions for producers in the rules to declare quantity of EEE placed in the market since 2012. No mechanism for tracking purchase of EEE by bulk consumers exists.

Therefore, monitoring of E-waste inventory through evaluation of Form 2 or Form 3 in accordance with Rule 4(9) of E-waste Rule by CECB in the state is possible only through the producers data obtained from centralized agency e.g. CPCB or the state where these producers are registered after 2012. CPCB data shows that as of September 2013. Therefore, CECB can track & monitor E-waste inventory in the state through the dismantler's / recycler's data obtained from centralized agency e.g. CPCB or the state where dismantler's / recycler's are registered. This also indicates that E-waste is either dismantled or recycled in informal sector in the state. Producers are majorly responsible for all the activities including financing of E-waste management. It indicates that producers may be fulfilling their responsibility through collection system catering to dismantlers & recycler within and outside the state. Therefore, collection centres registered in the state may offer a limited opportunity of E-waste inventory tracking & monitoring mechanism in the state. Assessment on the upstream side of the E-waste chain especially of both types of consumers (bulk & individual consumer), also indicate that only bulk consumer offer opportunity of E-waste inventory tracking & monitoring. Though, bulk consumers are required to maintain records of E-waste, they are not required to file the returns. Since no mechanism exist for tracking purchase of EEE by bulk consumers and producers are not required to declare quantity of EEE placed in the market since 2012, E-waste inventory assessment has to rely on available historical market research data. Therefore, there is need to identify different

producers, profile of consumers & bulk consumers, collection centre, dismantlers & recyclers who are catering to E-waste in the state.

Tracer technique, which was pilot tested in Chhattisgarh has been used in major urban centers/towns in Chhattisgarh to fix E-waste trade value chain. A tentative E-waste trade value chain for study area which has emerged out of field work from tracer techniques indicates the following profile of stakeholders & their inventory.

<u>Producers</u>: EEE producers / manufacturers do not exist in the study area. However, their products are being sold in the division. Secondary data confirms that EEE producers do not have manufacturing facilities in the division and therefore they are not registered with CECB. Since these producers are responsible for their products under EPR, their detailed **inventory** as per schedule 1 of E-waste (Management & Handling) rules is given in Annexure 1.

<u>Distributors / Traders / Retailers</u>: EEE from these producers are sold in the study area through Distributor / Trader / Retail network as well as directly through the company. Items like Centralized Data Processing, Mainframes, Mini-computers of Schedule 1 are used by large corporates, State and Central Government agencies falling under the category of bulk consumers whose profile is given below. **Inventory** of Distributors / Traders / Retailers selling items other than mentioned above in the study area is given in Annexure 2. However, retailers / dealers do not fall under the purview of E-waste (Management & Handling) Rules 2011, unless they serve as collection centre or drop off point.

<u>Consumers</u>: There are two types of consumers, which are found in the five districts of study area; Individual Consumers & Bulk Consumers. **Inventory** of bulk consumers in the five districts is given in Annexure 3.

<u>Collection Centres / Channel</u>: Tracer analysis indicates that EEE, which becomes E-waste in the study area partly gets collected & transported in the informal sector and partly in formal sector. Primary survey carried out through Tracer technique indicates that bulk of E-waste generated in the study area goes to informal sector. Majority of the producer / manufacturer have established collection channel in the study area. These collection channels work through following mechanism.

- 1. Single point call centre
- 2. Distributors / Retailers
- 3. Service Centres
- 4. Physically established collection centre / drop off point

The producers use a combination of these mechanisms. Inventory of Service centres in the study area is given in Annexure \$. Inventory of Physically established collection centres is given in Annexure 5. Majority of producers use call centre as well as dealer's network for collection of E-waste. There are two possibilities of onward transportation & disposal of E-waste. The first possibility is the disposal through informal sector & the second is through registered recycler. An inventory location of major scrap vendor / dismantler, temporary stockpile site / informal collection centre & landfill site is given in Annexure 6.

Small scrap dealer purchase waste from Household / Commercial Area / Institution, etc. At first stage, they segregate the waste than break the item and collect valuable items like Aluminum, Copper, Iron & Steel, Compressor, motor, etc. from E-waste. They sell their collected item to the large scrap dealer. They visit nearby area on daily/weekly basis and purchase the waste. These scrap dealers are not licensed by the municipalities but are part of the networks of large scrap dealers. Dismantling and segregation of E-waste occurs in a major way at large scrap dealers. Inventory of hotspots, identified in the study area have been geographically shown & also mapped in Annexure 7. Photo documentation captured district-wise of Raipur division of Chhattisgarh is given in Annexure 8. Some of the major findings of the disposal mechanism are:

- Electronic items goes to mechanic shops from households for repairing, and mechanic replace damaged / defunct parts/components from it and then they sold it to scrap dealers.
- Mechanics sell E-waste to scrap dealer by weight / Pcs. mainly of ICT items (IT as per Schedule 1); TV circuit Rs. 15-45/kg; Compressor Rs. 300-400/Pcs.; Washing Machine Motor Rs. 200/Pcs.; Copper Rs. 200-350/kg; DVD Circuit Rs. 20-25/kg; Mobile kit Rs. 1000-

2000/kg; SMPS Rs. 50/Pcs, Mother Board Rs. 90/Pcs.; Hard disk Rs. 120/Pcs.; CD Writer Rs. 35-40/Pcs.

- Scrap vendors sold E-waste to scrap dealer by weight at Rs. 150-250 per kg
- Scrap vendors sold damage mobile phone to scrap dealer as individual piece at Rs. 30-50 per piece
- Scrap dealer comes from Delhi yearly twice/thrice for collecting of E-waste
- There is no organized mechanism for collection, transportation and disposal of E-Waste in Raipur division.
- No mechanism exists in the state to monitor and track its inventory, collection, transportation and disposal.

<u>Repair Shops (AC/WM/REF)</u>: One person repairs one of these items every day. E-waste fractions/ waste Parts, like plastic body of these items, etc. is dumped into community bin and valuable item sold to nearby scrap dealer. Some of the respondent informed that Item which is not in repairable condition is returned to the owner of the product who in turn sells to the scrap dealer. Majority of the product are in repairable condition.

<u>Repair Shops (TV / PC / Mobile Phone)</u>: Majority of mobile phones, TV & computers repair shop owners are local citizens. Waste Parts, like plastic body of these items, etc. are dumped into community bin and valuable item sold to nearby scrap dealer. They also store valuable item and use it to repair other EEE. In case of mobile phone, they utilize maximum parts while waste parts are dumped in municipal bin. Majority of the product are in repairable condition.

Data matrix versus methodology used for E-waste inventory assessment indicates "Market Supply" method and "Carnegie Mellon" method can be applied for WEEE / E-waste inventory assessment in five districts of Raipur division. However, a combination of Carnegie Mellon method & tracer tracking has been selected for inventory assessment since it covers all the aspects of material flow chain. Assessment of data from these stakeholders through tracer tracking has resulted in assessment of obsolescence rate or average life of equipment described in chapter 5. Major sources of secondary data included Saturation Level – National census data was obtained from office of the Registrar General & Census Operation, Govt. of India, National Sample Survey Organization (NSSO), Department of Statistics, Government of India, State Statistics from Department of Statistics, Government of Chhattisgarh, Telecom Regulatory Authority of India (TRAI), Ministry of Communications & Information Technology (MOCIT), Government of India, Industry Association like Manufacturers Association for Information Technology (MAIT), Electronic Industries Association of India (ELCINA), Telecom Equipment Manufacturers Association of India (TEMA) & Research Institutions e.g. National Council for Applied Economic Research (NCAER). Data related to average life time, storage data, reuse, recycling & disposal at landfill site was obtained through "tracer tracking" technique & primary survey.

The description of each of these methods also describes constraints and advantages of each of these methods. The data requirement for each methodology based on mathematical expressions is given in Annexure 9. The extent of data required depends on the extent of geographical boundary, which could be national, regional or city boundary. Conceptually, the source of data can be identified by understanding the "material flow chain" within the given geographical boundary. A list of sources of data in study area, which was required for application of inventory assessment methodology, is given in Annexure 10. A sample of filled questionnaire using in field survey is given in Annexure 11.

Analysis shows that cell phone have the highest installed base followed by Computers, TV, printers, fixed line telephone, refrigerators, washing machines and Air Conditioners. In Raipur cellular phone, fixed line phone, TV, washing machine and refrigerator has the highest installed base followed by Baloda Bazar, Dhamtari, Gariaband, Mahasmund districts of Raipur division.

Inventory estimates in Raipur division indicate that E-waste generation ranges from **8296.25** tons in 2011 to **25319.07** tons in 2020. In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 88% of the total inventory followed by refrigerator (1%), Washing machine (1%), Air conditioner (1%), Cellular phone (1%), Computer (6%), Fixed Line Phone (1%) & Printer (1%). In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (60%), computer will constitute about 35% of the total inventory followed by Refrigerator (1%), Washing machine (1%), Cellular phone (0%), Printer (2%) & Fixed Line Phone (0%).

Some major observations are that Operating margin for Television waste per kilogram is Rs. 0.44. Operating margin for waste refrigerator is Rs. 11.46 per kilogram. For that of Washing Machine is Rs. 13.03 per kilogram. For that of Air Conditioners is Rs. 18.40 per kilogram. For scrap old Personal Computer is Rs. 6.98 per kg. For waste cellular phones is Rs. 24.20 per kg. The operating margin ranges from Rs. 0.44 to Rs. 24.20 per kilogram. Scrap of Mobile / cellular phones gives the maximum operating margin of Rs. 24.20 while scrap from television gives the minimum profit of Rs. 0.44 per kilogram. This indicates that informal sector if brought into formal sector considering taxation involved will only dismantle / recycle cellular phones followed by ACs and WMs to some extent. Therefore, there is a need to formulate financial instrument for making dismantling / recycling of white goods viable.

Market risks matrix highlight the availability of raw material, its collection and transportation as risks of high & medium intensities. Collection mechanism directly impacts the availability of raw material. Therefore, there is a need for both strict implementations of regulations as well as financial instrument for diverting E-waste inventory in to the formal sector.

Chapter 1: Introduction & Background

1.0 Introduction & Background

E-waste is one of the fastest growing waste streams in the world. In developed countries, it equals 1% of total solid waste generation on an average. As the fastest growing component of municipal waste across the world, it is estimated that more than 50 MT of E-waste is generated globally every year. The rapid change in technology, low initial cost, and planned obsolescence has resulted in its fast growth. These rapidly increasing numbers of electronic equipment and appliances have the potential to create serious environmental and health impacts at the "end of life" if not treated and disposed in an environmentally sound manner. E-waste is also a source of resource as some of these materials and valuable parts used in manufacture of electrical and electronic (EEE) items can be recycled and re-used. The harnessing of E-waste as a "resource" provides potential economic opportunities through the development of collection, recovery and recycling facilities. As per CPCB / MoEF 2006 estimates, India generated 1, 46,000 metric tones of E-waste from six items, which were projected to exceed 7, 00,000 metric tones by 2012. A report of the United Nations predicted that by 2020, E-waste from old computers would jump by 500 percent on 2007 levels in India [2]. In this context, Ministry of Environment & Forest, Government of India at first notified E-waste guidelines followed by Hazardous Waste (Management, Handling & Transboundary) Rules in 2008. This was followed by formulation of E-waste (Management & Handling) Rules 2011, which came into effect from 1st May 2012. In order to implement these regulations, each state is mandated to prepare their E-waste inventory which can assist State Pollution Control Boards (SPCB) to monitor & regulate E-waste Management as per E-waste rules.

In this context, Chhattisgarh Environment Conservation Board invited Proposals for Inventorization of Ewaste in Raipur, Bilaspur, Durg, Bastar and Sarguja divisions of the State of Chhattisgarh. IRGSSA submitted its technical & financial proposal to CECB to carry out E-waste inventorization in Raipur, Bilaspur, Durg, Bastar and Sarguja divisions of the State of Chhattisgarh.

1.1 Need for Study

Despite of enactment of law for handling E-waste in India, this particular waste is being disposed off unaudited, in absence of appropriate inventory of E-waste in most of the states / cities. As per National Ewaste inventory estimates carried out by CPCB in 2006, Chhattisgarh state ranks among top twenty states generating E-waste in India. Therefore, in Chhattisgarh an effective inventory comprising the details of Ewaste and related components is yet to be created to manage & handle E-waste in eco-friendly manner and to combat the problem associated this waste. In this context, it is proposed to prepare an Inventory of Ewaste & related components in five divisions of Chhattisgarh viz. Raipur, Bilaspur, Durg, Bastar and Sarguja. The overall aim of this initiative is to assess the generators, quantity and present practices for handling of Ewaste in these divisions.

The current effort is aimed to prepare an action plan for E-waste for implementation of the legislations framed. The items to be covered in this assessment include personal computers, mobile phones, televisions, washing machines and refrigerators etc. as mentioned in E-waste (Management & Handling) Rules, 2016. A list of these items as per ToR is given in **Table 1.1**.

	Table 1.1: Categories of Electrical and Electronic Equipment
Sr. No.	Categories of Electrical and Electronic Equipment
i.	Information Technology and Telecommunication Equipment
	Centralized Data Processing
	Mainframes, Minicomputers
	Personal Computers (Central Processing Unit with input and output devices)
	Laptop Computers (Central Processing Unit with input and output devices)
	Notebook computers
	Notepad Computers

Sr. No.	Categories of Electrical and Electronic Equipment
	Printers including cartridges
	Copying equipment
	Electrical and Electronic typewriters
	User terminals and systems
	Facsimile
	Telex
	Telephones
	Pay telephones
	Cordless telephones
	Cellular telephones
	Answering systems
 11.	Consumer Electrical and Electronics
	Television sets (including sets based on liquid Crystal Display and Light Emitting Diode technology),
	Refrigerator, Washing Machine, Air conditioners excluding centralized air conditioning plants.

1.2 Objective

The objective of the Rapid E-waste assessment is to identify and quantify the E-waste generation for reuse, recycle and final disposal in the study area by adopting uniform approach and methodology. The main objectives of this study are as follows:

- ➤ To assess identify and quantify the WEEE generation.
- ➤ To examine the existing WEEE recycling system
- > To study the problems / risks posed by the recycling system at present/ future
- To estimate the existing and future quantity of WEEE in the study area
- To evaluate the capacities / capabilities of existing stakeholders and infrastructure for reuse, recycle and disposal of E-wastes
- > To analyze the environmental and social sustainability of present system.
- ➢ To determine E-trade economics for WEEE
- Preparation of directory of the stakeholders
- Conduct 01 sensitizing workshops in the each study area

1.3 Scope of Work (SoW)

In order to achieve the above objectives identified by CECB, IRGSSA has developed a comprehensive Methodology addressing the need to develop and implement an effective E-waste management based on the need to quantify and characterize this waste stream, identify major waste generators, assess risks involved and develop and implement a scientific, safe and environmentally sound management system, including policies and technologies.

The project aims to promote identification and implementation of environmentally sound and commercially viable technologies for the various elements of waste management *viz* collection, segregation, transportation, treatment, recovery and/ or recycle and disposal. The fundamental approach can be summarized in the following three phases.

Phase 1: Mobilization and work plan

Team will be mobilized & work plan will be prepared & presented to CECB.

Phase 2: Data Collection / Field Work

IRGSSA would be following the approach suggested by CECB. In order to execute this assignment, it is essential to establish the E-waste business chain linking different stakeholders to understand the trade economics and associated environmental impacts. An example of this chain is given in **Figure 1.1**.



Figure 1.1: Conceptual WEEE business chain

This chain will be mapped geographically in the study area to describe the following:

- ➢ The stakeholders
- > Their respective geographical distribution in the study area and
- ➢ WEEE generation cycle
- Material flow across stakeholders

Study Area: As per ToR, the study area is Raipur, Bilaspur, Durg, Bastar and Sarguja. However, the current report is being submitted for Raipur Division. In this division Dhamtari, Gariyaband, Raipur, Baloda Bazar (new) and Mahasamand five districts are covered.

This study would lead to the identification of stakeholders, classification of organization as organized / unorganized sector. Further their geographical location would be determined in the terms of their operating base coverage. Conceptually, some of the major stakeholders would include:

Ist Group

- ➢ The Importers, Manufacturers
- > The distributors, traders and retailers
- The consumers Individual households, Business sector, IT sector, BPO, teaching institutions, Railways, Airlines, Defence establishments, Transport Corporations, PUCs etc.

2nd Group

- > The Collectors Scrap dealers, Big Bazaars or malls who are buying the e-waste
- > The Recyclers dissemblers, dismantlers, material recoveries,
- The Road side vendors
- The authorized / unauthorized Auctioneers, the sellers of the used electronic goods on the footpaths.

The study would also aim at establishing E-waste trade chain using conceptual input output analysis. This idea has been developed based on "E-waste material flows" through region and on its way its disintegration and processing in numerous steps until it rejoins the raw streams or ends in a final disposal. This will be done through "tracer techniques", which includes identification of tracer for each item and its tracking through the chain from the start of dismantling process till its final disposal.

Inventorization

Inventorization of E-waste would be done as follows:

- Inventory of obsolescence rate of each electronic product (viz. Personal computer / TV / Mobile phones as mentioned in the e-waste rules and guidelines issued by CPCB) using scenario analysis from secondary / market research data.
- Confirm obsolescence rate from data of primary survey using "tracer technique".
- Identify a tracer for each product and follow it from the start of dismantling process till its final disposal.
- The inventorization other than households (on sample basis) would also be on actual basis.

The Inventorization other than households (whereas sample basis at least 500 nos in rural and urban area of each district) should be on actual basis.

Analysis of existing E-waste recycling system & quantification of E-waste

This will include description & documentation of each process used in dismantling of an EEE and the location details. Carry out photo documentation and geographical setting of each step. Estimate the quantity of material dismantled at each step. Estimate the quantity of E-waste for a particular year based on market projections & obsolescence rate.

Phase 3: Report findings

A Final Inventory Assessment Report will be prepared for each division & findings will be presented in one workshop, one each for five divisions.

1.4 Approach & Methodology

IRGSSA will follow a very comprehensive approach and methodology as described below. This is based on UNEP's manuals 1 and 2 and its application in a number of countries globally including India. The consortium will carry out the following activities and will follow the following step wise approach and methodology for each of these activities.

Activity 1: Development of Policy & Regulatory Framework

Step 1: Carry out due diligence on E-waste policy / laws / regulations eg. EPR.

- Step 2: Identify the gaps with respect to existing environmental regulations and recommend tentative content, extent and coverage of E-waste policy/ laws/ regulatory framework.
- Step 3: Carry out due diligence on expected E-waste institutional mechanism like collection and transportation system and registry e.g. Collective and clearing house system, B2C and B2B model. Identify the gaps with respect to existing collection and transportation system and recommend tentative collection and transport framework.

Activity 2: Assessment of E-waste Market

- Step 1: Determine E-waste item of interest as per Schedule 1 of E-waste (Management & Handling) Rules 2011. This will assist in studying the items of interest ex. PCs, TVs, cellular telephones, and refrigerators etc. Determine the brands, local, national and international, which are available in the market for each item and the year of their introduction in the market. Determine brands which existed earlier. This can be determined through review of secondary data from industry association or by interacting with local dealers. If the product is manufactured under a brand name, the broad feature of technology used to manufacture item is generally disclosed. This will also assist in identifying its dealer's network, existing facilities for item's manufacture and repair and its membership with local industry association.
- Step 2: Determine average weight and size of local, national and international E-waste item from each brand ex. capacity of refrigerator (liters) / washing machine, size of monitor / TV / cellular phone. The variation in size of each item should be documented under each brand. Average weight and size along with percentage composition should be estimated. This can be further confirmed while carrying out field survey for documenting dismantling operation.
- Step 3: Determine broad components out of the 26 components of E- waste items. Determine composition of E-waste item from available source like industry association / manufacturer. Determine technology of E-waste item e.g. ODS based refrigerator / 386 / 486 / Pentium series of PCs and laptops / CRT / front loading / top loading washing machines etc. Determine approximate quantity of recoverable elements from each item based on outputs of step 2. Determine possible hazardous substance in E-waste item.



Figure 1.2: Geographical mapping of different attributes

- Step 4: Establish geographical boundary / system boundary of study area. Procure maps of the area and prepare base map of the area with physical features marked on it. If the detailed map is not available easily then procure city map and fix up the municipal boundaries. Alternately, maps of the study area can be prepared based on standard map search engines available on the internet. The base map will be used for generation of different thematic layers as shown in **Figure 1.2**. This mapping will give an insight into the possible sources of E-waste and assist in carrying out the primary survey.
- Step 5: Identify different stakeholders from Group 1 & Group 2 who could be E-waste generators and mark them as layer two on the base map. Physically verify by carrying out preliminary reconnaissance survey of the identified locations of the stakeholders. Mark the tentative locations by taking latitudes and longitudes of the identified locations through GPS instrument. Identify the stakeholders, which are in the formal / organized sector and which are in the informal sector.
- *Step 6:* Prepare a tentative E-waste trade value chain as per conceptual life cycle; four phase model and E-waste trade value chain. These figures should be customized as per preliminary survey, which will be confirmed and established during field survey.
- Step 7: Identify E-waste dismantling sites, recycling sites and landfill / dump sites. Physically verify these sites by preliminary reconnaissance survey and marking the tentative locations by recording their latitudes and longitudes through GPS instrument.
- Step 8: Identify data needs from these stakeholders based on identified stakeholders in step 5 and trade value chain identified in step 6.
- Activity 3: Selection of Methodology for E-waste Inventory
- Step 1: Identify data requirements. This is carried out by classifying data needs under the heads of saturation level, households, calculated sales, stock data, average life, storage data, reuse, recycle and landfill for each electronic item ex. PC, TV, refrigerator, cellular phone, etc.
- Step 2: Identify tentative sources of data for each electrical and electronic item. This will be based on preparing preliminary or detailed interview guide / checklist / questionnaires for data collection for each time.
- Step 3: Document secondary sources of data for each electrical and electronic equipment and visit the respective agency to procure data i.e. published / unpublished / historical.
- Step 4: Check the availability, reliability, amount and range and completeness of data against following decision criteria.

<u>Availability of data</u>

- 1. Number of sources of data, which can provide data for study area. Generally, more than one source of data is preferred for item of interest.
- 2. In what format, data is available i.e. yearly, half yearly, cumulative or distributed.
- 3. Whether the data is published/ unpublished, confidential/ public.
- 4. Mode of procurement of data.

Reliability of data

- 1. Data of at least two sources should match.
- 2. If there is any variation in sources of data, check the methodology of calculating and compiling the data from each source. If there is a difference in the calculation and compilation of data, then check the factor responsible for the difference.
- 3. Check the trends from the data obtained from different sources and correlations with other data.

Amount and Range of data

- 1. Check the availability of historical data for each E-waste item.
- 2. Historical data should be available for more than anticipated average life time of the E-waste item.

Completeness of data

- 1. Historical data should be complete without any gap.
- 2. If gap exists then source, which provide data with minimum gap should be selected so that the gaps can be supplemented.
- 3. Incomplete data can be supplemented by trend analysis or by national / regional / city level assumptions.

Step 5: Prepare the constraint matrix by mapping outputs of steps 4 and step 5. Decide the most suitable and applicable methodology for E-waste inventory assessment

Activity 4: E-waste Inventory Assessment:

Sub Activity1: Establishment of the study area and its geographical limit

This activity will include the establishment of geographical limits of study area i.e. geographically defining the area. This will include assessment of landuse maps of the study area, fixing of rural and urban boundaries and mapping of tentative locations of stakeholders. The investigation team will geographically verify the tentative locations where generation, stockpiling, collection, handling and brokering, processing and production of other items from E-waste are taking place by using transect walk.

Sub Activity 2: Identification of E-waste and establishment of E-waste trade value chain

This activity will include identification of specific E-waste item and its tracer (CRT / Compressor / LCD screen / any other) followed by tracking of tracer's geographical movement within the identified geographical limits of the area to its final end of life, e.g. places where items are unloaded, traded, transported, dismantled, recycled, reused, repaired and disposed, using output of activity 1. The following steps are involved in field investigations.

- Step 1: Identify the E-waste streams of specific E-waste item
- Step 2: Identify the E-waste processes i.e. unloaded, treated, transported, dismantled, recycled, reused, repaired, and disposed.
- Step 3: Follow the E-waste tracer through the process in the E- waste stream by using tracer/ hazardous process walk.

A typical, E-waste trade chain will be established in a geographical context after verification of the tentative trade value chain obtained as an output of activity 1 and activity 2. This superimposition of E-waste trade value chain on a map will facilitate spatial analysis.

Sub Activity 3: Estimate the E-waste and obsolescence rate/ average life through secondary data by

following "approach and methodology upstream of demarcation" mentioned. By using secondary data e.g. market research data like market supply and imports data, installed base of the E-waste item. The key to estimate E-waste is fixing of obsolescence rate based on market research data, industry data or on consumer behaviour. Since obsolescence rate is dynamic in nature, therefore, a range is fixed with upper and lower limits. Carry out sensitivity analysis for E-waste inventory using upper and lower limits of obsolescence rate.

Sub Activity 4: Verification of obsolescence rate / average lifespan through primary data. The obsolescence rate / average life can be verified through identification of E- waste stream and E-waste processes and tracking of tracer item. The following steps are involved in tracer verification.

- Step 1: Identify the tracer item
- Step 2: Follow the tracer item through the process in the E-waste stream
- Step 3: Identify all the organized and unorganized market of a tracer in the geographical area.
- Step 4: Establish the extent of dismantling / recycling happening in a geographical boundary.

The primary survey methodologies used for tracer technique and outputs are described in Table 1.2.

	Table 1.2: Methodology for estimation of E-waste quantity					
Objective	Detail	Primary Survey Methodologies Output				
WEEE / E- waste stream	Material flow	 Follow tracer materials: semi- structured interviews about quantities, quality, economics, and labor. Key-players are known (dealers, disassembly workers, recycler) Material flow (quantities / Labor in E-waste streams are identified 				
	Input quantities / Import	 Interviews with E- waste producers (manufacturers / retailers, auctions) to find out E-waste quantities Survey of key-players for import: structured questionnaires / interviews E-waste quantity input is estimated Percentage of imported / household E-waste is known 				
	Reuse	 Surveys of scrap dealers, retailers, ocomputer repair shops: structured interviews (using questionnaires) Quantities of reused entire equipment are estimated Quantities of reused equipment parts are estimated 				
	Disposal	 Sampling on different landfills Existence of E-waste fractions in landfills is known 				
Recycling technologies	Recycling technology	 Transect walks in different districts (semi-structured interviews) Applied recycling technologies are known Labor needed for different recycling processes is known 				
	Hazardous processes	 Semi-structured interviews in Hazards in different recycling processes are identified 				

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The structured and semi structured interviews can be conducted using questionnaires. The questionnaire has been developed to quantify and photo document each step in the E-waste value chain.

Sub Activity 5: Identify the products, by products and waste products and back calculate E-waste dismantled.

Identify products, by products and waste products. This can be carried out by using a combination of qualitative and quantitative estimations with the identified stakeholders across the value chain using photo documentation of sampled E-waste tracer. Using this data, back calculate to check the best fit scenario of Ewaste inventory obtained as an output from activity 3. The output from back calculation should confirm the obsolescence rate / average life of E-Waste within the range used in activity 3. This obsolescence rate is used for calculating E-waste projections based on historical data.

Sub Activity 6: Establish E-waste trade economics

Each stakeholder in the dismantling processes is linked to the other and the trade between the two takes

place based on profit. Therefore, the basic parameters driving this trade, which should be estimated, are as follows.

- 1. Input cost
- 2. Selling Price
- 3. Operating margin

Estimate input cost in terms of raw material cost / energy cost and labour cost. Estimate raw material cost / energy cost and labour cost using data collected from questionnaire add the two costs to arrive at input cost. Estimate selling price of the product by using data from questionnaire. Establish operating margin as the difference between selling price and input cost.

Sub Activity 7: Identify and assess the impacts

Identify the effluents / solid waste / emissions from each of the process. Establish their quantity if possible. Establish the geographical location of their discharge and history of the site. Classify impacts into environment, health and business impacts. Use relative ranking technique to quantify impacts. Relative ranking technique is based on scores where each sector i.e. health, environment and business are assigned with individual score subject to identified negative and positives impacts on the workers, surroundings and economy.

Activity 5: Compilation of draft & final reports.

Activity 6: Workshops in each division.

1.5 Format of the Report

This **Final Inventory Assessment Report** has been compiled in six chapters. The table of contents of each chapter is given below.

Chapter 1 Introduction and Background: Introduction; Objective of the Study as per ToR; Scope of Work (SoW) as per ToR; Approach and Methodology; Format of the Report.

Chapter 2 Policy & Regulatory Framework: Overview of Regulatory Framework; Policy, Regulations, their Scope and Institutional Responsibility; Reforms in Waste Management; E-waste and Environmental Legislation in India and Chhattisgarh.

Chapter 3 Assessment of E-waste Market: Introduction; E-waste Composition; Mechanism of E-waste Trade; Conclusions.

Chapter 4 Methodology for E-waste Inventory: Introduction; Methods for Inventory Assessment; Material Flow Chain, Data Sources and Data Gaps in Chhattisgarh; Constraints / Limitations and Selection of Methodology; Methodology / Approach & Instruments Used; Conclusion.

Chapter 5 E-waste Inventory Assessment: Introduction; Market Size Assessment of Electrical and Electronic Equipment (EEE) in Chhattisgarh; Obsolescence Rate / Average Life; E-waste Inventory; E-waste Processing in Chhattisgarh; Environmental Pollution; Market Risks; Conclusions.

Chapter 6 Conclusions & Recommendations: Regulations; E-waste Market; Methodology for Inventory Assessment; E-waste Inventory.

Chapter 2: Policy & Regulatory Framework

2.0 Overview of Regulatory Framework

E-waste management comes under the broad regulatory framework related to environment, foreign trade and local rules & regulations. A number of policy & regulatory initiatives have come into effect since 2006. The following sections describe the policy framework, relevant rules and regulations, which regulates E-waste management and emerging framework under extended producer responsibility (EPR). Further, their implications in the context of current situation in the study area have been described.

2.1 Policy, Regulations and their Scope

During the 1990s, Ministry of Environment & Forests (MoEF) adopted pollution control policy by formulating multi-pronged strategies in the form of regulations, legislations, agreements, fiscal incentives and other measures to abate pollution. National Environmental Policy, which was declared in 2006 identified pollution abatement as an important issue affecting human health and poverty. The policy focuses on optimizing resource efficiency and minimizing pollution loads. An analysis of policy statements reveals that there has been a gradual shift from simple pollution control to the pollution abatement leading to reduction, recovery and recycling. Policy states about strengthening informal sector through technological upgradation & incentivization. It states about promotion of segregation, reuse & recycling & benign disposal of waste. The policy further states involvement of private sector for hazardous waste management. The policy also focuses on optimizing resource efficiency and minimizing pollution loads. National Environment Policy clearly states about the need for preparation of guidelines & regulations for E-waste management in India.

2.1.1 E-Waste and Environmental Legislation in India

The Environment (Protection) Act 1986, an umbrella act also covers industrial waste and provides broad guidelines to address it. Under the umbrella act, a number of rules have been formulated to address hazardous waste like Hazardous Waste (Management Handling & Transboundary) Rules, Battery (Management & Handling) Rules & Bio Medical (Management & Handling) Rules. Specific laws for electronic waste have been notified in May 2011, effective from 1st May 2012 in the country. Further, India is also a signatory to international conventions like Basel Convention, whose provisions are applicable for export and import of E-waste. These provisions find expression in terms of Rules 13, 14, 15 & 16 of the HW (Management, Handling and Transboundary Movement) Rules, 2008. Therefore, there are two regulatory scenarios related to E-waste management as shown in **Table 2.1**. At first, E-waste (Management & Handling) Rules 2011 & Hazardous Waste (Management, Handling & Transboundary) Movement Rules 2008 have been described. This is followed by description of guidelines for implementation of regulations.

Table 2.1: E-waste Regulatory Scenario					
Regulations / Guidelines	E-waste M Pre 1 st May 2012	anagement Post 1 st May 2012	Export & Imp Pre 1 st May 2012	port of E-waste Post 1 st May 2012	
E-waste (Management & Handling) Rules 2011		\checkmark			
Hazardous Waste (Management, Handling & Transboundary) Rules 2008	\checkmark		\checkmark	\checkmark	
Guidelines for Environmentally Sound Management of E-waste 2008	\checkmark	\checkmark			
Guidelines for Implementation of E-waste Regulations 2012	\checkmark	\checkmark			
Source: IRGSSA					

Table 2.1 clearly indicates that pre 1st May 2012 Hazardous Waste (Management Handling) Rules were used to regulate E-waste management. It is specifically relevant in case of E-waste recyclers, who got registered prior to 1st May 2012 & whose registration extends beyond this date.

CPCB data shows that as of September 2013, Chhattisgarh has M/s Navrachna Recycling Pvt. Ltd. & M/s ADV Metal Combine Private Limited has two E-waste dismantler / recycler, located at Rajnandgaon & Durg districts having a licensed. Therefore, this indicates that E-waste is either dismantled or recycled in both formal and informal sector in state because of their limited capacity.

2.1.2 E-Waste (Management and Handling) Rules, 2011

Salient features of the E-waste rules are given below.

- These rules are applicable to every producer(s), collection centre(s), dismantler(s), recycler(s), consumer(s) or bulk consumer(s) involved in the manufacture, sale, purchase and processing of electrical and electronic equipment or components as specified in Schedule-I. However, micro, small and medium enterprise are not covered under this regulation.
- The rules clearly define electrical and electronic equipment (EEE) and E-waste. Definition of E-waste categorizes them into two broad categories, i.e., IT and Telecommunication Equipment and Consumer Electrical and Electronics. As per Schedule-I of the rules, seventeen items have been specified under the IT and Telecommunication Equipment category and four items have been specified under the Consumer Electrical and Electronics category. The categories of E-waste covered under the rules are provided in Section 1.4 of Chapter 1.
- The rules also clearly define producers, bulk consumer, consumer, collection centre, transporter, dismantler and recycler. These form an integral part of material flow chain. The physical, financial & compliance responsibilities of each of the above stakeholders, as specified in the rules have been summarised in **Table 2.2** is given below.
- The rules provide direction to domestic EEE manufacturers/ producers to be RoHS (reduction in the use of hazardous substance) compliant within three years. It also allows imports of only RoHS compliant EEE.

Respon	sibilities	Producer	Consumer	Bulk Consumer	Collection Centre	Dismantler	Recycler / Reprocessor
Collection	Manufacturing	\checkmark					
	End of Life	\checkmark					
Take-back	Individual	\checkmark					
	Collectively	\checkmark					
Transportation to	Producer		\checkmark	\checkmark			
	Collection Centre	\checkmark	\checkmark	\checkmark			
	Dismantlers/ Recyclers	\checkmark	\checkmark		\checkmark	\checkmark	
	TSDF* Facility	\checkmark				\checkmark	\checkmark
Storage					\checkmark	\checkmark	\checkmark
Financing		\checkmark					
Registration		\checkmark			\checkmark	\checkmark	
Filing of Annual Re	\checkmark			\checkmark	\checkmark	\checkmark	
Return of Annual Inventory Handled $\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{$							

Table 2.2: Responsibilities of Stakeholders for Collection, Transportation, Storage and Disposal of E-waste

Note: \sqrt{means} "Yes", TSDF means Treatment Storage and Disposal Source: IRGSSA

Table 2.2 indicates that producers' major responsibility for all the activities including financing of E-waste management. Since, the state has two registered dismantler & recycler with limited capacity, it indicates that producers may be fulfilling their responsibility through collection system catering to dismantlers & recycler outside the state.

Therefore, there is need to identify different producers, profile of consumers & bulk consumers & collection centre in the study area and dismantlers & recyclers who are catering to E-waste.

2.1.3 The Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008

The Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008, defines hazardous waste as "any waste" which by reason of any of its physical, chemical, reactive, toxic, flammable, explosive or corrosive characteristics causes danger or likely to cause danger to health or environment, whether alone or when on contact with other wastes or substances, and shall include:

- Waste substances that are generated in the 36 processes indicated in column 2 of Schedule I and consist of wholly or partly of the waste substances referred to in column 3 of same schedule.
- Waste substances that consist wholly or partly of substances indicated in Schedule II, unless the concentration of substances is less than the limit indicated in the same Schedule.
- Waste substances that are indicated in Part A or Part B of Schedule III in respect of import or export of such wastes in accordance with rules 12,13, 14, 15 and 16 or the wastes other than those specified in Part A or Part B if they possess any of the hazardous characteristics in Part C of that schedule.
- Schedule IV includes E-waste as item 18 in its list of hazardous wastes requiring registration for recycling/ reprocessing. This item covers components of waste electrical and electronic assemblies comprising accumulators and other batteries included on list A, mercury switches, activated glass cullets from cathode ray tubes and other activated glass and PCB-capacitors, or any other component contaminated with Schedule 2 constituents (e.g. cadmium, mercury, lead, polychlorinated biphenyl) to an extent that they exhibited hazard characteristics indicated in part C of this schedule.
- Rule 9 of Chapter III on procedures for recycling, reprocessing or reuse of hazardous waste states that the occupier generating hazardous waste specified in schedule IV may sell it only to recycler having a valid registration from the CPCB for recycling or recovery.

2.1.4 Basel Convention and its Application to E-waste

The Basel Convention defines waste by disposal destination or recovery processes. These various processes are listed in Anne IV of the Convention. For example, virtually any material that will be recycled or processed in order to reclaim a metal, or to reclaim an organic or inorganic substance for further use, is deemed a waste. Electronic components that are used without further processing are likely to not be defined as a waste. The convention has provided for two lists. List A found in Annex VII is presumed to be hazardous and thus covered by the Basel convention; and list B, found in Annex IX, is presumed to be non-hazardous and thus not subject to Basel convention. The waste listed in list A is waste that poses serious threats to environment and human health. As a result of their adverse effects these substances require special handling and disposal processes.

The Basel Annex-VII hazardous waste lists the following applicable entries to e-waste:

A1010 Metal wastes and waste consisting of alloys of any of the following: antimony, arsenic, beryllium, cadmium, mercury, selenium, tellurium, thallium.

A1020 Waste having as constituents or contaminants, excluding metal waste in massive form, any of the following: antimony compounds, beryllium, beryllium compounds, cadmium, cadmium compound, lead, lead compounds, selenium, selenium compounds, tellurium, tellurium compound.

A1030 Wastes having as constituents or contaminants any of the following: arsenic, Arsenic compounds, mercury, mercury compound, thallium, thallium compounds.

A1160 Waste lead-acid batteries, whole or crushed.

A1170 Unsorted waste batteries excluding mixtures of only list B batteries. Waste batteries not specified on list B containing Annex I constituents to an extent to render them hazardous. [Note: List B batteries include: waste batteries conforming to a specification, excluding those made with lead, cadmium or mercury]

A1180 Waste electrical and electronic assemblies or scraps containing components such as accumulators and other batteries included on list A, mercury- switches, glass from cathode ray tubes and other activated glass and PCB- capacitors, or contaminated with Annex 1 constituents (e.g. cadmium, mercury, lead, polychlorinated biphenyl) to an extent that they exhibit hazard characteristics contain in Annex III.

A2010 Glass waste from cathode ray tubes and other activated glass destined for direct reuse and not for recycling or final disposal.

It is also important to note that the Basel convention's list B includes:

B1110 Electrical and electronic assemblies (including printed circuit board, electronic components and wires) destined for direct reuse and not for recycling or final disposal.

From the above we can conclude that at the very least, circuit board, CRTs, and other electronic boards or components and assemblies containing lead based solders and copper beryllium alloys (which include most computer circuit boards and much other electronic equipment), are hazardous wastes according to Basel convention. Likewise, whole, used, discarded computers, printers, and monitors that contain such circuit boards or CRTs that are not to be reused directly are to be considered as hazardous waste and subject to the Basel convention.

The provisions of Basel Convention & its provisions under Hazardous Waste Rules are not applicable currently in Chhattisgarh unless export and import of E-waste is carried out by any registered dismantler / recycler. Therefore, they have been described considering E-waste management intervention in future.

2.1.5 Guidelines for environmentally sound management of E-waste, 2008

Guidelines for environmentally sound management of E-waste have been formulated by CPCB in 2008, which provide broad framework to recyclers and regulators on the technologies as well as issues related to compliance.

The objective of these Guidelines is to provide guidance for identification of various sources of waste electrical and electronic equipments (E-waste) and prescribed procedures for handling E-waste in an environmentally sound manner.

These Guidelines are reference document for the management, handling and disposal of E-wastes. These are intended to provide guidance and broad outline, however, the specific methods of treatment and disposal for specific wastes needs to be worked out according to the hazardous / risk potential of the waste under question. These Guidelines provide the minimum practice required to be followed in the management of E-wastes and the State Department of Environment or State Pollution Control Board may prescribe more stringent norms as deemed necessary.

These Guidelines shall apply to all those who handle e-waste which includes the generators, collectors, transporters, dismantlers, recycler and stakeholders of E-wastes irrespective of their scale of operation

These guidelines under classification of E-waste, describe Composition of E-waste; Components of E-waste; possible hazardous substances present in E-waste; E-waste scenario; Basis of Defining E-waste; Proposed definition of E-waste; Reduction of the Hazardous Substances (RoHS) in the Electronic & Electrical Equipments and Extended Producer Responsibility (EPR). It gives guidelines for environmentally sound

management for E-waste. Under this head, it describes E-waste Composition and Recycle Potential; Assessment of Hazardousness of E-waste; Recycling, Reuse and Recovery Options; Treatment & Disposal Options and E-waste Recycling / Treatment technologies in India.

Further, it describes environmentally sound treatment technology for E-waste, consisting of description of environmentally sound E-waste treatment technologies; Environmental Impacts of the 1st, 2nd and 3rd level E-waste treatment system; Technology Currently used in India; Best available technology and Available operating facilities. Lastly it describes guidelines for establishment of integrated E-waste recycling & treatment facility consisting of Facility operation requirements; Procedures for setting up & management of integrated E-waste facility and Procedures for compliance with the existing regulations and guidelines.

In the context of current study, these guidelines provide guidance related to assessment of current handling practices, storages & channelization of E-waste in the study area as per SoW.

2.1.6 Guidelines for Implementation of E-waste Rules, 2011

MoEF/CPCB after consulting various stake holders felt the need for preparing a guidance document for implementation of the provisions of the E-Waste (Management & Handling) Rules, 2011 that may help the Producers, Consumer & Bulk Consumer, Collection Center, Dismantler, Recycler and Regulatory agencies (SPCBs/PCCs) for effective compliance / implementation of these rules. This document also provides guidance on setting up collection mechanism, dismantling and recycling operations. Further, guidelines also clarifies issues related to RoHS e.g. the rules call for the reduction in the use of hazardous substances in electrical and electronic equipment. Every producer of equipment listed in Schedule 1 of the Rule shall ensure that the covered products do not contain lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls or poly-brominated di-phenyl ethers above a specified threshold. The threshold for cadmium is 0.01% by weight in homogeneous material, for all other substances, the threshold is 0.1% by weight in homogeneous material. Various clarifications offered by the guidelines are given below.

1. Clarification regarding definitions

- **Producer** is any person who, irrespective of the selling technique used, "manufactures and offers to sell electrical and electronic equipment under his own brand; or offers to sell under his own brand, assembled electrical and electronic equipment produced by other manufacturers or suppliers; or offers to sell imported electrical and electronic equipment" and has to take authorization under these Rules for implementation of EPR.
- **Bulk Consumers** are bulk users of electrical and electronic equipment such as central government or state government departments, public sector undertakings, banks, educational institutions, multinational organizations, international agencies and private companies that are registered under the Factories Act, 1948 and Companies Act, 1956; they have to maintain records on E-waste generated and channelized to registered/authorized collection centres / recycler / dismantler.
- **Extended Producer Responsibility** is a responsibility of any producer of electrical or electronic equipment, for their products beyond manufacturing until environmentally sound management of their end of life products.
- Collection Centre is a centre established individually or jointly or a registered society or a designated agency or a company or an association to collect E-waste which has to obtain authorization under E-Waste Rules, 2011.
- **Dismantler** is any person or registered society or a designated agency or a company or an association engaged in dismantling of used electrical and electronic equipment into their components that has to obtain authorization and registration E-Waste Rules, 2011. The association may include a consortium as well.
- Recycler is any person who is engaged in recycling or reprocessing of used electrical and electronic

equipment or assemblies or their component. Recycling facility may be set up by an individual or a company or a joint venture or a consortium.

• **SPCBs / PCCs** have been given the responsibility as regulatory agencies for ensuring implementation of the E-waste Rules in their respective States.

2. Clarification regarding scope and requirements for compliance to EPR:

- Producers intending to sell their EEEs listed in Schedule-I are required to take authorization only in the place where their manufacturing facilities and corporate head offices are located. In case, of producers importing EEEs listed in Schedule-I, authorization may be taken from SPCB of the State where the port of landing is located.
- Since these products are sold across the country, SPCB/PCC concerned granting the authorization would inform the CPCB of the details of the authorization granted. CPCB would maintain a centralized database on their website, which will be available to all stakeholders. Producers will also place this information on their website and provide details of products sold to the SPCB from whom they have obtained authorization. SPCBs will provide consolidated information to CPCB on an annual basis which CPCB will maintain on the centralized database.
- In the application for authorization, it should be clearly mentioned, how the producer would ensure channelization of the E-waste at the end of its life; details of his own collection centres or take-back systems or the collection centres authorized by him, shall be specified.
- As per the EPR under the Rules, the producers are required to achieve 100% collection and channelization of the end of the life equipment. However, for the purpose of monitoring, targets need to be fixed. Such targets should be based on the life of the product, type of the product, usage and consumption patterns and other relevant factors. CPCB will, therefore, set up a Committee, which will examine the issue of fixing targets, based on the aforesaid factors and also taking into consideration the level of compliance achieved during the first two years.
- Producer who has manufacturing facility shall comply with prevailing environmental regulations under Water (P&C) Act, 1974, Air (P&C) Act, 1981, Hazardous Waste (M, H&TM) Rules, 2008 and other relevant regulations. In the case of manufacturers, who has obtained authorization under the Hazardous Waste (Management, Handling & Transboundary Movement) Rules, 2008 need not take separate authorization under the e-waste rules till the validity/expiry of that authorization. Subsequent authorization has to be taken under the E- waste rules, 2011 to ensure that electronic scraps, rejects etc. generated during the manufacturing shall be sent or channelized to registered E-waste recycling facilities. Such producer shall obtain authorization only from SPCB/PCC of the State where the manufacturing facility is located.
- The producer is required to maintain records in form 2 along with the details of the e-waste handled/generated and has to submit the annual returns in form 3 in accordance with Rule 4(9) of these Rules.
- Producer shall finance the EPR system either by setting up individual collection system or by joining a common collection system by authorizing them.

Scope of EPR for the Producer:

- i. Producer may assess their individual requirements and design a collection or product take back system as they deem appropriate as long as it facilitates channelization of E-waste for environmentally sound management.
- ii. Producer may arrange for collection from both, individual and bulk consumers and channelize the waste to collection centres or recyclers/dismantlers.
- iii. The producer may opt to implement EPR on his own individually or collectively. There can be

two distinct models; (i.) individual producer responsibility where producer implements EPR managed on his own by setting up his own authorized collection centres or (ii.) collective producers responsibility, where producers may authorize common collection centres (CCC) independently or by joining a consortium as a member. Producers importing EEE listed in schedule – I, may take authorization from the State where the landing port is located

iv. In the E-waste rules, the logo has been printed without a bar below the symbol, whereas the present practice commonly followed by the producer, the Logo has a bar below the symbol. Logo without the bar below the symbol and the logo with bar below the symbol as shown below are acceptable. Symbol may be placed on the products or printed in the accompanying product documentation.



- v. As per Rule 4(6) of the E-waste Rules, 2011 the producer is responsible for creating awareness for the consumer about the product that has been placed on the market. The information should essentially convey the message for the compliance under the rules and the responsibility undertaken by the producer on safe handling and disposal of the end-of-life product. Various modes for creation of awareness such as publications, advertisements, posters, information booklets, use of Television, radio, newspaper etc., could be adopted for communicating the information. The details of awareness programs under taken shall be provided to SPCBs/PCCs while submitting annual returns as per Form 3.
- vi. Under Rule 4(5) it is mandatory for the producer to publicize the contact details of the authorized collection centres and collection points or their collection mechanism to the consumers and such information should be periodically updated. The detailed information should comprise of the full address, telephone number, fax number e-mail etc for each State. The helpline number (like call centre) may also be publicized so that the consumer can reach the nearest collection centre from where he/she is located.
- vii. Awareness is essential regarding the hazardous constituents present in the equipment as well as the safe handling and disposal of the product after its use. In case of the products complying with the provisions of rule 13(1), the same should be indicated in the product information booklet.
- viii. Producer may manage a system directly or with a help of any professional agency on his behalf for collection and channelization system of E-waste by involving relevant stakeholders such as consumer, bulk consumer, NGOs, informal sector, resident associations, retailers, dealers, etc.
- ix. The scope of implementing the EPR by the producers is also explained in the schematic diagram given in **Figure 2.1**.



Figure 2.1: Scope of implementing EPR for Producers Source: E-waste Regulation Guidelines 2012

3. Clarifications regarding Collection Centres

A collection centre is a store/warehouse where the E-waste collected from consumers, bulk consumers, urban local bodies and retail outlets/collection-points/collection-bins/mobile-units etc. established by producers or collection centres, can be received and stored safely for necessary channelization for dismantling/recycling. These guidelines suggest the following options and requirements for setting up Collection Centres;

- i. Collection centres can be established by various ways. If a collection centre is set up for a particular producer, it may be called individual collection centre. If a collection centre caters the EPR requirements of multiple producers it may be called common collection centre. All collection centres require authorization from SPCBs / PCCs of respective States.
- ii. In case a producer himself sets up a collection centre, he shall take separate authorization from SPCBs / PCCs for setting up such individual collection centre.
- iii. Producer may organize take-back system through their retailers or through service centres and set up collection points or bins or drop-off points and link them to their authorized individual collection centres. Such collection points can also be set-up by authorized common collection centres.
- iv. Producer may organize take-back system through their retailers or service centres and set up collection points or bins and channelize the E-waste directly to registered dismantlers or recyclers.
- v. The collection points can be designated places where E-waste can be collected through residential areas, office complexes, commercial complexes, retail outlets, customer care stores, educational and research institutions, resident welfare associations (RWAs), NGOs working with rag pickers, etc. These collection points can be financed by producers or common collection centres (on behalf of producers) to channelize the E-waste to registered dismantler or recyclers. The E-waste collected through these points should be transported to collection centres or registered dismantling or recycling plants within a stipulated time period as per rule 12. These collection points do not require to take authorization from SPCBs/PCCs.
- vi. Collection Bins could be installed in public places such as kerbsides, restaurants, malls, offices etc. which can be owned by the authorized collection centres or the producer. The contact details of authorized collection agencies should be printed on these bins for reference purposes of the general public. The E-waste collected in these bins should be transported to collection centres or

channelized to registered dismantler or recyclers by the producers. These collection Bins do not require authorization.

- vii. Mobile collection vans can also act as collection systems for door to door collection of E-waste or from institutions / individuals / small enterprises and such vans shall be linked to collection centre or provided by producer to channelize the E-waste to collection centres or registered dismantler or recyclers. A mobile collection van does not require authorization but their detail has to be provided to SPCBs / PCCs while seeking authorization by the producers or collection centres.
- viii. SPCBs shall ensure that authorized collection centres comply with the provisions of the Rules and ensure that the E-waste collected by them is stored in a secured manner and no damage is caused to the environment during storage and transportation till the e-waste reaches registered dismantler (s) or recycler (s) by undertaking periodic inspections and verifications
- ix. The Rules specify that Collection Centres are allowed to store E-waste for a maximum period of 180 days. However, this period may be extended up to one year in the exceptional cases with genuine reasons when the Collection Centres are located in the States, which do not have any registered dismantling or recycling facility and are unable to send the e-waste for recycling within the stipulated time period.

The criteria for setting up collection centres are

- i. The collection, transportation, storage and handling of E-Waste in the collection centres has to be done carefully without breaking the end of life equipments.
- ii. Collection centers, established under these Rules, need not seek Consent to Establish and Consent to Operate under the Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981.
- iii. Producers who has pan India presence having large number of distributors/dealers in each of the State and has large warehouses already in place can use the space if available in these ware house for establishing collection centre. However, the space used for collection centre has to be clearly demarcated (by enclosure or partition) from the space meant for new goods.
- iv. The storage capacity of any collection centre should be commensurate with available area, volume of operations (in weight) and type of E-waste.
- v. The collection centre where Refrigerator and Air conditioners are also stored should have adequate facilities for handling / arresting leakage of compressor oils, CFCs/HCFCs if any.
- vi. Covered shed/spaces may be used for storage of E-Waste generated from IT and Telecommunication equipments while open spaces can be used for storage of refrigerators / washing machines /air conditioners. In case of storage of E-waste, generated from IT and Telecommunication equipment, in open spaces, containers with lids/covers may be used. E-waste comprising of IT & TE waste preferably be segregated and stored at collection centre in suitable racks/containers/bins.
- vii. Containers of appropriate size and shape may be used for segregation of E-waste items generated from IT and Telecommunication equipments to facilitate effective collection and handling operations. Containers can be made either of wood or plastic or mild steel or any appropriate material with sufficient strength and shapes (top open containers, caged boxes, rakes etc.) for holding the E-waste. These containers/racks may be placed in such a way that there should be adequate space for movement of workers and material.







viii. Producer can assess their individual requirements and design a collection or product take back systems as they deem appropriate as long as it facilitates channelization of WEEE for environmentally sound management.

4. Clarification regarding E-waste Dismantler

As per these rules any person or registered society or a designated agency or a company or an association can engage in dismantling of end of life electrical and electronic equipments into their components by obtaining registration and authorization from the respective SPCB/PCC.

- Dismantling operation can be manual, semi manual and automatic involving physical segregation operations for plastics, glass, steel, non-ferrous material, wires, gases, liquids and printed circuit boards. Dismantlers may perform the following operations.
 - 1. Decontamination
 - 2. Manual dismantling using appropriate tools, PPEs and dust control equipment.
 - 3. Hammering
 - 4. Shredding
 - 5. Segregation and
 - 6. Specialized separation processes
 - a) CRT cutting into funnel and panel including removal of phosphor coating from the panel as well as lead paste binding the panel with the funnel.
 - The first step is to decontaminate E-waste and render it non-hazardous by separating hazardous components and materials. Hazardous electronic components such Hg switches, Poly Chlorinated Biphenyl (PCBs) etc. can be recovered and sent to TSDFs for treatment and disposal. In case of refrigerators and air conditioner, the refrigerant gases such as chlorofluorocarbon (CFCs), hydrochlorofluorocarbons (HCFCs) etc. can be collected by using gas recovery equipment for their recovery and storage. The refrigerant gases may be re-used or may be diposed by thermal destruction adopting any of the following options:
 - i. By incineration in existing common HW incinerators
 - ii. By co-processing in cement kiln
 - iii. By plasma destruction
- Dismantling operations shall not include Fine grinding / wet shredding / wet grinding operations. Dismantling operations shall not be permitted for chemical leaching or heating process or melting the material. Dismantlers shall not shred segregated LCDs.
- Dismantler shall have adequate facilities for disposal of bag filter residue and floor cleaning dust in secure manner or shall obtain membership with TSDF for safe disposal.
- Dismantlers can be permitted shredding or cutting of printed circuit boards not below the size of 20mm which have to be handled by employing minimal manual handling and with adequate air pollution control systems.

5. Clarification regarding E-waste Recyclers

As per these rules any person who is engaged in recycling or reprocessing of used electrical and electronic equipment or assemblies or their component is a recycler. Recyclers may also set up their own authorized collection centres and may establish linkages with producers/bulk generators/other collection agencies. They may also establish a scheme for household collection of e-waste or may establish tie–ups with other agencies involved in collection of E-waste from individual consumers.

The functions of the recycling facilities are similar to the dismantlers but implements high degree technologies for recycling or recovery operations. There shall be no restriction on degree of operations that can be permitted for recyclers. The following processes can be employed by recyclers;

- 1. Manual / semi-manual / automatic dismantling operations
- 2. Shredding / crushing / grinding / enrichment operations
- 3. Pyro-metallurgical operations Smelting furnace
- 4. Hydro metallurgical operations

- 5. Electro-weaning
- 6. CRT cutting
- 7. Toner cartridge recycling
- 8. Melting, casting, molding operations (for metals and plastics)
- A recycling facility can be permitted to receive any kind of E-waste covered under E-waste Rules.
- The recycling facilities shall comply with the requirements as specified for dismantlers in the above section for the operations specified therein.
- A recycling facility shall install adequate waste water treatment facilities for process wastewater and air pollution control equipment depending on type of operations undertaken.
- Suitable space de dusting equipment shall be installed where manual dismantling, shredding operations are carried out.
- Suitable fume hoods connected with bag dust collectors followed by wet (chemical) scrubbers shall be installed for control of fugitive emissions from furnaces or chemical reactor fumes.
- In additions to dismantling operations, recyclers may adopt suitable technologies for shredding, wet grinding, gravity / magnetic/density/eddy current / electromagnetic separators with adequate air pollution control equipment. It shall be ensured that dust control equipment comprises of mechanical dust collectors followed by fabric filters or two stage fabric filters or fabric filter followed by wet (chemical) scrubbers.
- Adequate facilities for onsite collection and storage of bag filter residues, floor cleaning dust and other hazardous material shall be provided and sent to secure land fill facility by obtaining membership with TSDF operator.
- The degree of refining and % recovery of resource or precious material present in the E-waste shall be given due importance.

6. Clarification regarding Recycling of CRT Monitor and TVs

- Large volumes of CRTs are expected to be generated in coming years. Care should be taken for recycling of CRTs as it contains harmful substances.
- CRT monitors and TVs can be manually removed from plastic/ wooden casing. The CRT is split into leaded funnel and unleaded panel glass using different splitting technology in a closed chamber under low vacuum environment and the funnel section is then lifted off from the panel glass section and the internal metal gasket is removed for facilitating the removal of internal phosphor coating.
- The CRT can be split manually adopting Ni-Chrome hot wire cutting, Diamond wire method or Diamond saw separation
- Manual shredding, cutting, and segregation operations for CRTs should be carried out in vacuum chambers where the dust is extracted through cyclones, bag filters, ID fan and a suitable chimney. The operators should use gloves fixed to the walls of the vacuum chamber while handling CRTs as shown in the figure below.





- The internal phosphor coating from the inner side of panel glass is removed by using an abrasive wire brush and collected separately. The extracted air is cleaned through high efficiency bag-filter system to collect the phosphor dust. The phosphor dust so collected in the filter bags should be sent to TSDF.
- Segregated CRTs can also be shredded in automatic shredding machines connected with dust

control systems. The mixed shredded glass is separated into leaded glass and glass cullet using electro-magnetic field or by density separation.

7. Clarification Regarding Bulk Consumers

- As per these rules a bulk consumer has to ensure that the e-waste generated by them have to be channelized to authorized collection centres or registered dismantler or recycler or is returned to the producer through its pick up or take back services or through its collection points.
- The bulk consumer has to maintain records of e-waste generated by them in Form 2 and make such records available for scrutiny to SPCBs / PCCs whenever demanded.

8. Clarification regarding reduction in the use of Hazardous Substances (RoHS) in the manufacture of electrical and electronic equipments:

The e-waste rules specifies limit for hazardous substance in the components of electrical and electronic equipments. The limits are detailed below

- i. Every producer of electrical and electronic equipments as per Schedule I shall ensure that new electrical and electronic equipments should not have concentration value more than 0.1% by weight in homogenous materials for Lead, Mercury, Cadmium, Hexavalent Chromium, Polybrominated biphenyls or polybrominated diphenyl ethers and for Cadmium more than 0.01% by weight in homogenous materials. The above maximum concentration limit should be achieved before 01-05-2014. The above limits will not apply to components of electrical and electronic equipment manufactured or placed in the market six years before the date of commencement of these rules. The above limits will also not apply to applications listed in Schedule II of the e-waste rules and electronic equipments used for defense purpose.
- ii. Import or placement in the market for new electrical and electronic equipment shall be permitted only for those equipment which are RoHS compliant.
- iii. Components of electrical and electronic equipment manufactured or placed in the market before the date of 01-05-2014 are exempted from above provisions.
- iv. The reductions have to be achieved before 1 May 2014 i.e. within two years from the dates of commencement of these rules. Certain applications listed in Schedule II are exempted from the above requirement and there is also an exemption for components of electrical and electronic equipment manufactured or placed in the market six years before the date of commencement of the reduction.

9. Clarification regarding interstate transportation or E-waste

- Transportation of e-waste, being sent for dismantling or recycling to a facility in a State other than the State, where it is generated or collected, does not require 'No objection certificate' from the SPCBs/PCCs concerned.
- However, Transporter of the E-waste is required to give prior intimation to the SPCBs/PCCs concerned i.e. the States in which the E-waste is generated, transited and being sent for the purpose of recycling or dismantling.

10. Clarification Over-all Compliance Mechanism

A compliance mechanism has been set out in E-waste Rules for producers, collection centers, consumer, bulk consumers, dismantler, recyclers and the regulatory authorities (SPCB's, PCCs, CPCB and MoEF). It also sets out the responsibilities for producers to finance and organize the take back and recycling system. However, while ensuring that the given compliance mechanism is followed the same be can be visualized in the following schematic flow sheet given in **Figure 2.2**.



Figure 2.2: Implementation of E-Waste Rules 2011 Source: E-waste Regulation Guidelines 2012

2.2 Institutional Structure

The Ministry of Environment and Forests, Government of India, is the nodal agency at the central level for policy, planning, promoting and coordinating the environmental programs. A number of enforcement agencies assist the Ministry of Environment and Forests at the state level in executing the assigned responsibilities. The Central Pollution Control Board (CPCB) advises on the policy and enforcement. State Pollution Control Boards (SPCB) carry out the enforcement at the state level. The roles & responsibilities of different agencies under E-waste rules are provided in **Table 2.3**.

Sr. No.	Authority/(ies)	Duties				
1.	Central Pollution Control Board, Delhi	 i. Coordination with State Pollution Control Boards/ Committees of UT ii. Preparation of Guidelines for Environmentally Sound Management of e-waste iii. Conduct assessment of e-waste generation and processing iv. Recommend standards and specifications for processing and recycling e-waste v. Documentation, compilation of data on e-waste and uploading on websites of CPCB vi. Conducting training & awareness programmes. vii. Submit Annual Report to the Ministry. viii. Any other function delegated by the Ministry under these rules. ix. Enforcement of provisions regarding reduction in use of hazardous substances (RoHS) in manufacture of electrical & electronic equipment. x. Initiatives for IT industry for reducing hazardous substances. xii Set targets for RoHS compliance in manufacture of electrical & electronic equipment. xii Incentives and certification for green design/products 				
2.	State Pollution Control Boards/ Committees of Union Territories	 i. Inventorization of e-waste. ii. Grant & renewal of Authorization iii. Registration of recyclers of e-waste iv. Monitoring compliance of authorization and registration conditions v. Maintain information on the conditions imposed for authorization etc. vi. Implementation of programmes to encourage environmentally sound recycling vii. Action against violations of these rules 				

Table 2.3: List of Authorities and Corresponding Duties as per E-waste (Management and Handling) Rules, 2011

Sr. No.	Authority/(ies)	Duties		
		viii. Any other function delegated by the Ministry under these rules		
3.	Urban Local Bodies (Municipal Committee/Council/C orporation)	(i) To ensure that e-waste if found to be mixed with Municipal Solid Waste is properly segregated, collected and is channelized to either authorized collection centre or dismantler or recycler.(ii) To ensure that e-waste pertaining to orphan products is collected and channelized to either authorized collection centre or dismantler or recycler.		

Source: E-waste Rules 2012

The roles and responsibilities of different agencies related to hazardous waste and its export and import is given below in Table 2.4.

Sr. No.	Authority/(ies)	Duties and Corresponding Rule
1.	Ministry of Environment and forests, under the Environment (protection) Act, 1986	 i. Identification of hazardous wastes ii. Permission to exporters of hazardous wastes iii. Permission to importers of hazardous wastes. iv. Permission for transit of hazardous wastes through India. v. Sponsoring of training and awareness program on Hazardous Waste and Management related activities.
2.	Central Pollution Control Board constituted under the Water (Prevention and Control of Pollution) Act, 1974	 i. Coordination of activities of the State Pollution Control Boards/ committees. ii. Conduct training courses for authorities dealing with management of hazardous substances. iii. Recommend standards for treatment, disposal of waste and leachates. Recommend procedures for characterisation of hazardous wastes. iv. Sector specific documentation to identify waste for inclusion in Hazardous Wastes (Management, Handling and transboundary Movement) Rules 2008. v. Prepare guidelines to prevent/ reduce/ minimize the generation and handling of hazardous wastes.
3.	State Government/ Union Territory Government and Administration	 vi. Any other function under rules delegated by MoEF. i. Identification of site (s) for common hazardous waste treatment, storage and disposal facility (TSDF). ii. Assess EIA reports and convey the decision of approval of site or otherwise. iii. Acquire the site or inform operator of facility or occupier or association of occupiers to acquire site. iv. Notification of sites v. Publish periodically an inventory of all disposal sites in the state/union territory
4.	State Pollution Control Boards constituted under the Water (Prevention and Control of Pollution) Act, 1974	 i. Inventorization of hazardous waste ii. Grant and renew authorization iii. Monitor the compliance of the various provisions and conditions of authorization including conditions of permission for issued by MoEF exports and imports. iv. Examining the applications for imports submitted by the importers and forwarding the same to MoEF. v. Implementation of programs to prevent/ reduce/ minimize the generation of hazardous wastes. vi. Registration and renewal of registration of Recyclers/ Re-Processors. viii. Action against violations of Hazardous Wastes (Management, Handling and Transboundary Movement) Rules 2008. viiii. Any other function under these rules assigned by MoEF from time to time.
4.	Directorate General of Foreign Trade constituted under the Foreign Trade (Development & regulation) Act 1992	 Grant licence for import of hazardous wastes Refuse licence for hazardous wastes prohibited for imports and exports.

Table 2.4: The authority, duties and corresponding rule as per Schedule VII of the HW Rules, 2008

Sr. No.	Authority/(ies)	Duties and Corresponding Rule
5.	Port Authorities under	i. Verify the documents
	Indian Port Act 1908 and	ii. Inform the ministry of Environment and Forests, Govt. of India of
	Customs Authorities under	any illegal traffic
	the customs Act, 1962	iii. Analyze wastes permitted for imports and exports.
		iv. Train officials on the provisions of the Hazardous Wastes Rules and
		in analysis of hazardous wastes.
		v. Take action against export/import Acts, 1908/ Customs Act 1962.

Source: Hazardous Waste (Management, Handling & Transboundary) Rules 2008

Applicability of E-waste Rules is given in Table 2.5.

Table 2.5: E-Waste	(M&H)	Rules - 2011	applicability
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Sr. No.	Type of Applicant	To Maintain Records	To Maintain Record in Form -2	Filling Annual Return in Form - 3	Authorization Form-I	Registration Form-IV	RoHS Compliance
1. (Consumer	Х	X	Х	Х	Х	Х
2. I	Bulk Consumer			Х	Х	X	Х
3. U	Jrban Local Bodies		X	X	X	Х	Х
4. (Collection Centre					X	X
Ι	Producer –offer to			\checkmark		Х	\checkmark
5. s	ell						
6. I	Producer - importer	V				Х	
7. I I	Producer - Manufacturing EEE	; √				X	\checkmark
8. I	Dismantler						X
9. F	Recycler			\checkmark			Х
S	ource: E-waste Rules	guideline	s .				
	X = Not applicable	ole	$\sqrt{=}$	= Applicable			

Clarification of the role of State Pollution Control Boards as per E-waste Guideline 2012.

- SPCB/PCC shall also ensure that Producer having manufacturing facility or corporate head office in their State shall obtain authorization. SPCB/PCC shall also ensure that a Producer having their port of landing of imported equipments in their State obtains authorization.
- Shall ensure that manufacturer has set-up adequate collection mechanism to cater the collection needs from entire State.
- The number of collection centres or take-back systems may depend on quantum of sales, number of urban centres in that State.
- The authorization granted to each producer shall be evaluated on case to case basis depending on their proposed EPR implementation scheme. The details of EPR with respect to authorized collection centres, collection points, take-back systems, authorized recyclers, authorized dismantlers and details of agreement between producers, authorized collection centre, dismantler and recycler are required for evaluation.
- Shall ensure that the collection centres, who have applied for authorization, should have adequate space for storing the quantity of e-waste for which application has been made.
- Shall ensure that adequate numbers of containers proportionate to the applied capacity are available for storing e-waste.
- Shall ensure that collection centre should not store e-waste for a period exceeding one hundred and eighty days. The storage period may be extended to one year in those States which do not have any registered dismantling and recycling facility or in such cases where the e-waste needs to be stored for development of a process for its recycling or reuse.
- Shall ensure that collection centre should have arrangement in place for transferring the e-waste to the registered dismantler or recycler.
- Shall ensure that dismantlers and recyclers who have applied for authorization and registration, possess appropriate facilities, technical capabilities and equipment to handle e-waste safely. The land may be owned by the dismantlers/recyclers or could be on lease.

- SPCBs/PCCs shall ensure that no one starts dismantling or recycling of e-waste without having prior permission (registration and authorization) to do so from SPCBs/PCCs.
- Shall ensure that dismantler and recyclers should have appropriate equipments for dismantling and recycling of e-waste.
- Grant of registration for dismantling and or recycling has to be evaluated on case to case basis depending on their capacity and level of operation. The SPCBs/PCCs should ensure that dismantler should not exceed their mandate for processing any e-waste for recovery or refining of materials.
- SPCBs/PCCs shall ensure that dismantlers have well set mechanism for providing dismantled material to recyclers. Action Plan for channelizing the disposal of dismantled component in an environmentally sound manner has to be provided by dismantler.
- SPCBs/PCCs shall ensure that dismantlers/recyclers should be members of TSDF.
- SPCBs/PCCs shall ensure that dismantlers/recyclers should file their annual returns within the stipulated time period.
- SPCBs/PCCs shall place on their web site the conditions imposed on the collection centre, dismantler and recycler while granting authorization and registration and ensure that these conditions are strictly met with by the facility concerned.
- SPCBs/PCCs should regularly monitor the compliance of authorization and registration.

Role of Municipal Authorities

- There is possibility of mixing of e-waste with municipal solid waste. In such cases, the Urban Local bodies (Municipal Committees/ Councils/ Corporations) are required to ensure that E-waste if found to be mixed with MSW is properly segregated, collected and is channelized to either authorized collection centre or dismantler or recycler.
- The Urban Local bodies (Municipal Committees/Councils/ Corporations) are also required to ensure that e-waste generated from non branded or assembled electrical and electronic equipment as specified in Schedule I is collected and channelized to either authorized collection centre or dismantler or recycler. The ULBs are also required to collect E-waste generated from those EEEs which are covered under the rules and produced by a company, which has closed its operation or has stopped product support.
- ULBs may also set up their own collection points at MSW disposal site, public places, residential locality etc to collect the E-waste and such collection points shall be connected to authorized collection centres/dismantlers/recyclers.

2.3 Overall Assessment with respect to Emerging Regulatory Scenario

Major conclusions drawn from regulatory assessment having implications an E-waste management in the state are given below.

National Environment Policy 2006

National Environment Policy 2006 provided overall guidelines on waste management including E-waste. These provided road map for preparation of guidelines and regulation policy. At first guidelines came into effect in 2008, which provided a minimum practice required for environmentally sound management of E-waste.

Guidelines Environment sound Management of E waste

These guidelines also provided the basis for amendment of Hazardous Waste (Management, Handling & Transboundary Movement) Rules 2008 & E-waste was included as part of Schedule IV. This development brought E-waste recycling into the ambit of hazardous waste regulations and facilitated control of export & import of E-waste. A number of E-waste recyclers got registered under these rules indicating the part formalization of the E-waste trade value chain but diversion less than 5% of the E-waste generation to these recyclers paved the way for separate E-waste regulation based on EPR.

E-waste (Management & Handling) Rule 2011

In 2011, new E-waste (Management & Handling) Rules were notified, which came into effect in 2012. These rules were formulated in close consultation with producers & their associations and other stakeholder. Some of the major features of this regulation having implication on E-waste inventory assessment are given below.

- No target has been fixed to collect E-waste from the time of enforcement. Producer is not bound by any collection target.
- There are no mandatory provisions for producers in the rules to declare quantity of EEE placed in the market since 2012.
- No mechanism for tracking purchase of EEE by bulk consumers exists.

Draft E-waste (Management & Handling) Rules 2016

Draft E-waste (Management & Handling) Rules have been disclosed and are expected to be notified any day. These rules have been formulated in close consultation with major stakeholders in E-waste trade value chain. Some of the major features of this regulation having implication on E-waste inventory assessment are given below.

- All the above three points (1, 2 & 3) have been addressed in the draft rules.
- Draft rules recommend financial mechanism to address financial implications for E-waste management.
- Responsibilities of Consumers especially bulk consumers have been increased.

2.4 Conclusions

None of the major brands manufacturing / importing items mentioned in Schedule 1 of the E-waste rules have manufacturing facilities or corporate head offices located in Chhattisgarh Therefore, monitoring of E-waste inventory through evaluation of Form 2 or Form 3 in accordance with Rule 4(9) of E-waste Rule by CECB in the state is possible only through the producers data obtained from centralized agency e.g. CPCB or the state where these producers are registered after 2012.

CPCB data shows that as of September 2013, Chhattisgarh has two E-waste dismantler / recycler M/s Navrachna Recycling Pvt. Ltd. & M/s ADV Metal Combine Private Limited. Therefore, CECB can track & monitor E-waste inventory in the state through the dismantler's / recycler's data obtained from centralized agency e.g. CPCB or the state where dismantler's / recycler's are registered. This also indicates that E-waste is either dismantled or recycled in both formal & informal sector in the state.

Table 2.2 indicates that producers are majorly responsible for all the activities including financing of E-waste management. Since, the state has two registered dismantler & recycler; it indicates that producers may be fulfilling their responsibility through collection system catering to dismantlers & recycler both inside & outside the state.

Assessment on the upstream side of the E-waste chain especially of both types of consumers (bulk & individual consumer), also indicate that only bulk consumer offer opportunity of E-waste inventory tracking & monitoring. Though, bulk consumers are required to maintain records of E-waste, they are not required to file the returns.

Since no mechanism exist for tracking purchase of EEE by bulk consumers and also producers are not required to declare quantity of EEE placed in the market since 2012, E-waste inventory assessment has to rely on available historical market research data.

Therefore, there is a need to identify different producers, profile of consumers & bulk consumers, collection centre, dismantlers & recyclers who are catering to E-waste in the five districts in the study area.

Chapter 3: Assessment of E-waste Market

3.0 Introduction

The increasing market penetration of the consumer electronics will lead to reduced life of electronics items and greater generation of E-waste in Chhattisgarh. Therefore, an assessment of E-waste market structure requires an understanding of E-waste as a "tradable commodity" and its "mechanism of trading". In Chhattisgarh E-waste as a "tradable commodity" can be described in terms of its composition and its potential for material recovery. "Mechanism of Trading" can be described in terms of E-waste trade value chain. This chain will identify different stakeholders consisting of producers, consumer or bulk consumers, collection centers, dismantlers and recyclers, while mechanism of trading will determine E-waste generation, present handling practices, storage and channelization for its recycling or disposal. The following sections describe each of these items to facilitate an understanding of E-waste market in five divisions of Chhattisgarh.

3.1 E-Waste Composition

E-waste Composition has been described in terms of components, which contain items of economic value. At first E-waste has been classified into 19 components forming "building blocks", which are easily "identifiable" and "removable", followed by their respective hazardousness.

3.1.1 E-waste Components

A number of components, which are assembled to produce "Electrical and Electronic Equipment" are metal, motor / compressor, cooling, plastic, insulation, glass, LCD, rubber, wiring / electrical, concrete, transformer, circuit board, fluorescent lamp, incandescent lamp, heating element, thermostat, FR / BFR – containing plastic, batteries, CFC / HCFC / HFC / HC & external electric cables. Specific component, which are found in Air Conditioners, refrigerator, washing machine, personal computers, cellular telephones, TVs and other items as per schedule 1 are described in **Table 3.1**.

Large household appliance like Air Conditioners / refrigerator may consist of electric motor, a circuit board, a transformer, capacitor, thermal insulation, switches, wiring, plastic casing (containing flame retardants) etc. A typical washing machine may consist of the metal casing, inner and outer drums, a motor, a pump, washing cycle controller unit, switches and other components. IT and telecom equipments sector is observing a trend of "micro miniaturization", while CRTs in monitor are being replaced by LCD screens. Further, there is an increasing trend of reduction in weights of these items.

Table 3.1 indicates that the range of different items found in E-waste is diverse classifying it a waste of complex nature. However, it shows that E-waste can be dismantled or disassembled into relatively small number of common components for further treatment. This disassembly results in segregation and treatment of E-waste.

3.1.2 E-waste Composition, Recyclability and Hazardousness

During market survey of major stakeholders in Raipur division, it was revealed that broadly E-waste consists of ferrous and non-ferrous metals, plastics, glass, wood, printed circuit boards, rubber and other items. Iron and steel constitutes about 50% of the E-waste followed by plastics, non - ferrous metals and other constituents. Non-ferrous metals consist of metals like copper, aluminum and precious metals ex. silver, gold, platinum, palladium etc. Therefore, these items are dismantled in informal sector. However, the presence of elements like lead, mercury, arsenic, cadmium, selenium, hexavalent chromium and flame retardants in E-waste and their components beyond threshold quantities render them hazardous in nature.

Table 3.1: Components in E-waste

Sr. No.	Items of Electrical & Electronic Equipment's	Metal	Motor / Cooling	Plastic	Insulation	Glass	CRT	LCD	Rubber	Wiring / Electrical	Transformer	Magnetron	Circuit Board	Fluorescent lamp (in ballast)	Incandescent lamp	Heating element	'Thermostat	FR / BFR - containing plastic	Batteries	CFC, HCFC, HFC, HC	External electric cables
I.	Information Technology and Tel	lecomm	unicatio	n Equip	oment																
1.	Centralized Data Processing																				
2.	Mainframes	\checkmark	\checkmark	\checkmark					\checkmark		\checkmark							\checkmark	\checkmark		
3.	Mini Computers																		\checkmark		
4.	Personal Computing	\checkmark	\checkmark	\checkmark			\checkmark		\checkmark		\checkmark										
5.	Personal Computers (Central processing unit with input and output devices)	V	N	V	V		V	V	V	V	V	V	V						V		V
6.	Laptop Computers (Central processing unit with input and output devices)		V	V	V	V		V	V	V	V		V	\checkmark				\checkmark	V		
7.	Notebook Computers	\checkmark	\checkmark	\checkmark					\checkmark	\checkmark				\checkmark					\checkmark		\checkmark
8.	Notepad Computers	\checkmark	\checkmark		\checkmark			\checkmark	\checkmark		\checkmark		\checkmark					\checkmark	\checkmark		\checkmark
9.	Printers including cartridges	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark			\checkmark		\checkmark							\checkmark			
10.	Copying Equipment	\checkmark	\checkmark	\checkmark		\checkmark			\checkmark		\checkmark							\checkmark			
11.	User Terminals and Systems	\checkmark		\checkmark			\checkmark		\checkmark	\checkmark	\checkmark	\checkmark	\checkmark								\checkmark
12.	Facsimile	\checkmark	\checkmark	\checkmark	\checkmark				\checkmark		\checkmark							\checkmark			
13.	Telephones			\checkmark						\checkmark											
14.	Pay Telephones										\checkmark										
15.	Cordless Telephones	\checkmark		\checkmark						\checkmark			\checkmark						\checkmark		\checkmark
16.	Cellular Telephones	\checkmark	\checkmark	\checkmark		\checkmark				\checkmark			\checkmark					\checkmark	\checkmark		\checkmark
17.	Answering Systems	\checkmark	\checkmark	\checkmark	\checkmark				\checkmark	\checkmark			\checkmark						\checkmark		\checkmark
II.	Consumer Electrical and Electro	nics			1																
18.	Cathode Ray Tube (CRT) TV												N								N
19.	Liquid Crystal Display (LCD) TV																				
20.	Light Emitting Diode (LED) TV	V	,	N	,	N			,	V	\checkmark			\checkmark	,		,				
21.	Refrigerator	N	N	N		N			V	N					N		N			\checkmark	N
22.	Washing Machine	N		N		\checkmark			\checkmark	N			N			\checkmark	V			L	N
23.	Air Conditioners excluding centralized air conditioning plants	V	V	V	\checkmark				N	V			\checkmark				V	N		\checkmark	\checkmark
24.	Compact Fluorescent Lamp CFL																				

 $\sqrt{\text{Present as a component}}$

• Possible presence as a component Source: Prepared from WEEE & Hazardous Waste, A report produced for DEFRA, UK Government, March 2004, AEA Technology

The possible substances of concern, which may be released during recovery of secondary raw material from E-waste, are given in **Table 3.2**.

Component	Possible Hazardous Content					
Metal						
Motor \setminus Compressor						
Cooling	ODS					
Plastic	Phthalate plasticize, BFR					
Insulation	Insulation ODS in foam, asbestos, refractory ceramic fiber					
Glass						
CRT	Lead, Antimony, Mercury, Phosphors					
LCD	Mercury					
Rubber	Phthalate plasticizer, BFR					
Wiring / Electrical	Phthalate plasticizer, Lead, BFR					
Concrete						
Transformer						
Circuit Board	Lead, Beryllium, Antimony, BFR					
Fluorescent Lamp	Mercury, Phosphorus, Flame Retardants					
Incandescent Lamp						
Heating Element						
Thermostat	Mercury					
BFR – containing plastic	BFRs					
Batteries	Lead, Lithium, Cadmium, Mercury					
CFC, HCFC, HFC, HC	Ozone depleting substances					
External electric cables	BFRs, plasticizers					

Table 3.2: Possible Hazardous Substances in E-waste Components Possible Hazardous Content

Source: Compiled from WEEE & Hazardous Waste, A report produced for DEFRA, March 2004, AEA Technology

Major components, which cause most concern, include lead, mercury, cadmium and chromium (VI), halogenated substances (e.g. CFCs), polychlorinated biphenyls, plastics and circuit boards that contain brominated flame retardants (BFRs). BFR can give rise to dioxins and furans during incineration and open burning of E-waste fractions at dump site can lead to other toxic release. Other materials and substances that can be present in E-waste are arsenic, asbestos, nickel and copper. These substances may act as a catalyst to increase the formation of dioxins during incineration.

3.2 Mechanism of E-Waste Trade

"Material Flow" along the "Life Cycle" of electrical and electronic equipment within a "Geographical Boundary" of Raipur division of Chhattisgarh forms the basis of E- waste generation. The following sections describe a conceptual understanding of material flow, along the life of electrical and electronic equipment, its conversion into an "obsolete" item followed by its transformation into new material. A conceptual E-waste trade value chain showing material flow along the E-waste trade value chain is shown in **Figure 3.1**. This is followed by customization of the conceptual E-waste trade value chain for Raipur division.

Raw Material Input





Source: UNEP Manual Vol. I; Inventory Assessment Manual

The establishment of material flow within a geographical boundary assists in identifying, networks / chain connecting different phases of life cycle of electrical and electronic equipment and associated stakeholders. The material flow, when applied to "life cycle" of electrical and electronic equipment leads to evolution of the 'Four-Phase-Model', where each phase describes respective unit operations and different stakeholders. Each of these phases and associated stakeholders is described in **Table 3.3** and depicted in **Figure 3.2**. The dotted vertical line in the **Figure 3.2** indicates the stage of "obsolescence" in between the second and third phase of life cycle.

Table 3.3: Phases of material flow model

S.No.	Phase	Stakeholders
1.	<u>Phase I:</u> Unit Operations / Processes / Activities: Production and sales of electrical and electronic equipment including import, export, and input of equipment for re-use from repair of WEEE / E-waste.	Stakeholders: Manufacturers, importers, exporters, and retailers (brand new / second hand)
2.	<u>Phase II:</u> Unit Operations / Processes / Activities: Consumption of electrical and electronic equipment, use of electrical and electronic equipment in households, offices and industry.	Stakeholders: Consumers like households, commercial places like offices and industry
3.	<u>Phase III:</u> Unit Operations / Processes / Activities: Consumption of electrical and electronic equipment, use of electrical and electronic equipment in households, offices and industry.	Stakeholders: Consumers, importers, exporters, collectors, traders, dismantlers, waste treatment operators
4.	<u>Phase IV:</u> Unit Operations / Processes / Activities: Treatment / disposal alternatives for WEEE/E-waste ex. repair, decontaminating, dismantling, shredding, landfill and incineration.	Stakeholders: Dismantlers, Recycling, Hazards landfill site operators.
Courses De	at and from Waste from clostning, and clostnonic equitment (WEEE)	an antition damageness substances and

Source: Prepared from Waste from electrical and electronic equipment (WEEE) – quantities, dangerous substances and treatment methods, EEA Copenhagen, 2003

In developed countries, where E-waste management system is in operation, the entire trade value chain occurs in organized / formal sector. The blue line indicates the starting point of informal sector involvement in E-waste management in a developing country. An example of generic E-waste trade value chain in a developing country is shown in **Figure 3.3**. In majority of developing countries, the informal sector engagement starts from the point of collection and continues till the last stage in some capacity. However, other steps / unit operations like E-waste processing, production / end products may be present or absent in a country. Therefore, this chain can be further modified or customized with inter or intra linkages depending on the E-waste processing or end production in Raipur division.



Figure 3.2: Generic E-waste trade value chain in a developing country Source: UNEP Manual Vol. II; Inventory Assessment Manual



Figure 3.3: The 'Four-Phase-Model'

Source: Prepared from Waste from electrical and electronic equipment (WEEE) – quantities, dangerous substances and treatment methods, EEA Copenhagen, 2003
3.3 E-waste trade value chain in Raipur Division (5 districts)

A tentative E-waste trade value chain for study area which has emerged out of field work is shown in **Figure 3.4**. Tracer technique, which was pilot tested in Raipur division has been used in major five districts in the division to fix E-waste trade value chain. A brief description of the identified stakeholders is given below.



Figure 3.4: Tentative E-waste trade value chain in Study Area

<u>Producers</u>

Figure 3.4 indicates that EEE producers / manufacturers do not exist in the study area. However, their products are being sold in the division. Secondary data confirms that EEE producers do not have manufacturing facilities in the division and therefore they are not registered with Chhattisgarh Pollution Control Board. Since these producers are responsible for their products under EPR, their detailed **inventory** as per schedule 1 of E-waste (Management & Handling) rules is given in Annexure 1.

Distributors / Traders / Retailers

EEE from these producers are sold in the study area through Distributor / Trader / Retail network as well as directly through the company. Items like Centralized Data Processing, Mainframes, Mini computers of Schedule 1 are used by large corporates, State and Central Government agencies falling under the category of bulk consumers whose profile is given below. **Inventory** of Distributors / Traders / Retailers selling items other than mentioned above in the study area is given in **Annexure 2**. However, retailers / dealers do not fall under the purview of E-waste (Management & Handling) Rules 2011, unless they serve as collection centre or drop off point.

<u>Consumers</u>

There are two types of consumers, which are found in the five districts of study area: Individual Consumers & Bulk Consumers. **Inventory** of bulk consumers in the five districts is given in **Annexure 3**.

Collection Centres / Channel

Tracer analysis indicates that EEE, which becomes E-waste in the study area partly gets collected & transported in the informal sector and partly in formal sector. Primary survey carried out through

Tracer technique indicates that bulk of E-waste generated in the study area goes to informal sector. Majority of the producer / manufacturer have established collection channel in the study area. These collection channels work through following mechanism.

- 1. Single point call centre
- 2. Distributors / Retailers
- 3. Service Centres
- 4. Physically established collection centre / drop off point

The producers use a combination of these mechanisms as given in Table 3.4.

Brands	Collection through Call Centre	Collection through Dealers / Retailer	Collection through Service Centre	Collection through Collection Centre / establishment	Remarks
LG	\checkmark		\checkmark	\checkmark	
Panasonic	\checkmark				
Samsung	V			\checkmark	Technician come to the site of E- waste discarded item, check the item and collect. (No compensate) provides certificate. (All the E-waste discarded item go to Haridwar, Rorkee) Attero Recycling Company.
Toshiba	V				Collection is carried out by a logistic service provider "M/s Kintetsu World Express Pvt. Ltd.", earlier "Gati"
Haier	\checkmark				
Kelvinator	V				Exchange your electronic item to your nearest dealer or where you buy the product
Electrolux	V				Exchange your electronic item to your nearest dealer or where you buy the product
Godrej	\checkmark				
Hitachi	V				Exchange offer contact to your dealer no collection center
BPL	\checkmark				Contact to your dealer where you buy the product
Akai	V				To the dealer he gives the cost of the product.
Sansui	V				E-waste Regarding no information Contact to nearest dealer
Philips	V				Call on customer care door to door collection of E-waste / discarded items of Philips
Whirlpool					To dealer he exchange your electronic item
			Printe	rs	
HP	\checkmark	\checkmark			Drop your items as dealer's drop off locations.

Table 3.4: Manufacturer's E-waste Collection Centre System in Raipur

Brands	Collection through Call Centre	Collection through Dealers / Retailer	Collection through Service Centre	Collection through Collection Centre / establishment	Remarks
Canon					
Brother					
TVSE	\checkmark				

Inventory of Service centres in the study area is given in **Annexure 4**. Inventory of Physically established collection centres is given in Annexure 5. **Table 3.4** indicates that majority of producers use call centre as well as dealer's network for collection of E-waste. There are two possibilities of onward transportation & disposal of E-waste. The first possibility is the disposal through informal sector & the second is through registered recycler. Since dealers are not covered under E-waste Rules, they are not legally bound to report.

<u>Informal Sector</u>

Tracer technique has been used in the Raipur division to fix E-waste trade value chain in the informal sector.

E-waste is collected & dismantled in informal sector in the study area. Further, its major fractions are transported outside the state mainly to Ghaziabad, Gwalior, Etawah & Delhi through informal sector traders. An inventory location of major scrap vendor / dismantler, temporary stockpile site / informal collection centre & landfill site is given in **Annexure 6**.

It has been found that Raipur, Arang, Abhanpur, Sabji mandi Baloda Bazar, Mandi road, Gandhi chowk, Sadar Bazar bhatapara, New bus stand, Mahasati Mandir road, Ram saptah chowk, Jai stambh chowk, Main road simga, Bilaspur road, Bemetra chowk, Sadar road, Main road kasdol, Dhamtari, Tehsil Dhamtari, Nagri, Magarlod rajim, Chhura, Gariaband city and then transported to Ghaziabad, Gwalior, Etawah & Delhi. They used to come twice/thrice in a year. The motherboards and floppy drives are removed from the machines by scrap vendors and sold by weight and mobile phone sold as individual pieces to scrap dealers. None of these scrap vendors have the ability to identify the condition of these components. They are then typically sold - TV Circuit Rs. 20-50/kg & TV 250-300/Pcs.; Compressor Rs. 400-450/Pcs.; Copper Rs. 350-450/kg; Refrigerator Rs. 500-1200/Pcs.; Washing Machine Rs. 700-800/Pcs; CFL Rs. 300/kg and Mobile kit Rs. 30-50/Pcs.

- Electronic items go to mechanic shops from households for repairing, and mechanic replaces damaged / defunct parts / components from it and then they sell it to scrap dealers.
- Mechanics sell E-waste to scrap dealer by weight / Pcs. mainly of ICT items (IT as per Schedule 1); TV circuit Rs. 15-45/kg; Compressor Rs. 300-400/Pcs.; Washing Machine Motor Rs. 200/Pcs.; Copper Rs. 200-350/kg; DVD Circuit Rs. 20-25/kg; Mobile kit Rs. 1000-2000/kg; SMPS Rs. 50/Pcs, Mother Board Rs. 90/Pcs.; Hard disk Rs. 120/Pcs.; CD Writer Rs. 35-40/Pcs.
- Small scrap vendors sell E-waste to big scrap dealer by weight / Pcs. TV Circuit Rs. 20-50/kg & TV 250-300/Pcs.; Compressor Rs. 400-450/Pcs.; Copper Rs. 350-450/kg; Refrigerator Rs. 500-1200/Pcs.; Washing Machine Rs. 700-800/Pcs; CFL Rs. 300/kg and Mobile kit Rs. 30-50/Pcs.
- Scrap dealers comes from Ghaziabad, Gwalior, Etawah & Delhi yearly twice / thrice for collection of E-waste.

- There is no organized mechanism for collection, transportation and disposal of E-Waste in Raipur division.
- No mechanism exists in the state to monitor and track its inventory, collection, transportation and disposal.

<u>Market Features</u>

E-waste Market concentration is mainly in Raipur district. This is due to higher penetration of EEE because of population concentration in this area. The EEE markets have been found to be small and price sensitive. Major brands, which have been observed, are Nokia, LG, Sony, Samsung, Panasonic, Philips, Videocon, Godrej, Onida, Whirlpool, Kelvinator, Haier, Hitachi, Voltas, Blue Star, Dell, HP, HCL and Lenovo. The new items after active life gets repaired and reused by the owner of the item. In case it becomes useless, it is left at repair centre, where it is cannibalized & finally its fractions are thrown in the dust bin.

Majority of material/ E-waste is transported to Ghaziabad, Gwalior, Etawah & Delhi with scattered temporary storage at different places of different towns.

Dump Sites (E-waste tracers)

Only Plastic and Glass parts of E-waste were found in Dump Site. Mixed waste was found in all dump sites. A summary of the process observed is shown in **Figure 3.5**.



Figure 3.5: Processes observed at dumpsite

Collection, Transportation & Processing (scrap dealers)

Small scrap dealer purchase waste from Household / Commercial Area / Institution, etc. At first stage, they segregate the waste than break the item and collect valuable items like Aluminum, Copper, Iron & Steel, Compressor, motor, etc. from E-waste. They sell their collected item to the large scrap dealer. They visit nearby area on daily/weekly basis and purchase the waste. These scrap dealers are not licensed by the municipalities but are part of the networks of large scrap dealers. Dismantling and segregation of E-waste occurs in a major way at large scrap dealers. A summary of the process observed is shown in **Table 3.5**. and illustrated in **Figure 3.6**.





Figure 3.6: Processes observed at scrap dealers / junkyards

Repair Shops (AC/WM/REF)

One person repairs one of these items every day. E-waste fractions/ waste Parts, like plastic body of these items, etc. is dumped into community bin and valuable item sold to nearby scrap dealer. Some of the respondent informed that Item which is not in repairable condition is returned to the owner of the product who in turn sells to the scrap dealer. Majority of the product are in repairable condition. A summary of the process observed is shown in **Figure 3.7** and illustrated in **Figure 3.8**.



Figure 3.7: Processes observed at AC, Washing Machine, and Refrigerator Repair Shop



Figure 3.8: Image showing Repairing Shop of AC/WM/REF in Project Area

<u>Repair Shops (TV / PC / Mobile Phone)</u>

Majority of mobile phones, TV & computers repair shop owners are local citizens. Waste Parts, like plastic body of these items, etc. are dumped into community bin and valuable item sold to nearby scrap dealer. They also store valuable item and use it to repair other EEE. Majority of the product are in repairable condition. A summary of the process observed is shown in **Figure 3.9** and illustrated in **Figure 3.10**.



Figure 3.9: Processes observed at TV, Computer, and Mobile Phone Repair Shop



Figure 3.10: Image showing TV Repairing Shop in Project Area

Summary E-Waste Process Study

There are various processes involved for recycling / reusing of electronic waste. The major process for different types of electronic items in Dhamtari, Gariaband, Raipur, Baloda Bazar (new) and Mahasamund are mentioned in **Table 3.6**.

		Process Status							
0					Baloda				
Sr.	D	D 1 1	<u> </u>	.	Bazar				
INO.	Process name	Dhamtari	Gariaband	Raipur	(new)	Mahasamund			
1	IC's Extraction from PCB	No	No	No	No	No			
2	Surface Heating of PCB and	No	No	No	No	No			
	Extraction of components								
3	Dissembling of Monitor & TV	Yes	Yes	Yes	Yes	Yes			
	and extraction of components								
4	Yoke core and Copper	No	No	No	No	No			
5	Metallic Core of Transformer	Yes	Yes	Yes	Yes	Yes			
	and Copper								
6	Rare Earth Core of	No	No	No	No	No			
	Transformer and Copper								
7	Rare Earth Core of Static	No	No	No	No	No			

Table 3.6: Processes involved for E-waste recycling in different towns

				Process S	Status	
Sr.	D. D				Baloda Bazar	
No.	Process name	Dhamtari	Gariaband	Raipur	(new)	Mahasamund
	Transformer					
8	Wire PVC and Copper	Yes	Yes	Yes	Yes	Yes
9	Plastic Shredder	No	No	No	No	No
10	Dismantling of Refrigerator and Compressor	Yes	Yes	Yes	Yes	Yes
11	Gold Extractions from Pins and Comb	No	No	No	No	No
12	Acid Bath for PCB	No	No	No	No	No
13	Regunning CRT's	No	No	No	No	No
14	Glass Recovery from CRT	No	No	No	No	No
15	Gold Recovery	No	No	No	No	No

The process details of fifteen processes are given in **Table 3.6**. The analysis of this table shows that there is dismantling activity occurring in, Gariaband, Raipur, Baloda Bazar (new) and Mahasamund. The entire amount of E-waste from these towns is transported to Ghaziabad, Gwalior, Etawah and Delhi for dismantling and further supply to Delhi market. Photo documentation captured in different towns of Raipur division is given in Annexure 8.

3.4 Conclusions

Major conclusions, which can be derived, include growing market of EEE in Raipur division. This growth may lead to increasing E-waste generation, which may further lead to higher pollution loads, health impacts and loss of recoverable items.

Chapter 4: Methodology for E-waste Inventory

4.0 Introduction

E-waste inventory forms the backbone of its E-waste management in a geographical area. There are, five methods, which have been used to determine E-waste inventory in both developed and developing countries. Each of these methods use "Material Flow" model. Therefore, the selection of E-waste inventory assessment methodology in five districts of Chhattisgarh in Raipur division is based on the availability, reliability and analysis of data along the material flow chain within their geographical boundary. The following sections describe each of these methods, their application, constraints, advantages, data requirements and sources of data in the context of Chhattisgarh.

4.1 Methods for Inventory Assessment

Different methods of E-waste inventory assessment as per UNEP's Manual 1 on E-waste Inventory Assessment are given below.

- 1. The Time Step Method.
- 2. The Market Supply Method.
- 3. The Carnegie Mellon Method.
- 4. Approximation Method 1.
- 5. Approximation Method 2.

The data requirement for each methodology based on mathematical expressions is given in Annexure 9. The extent of data required depends on the extent of geographical boundary, which could be national, regional or city boundary. Conceptually, the source of data can be identified by understanding the "material flow chain" within the given geographical boundary.

The E-waste material flow chain in Chhattisgarh as described in **Figure 3.4** of Chapter 3 is again shown in **Figure 4.1** in the context of inventory assessment. **Figure 4.1** shows that in all the five districts of the study area, the material flows from an organized / formal sector starting from production / manufacture till consumption phase, where major percentage of material enters into unorganized / informal sector. Therefore, the major constraints are related to availability, reliability, amount and range and completeness of the data along the chain.

Analysis of transfer of E-waste flow chain from formal to informal sector shows that the data for EEE in Chhattisgarh needs to be collected from secondary sources & primary survey. Therefore, E-waste inventory assessment in Chhattisgarh requires collection of available secondary data from the formal sector & its strengthening by primary survey in the informal sector followed by trend analysis.

4.2 Material Flow Chain, Data Sources and Data Gaps in Study Area

Figure 4.1 indicates that stakeholders existing in the study area are EEE retailers, consumers, service centres, E-waste collectors (to a limited extent) and two dismantlers in formal sector & other E-waste collectors (majority), & dismantlers in the informal sector in the study area. Therefore, secondary data related to stakeholders in the flow chain in the formal sector at temporal level was identified, collected and collated for quantification, while primary survey was carried out covering

stakeholders in the informal sector in the study area. The detailed findings of the primary survey are given in Chapter 3.



Figure 4.1: E-waste material flow chain in Study Area

Major observations related to data availability are given below.

- 1. Saturation Level National census data was obtained from office of the Registrar General & Census Operation, Govt. of India, National Sample Survey Organization (NSSO), Department of Statistics, Government of India, State Statistics from Department of Statistics, Government of Chhattisgarh, Telecom Regulatory Authority of India (TRAI), Ministry of Communications & Information Technology (MOCIT), Government of India, Industry Association like Manufacturers Association for Information Technology (MAIT), Electronic Industries Association of India (ELCINA), Telecom Equipment Manufacturers Association of India (TEMA) & Research Institutions e.g. National Council for Applied Economic Research (NCAER).
- 2. Number of Households Available with national census data (1991, 2001 & 2011).
- 3. Stock Data Stock levels at private/households, industry, commercial & sectors with Industry Association.
- 4. Data related to average life time, storage data, reuse, recycling & disposal at landfill site is not available from secondary sources & so primary survey was carried out in the study area.

	Table 4.1: Tentative sou	irces of data in Study Area	
Data Source/ Item	National/ Local Government Agencies	Industry/ Trade/ Recyclers/ Waste Disposal Operator's Association (Reports/ Published Data/ Field Work)	Market Research Agencies (Reports/ Published Data)
Saturation Level (Household & Industry)	National Census Data, (1991, 2001 & 2011)	Major Trading Agencies, (Retailers)	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
Number of Household	National Census Data, (1991, 2001 & 2011)		

. **C**. -1 A

Data Source/ Item	National/ Local Government Agencies	Industry/ Trade/ Recyclers/ Waste Disposal Operator's Association (Reports/ Published Data/ Field Work)	Market Research Agencies (Reports/ Published Data)
Export Data	Not required		
Import Data	Not required		
Stock Data Private (Rural & Urban)	NSSO (1994 – 2010)	Industry Association, Scrap Dealers, Recyclers, EEE Retailers	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
Stock Data Industry	TRAI, MOCIT, Govt of India.	Industry Association, Scrap Dealers, Recyclers, EEE Retailers	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
Average Life Time, Technology Change	TRAI, MOCIT, Govt of India.	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications, Annual Reports of Major Brands
Storage Data		Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications, Newspapers
Reuse		Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications
Recycle		Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	
Disposal in Landfill	City Municipalities	Scrap Dealers, Recyclers, EEE Retailers	

A matrix describing inventory methodology versus data availability has been prepared after assessing the data obtained as per **Table 4.1** (based on data requirement methodology) and summarized in **Table 4.2**. The major inferences, which can be drawn from **Table 4.2** are given below.

Method ology/ Data Require ment	Saturation		Numbe	Calculated Sales		Stock Data		Avera			Recycl		
	House hold	Industr y	r of Househ old	Export Data	Import Data	Manufac turing / Product ion	Priv ate	Indus try	ge Lifeti me	Stora ge data	Reu se	e / disma ntling	Land fill
Time Step Method	Х		\checkmark	Х	Х	V	Х	Х					
Market				Х	Х								

Table 4.2: Data Matrix Vs Methodology

Method	Saturation Level		Numbe	Calculated Sales			Stock Data		Avera	Store		Recycl	
Data Require ment	House hold	Industr y	r of Househ old	Export Data	Import Data	Manufac turing / Product ion	Priv ate	Indus try	ge Lifeti me	ge data	Reu se	e / disma ntling	Land fill
Supply Method													
Carnegie Mellon Method				Х	Х				\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
Approxim ation 1	Х	Х	\checkmark			\checkmark	Х	Х	\checkmark				
Approxim ation 2				Х	Х								

Note: √ means 'Available'/"Can be Derived"; X means 'Not Available'; NV means 'No value'

Since E-waste market in Chhattisgarh is a continuously growing market, which has not reached saturation levels, therefore Time Step Method, Approximation 1 & Approximation 2 Method have not been used. Further, market supply method can be applied since it requires at least one set of data related to EEE penetration & one set of data after E-waste generation. Carnegie Mellon method appears to give better estimates than Market Supply Method since data related to reuse and storage can be estimated while assessing, average life time based on primary & secondary data analysis. Further, only E-waste fractions of no economic value have been found in landfill sites in the study area.

Some of the findings of the secondary & primary data survey, which have been observed are given below. These findings have been used for carrying out inventory assessment of E-waste from items mentioned in Schedule 1 of E-waste rules 2016.

- 1. The office automation industry has undergone radical shift around 2006-07. The differentiation or gap between "Copier" and "Printer" segment of the Office Automation Industry had been bridged around the year 2006-07. The multi Functions Products (MFPs), which is Printer / Scanner / Fax / Copier, (including color MFPs) are the key drivers of this industry. Therefore, for E-waste inventory assessment, items Printers including cartridges, Copying Equipment, & Facsimile mentioned in Schedule 1 of E-waste rules, have been clubbed under one head of **"Printers including Cartridges"** for inventory assessment.
- 2. It is pertinent to state that Bharat Sanchar Nigam Limited is the only Telecom. Service Provider providing Telegraph Services to the citizens of the country across the length and breadth of the nation. As per BSNL there has been steep decline in the usage of Telegraph Services due to large scale penetration of Fixed Line Telephony, Mobile Services and Internet Services. SMS and E-mails have gained greater importance in Message Transmission over the years. Realizing the declining usage of Telegraph Services, the Establishment branch of BSNL Corporate Office defined Telegraph Services as diminishing services vide circular No. 19 1/2009/TE-II dated 19-02-2010. BSNL in order to keep pace with technological developments introduced Web Based Telegraph Messaging System in all circles by 31-03-2010. Further no Telex machines had been encountered at any of the scrap dealer in the study area.
- 3. Typewriter production stopped in India in 2010. Godrej & Boyce was the only typewriter producing company in the world. Although primary survey in the five districts of the study area, indicated presence of mechanical typewriters in courts premises & few government offices. Further, primary survey at the scrap dealer also did not indicate any presence of electric or electronic typewriter coming into the dismantling or recycling chain.
- 4. NSSO data, Census data & data from research institution indicate temporal data compilation at national, state & district level for all types of TV (CRT, LCD & LED) clubbed together.

Therefore, all the three items under consumer Electrical & Electronics under schedule 1 of E-waste rules have been clubbed under the head TV for E-waste inventory assessment.

- 5. Temporal data from Census, NSSO, MOCIT, TRAI, TEMA market research institutions & telecom operators is classified under fixed line and cellular subscribers at national, state & district level. Further, cellular subscribers consist of GSM & WLL categories. Therefore, Pay telephones, Cordless telephones and Answering systems have been considered as sub-segments under fixed line subscriber segment since the consumers choice of instrument cannot be accomplished without subscription to a telephone connection. Therefore, E-waste inventory assessment has been carried out based on temporal fixed line and cellular telephone subscription at district level consisting of both rural & urban consumers.
- 6. Temporal data from Census, NSSO, MOCIT, MAIT market research institutions & telecom operators is classified under Desktop, PC, Notebooks & servers at national, state & district level. Further, Notebook consumers consist of netbooks & notepad computers, servers have also been considered consisting of mainframes & minicomputers subscribers consist of GSM & WLL categories. Therefore, E-waste inventory assessment has been carried out under the head of "computers".
- 7. Among the white goods both households and commercial segments drive the air conditioner market, while households drive the refrigerator, washing machine and TV market.

4.3 Methodology / Approach & Instruments Used

Carnegie Mellon method has been identified for E-waste inventory assessment in study area. Major data requirements in order to use this method are given below.

- 1. Information about stakeholders i.e. recycler / dismantler, scrap dealer, consumer etc.
- 2. Stock and generation of E-waste
- 3. Origin of new electrical and electronic equipment i.e. mode of procurement
- 4. Life time of electrical and electronic equipment
- 5. End of life management of electrical and electronic equipment
- 6. Process involved during dismantling
- 7. Final destination of E-waste fractions

In order to get the required data, two approaches have been adopted. These approaches are depicted in **Figure 4.2** and cover all the identified stakeholders in study area. Salient features of these approaches are given below.

Approach 1: Combination of primary and secondary data collection

Different types of data required has been identified collected, Collated & analyzed from the sources given in **Table 4.1**.

Approach 2: E-waste tracer tracking

In this approach, E-waste tracers are identified at dumpsites, which lead to identification of stakeholders further up on the upstream side of the material flow chain as given in **Figure 4.2**. These stakeholders include dismantlers, junkyard owners, repair shops and retail shops. Different processes carried out by stakeholders are identified, photo-documented and quantified. A list of dismantlers / recyclers, scrap dealers, trading agents, landfill sites and other agencies surveyed is given in chapter 3 and related annexures.



Division

4.4 Conclusion

Data matrix versus methodology used for E-waste inventory assessment indicates "Market Supply" method and "Carnegie Mellon" method can be applied for E-waste inventory assessment in five districts of Chhattisgarh in Raipur division. However, a combination of Carnegie Mellon method & tracer tracking has been selected for inventory assessment since it covers all the aspects of material flow chain. Assessment of data from these stakeholders through tracer tracking has resulted in assessment of obsolescence rate or average life of equipment described in chapter 5.

Chapter 5: E-Waste Inventory Assessment

5.1 Introduction

This chapter describes the E-waste inventory and market scenario for the E-waste management system in Raipur division. Since E-waste inventory forms the basis of planning for E-waste management system, an effort has been made to assess the E- waste inventory and market potential in the country. Following sections describe each of these items followed by pollution potential and risk profiling.

5.2 Market Size Assessment of Electrical and Electronic Equipment (EEE) in Raipur Division

The time series data related to market size of each of the EEE items has been computed from data obtained from different agencies as well as from trend analysis. This data was compiled from data sources described in chapter 4. The EEE market size for Air Conditioners, refrigerator, washing machine, personal computers, cellular telephones, TVs and other items as per schedule 1 is shown in **Table 5.1** to **Table 5.8**.

Year	Baloda	Dhamtari	Gariaband	Mahasman	Raipur
2006	3662	2493	1819	3129	11808
2007	22872	15045	10983	18982	72751
2008	35226	22397	16364	28390	110546
2009	47814	29394	21500	37420	148080
2010	58746	34929	25584	44641	179583
2011	61406	37623	28115	48583	191173
2012	69727	41323	30788	53571	214311
2013	78004	44730	33215	58192	236749
2014	86358	47931	35462	62551	258884
2015	94878	50988	37573	66717	280998
2016	103634	53946	39577	70742	303306
2017	112687	56838	41500	74664	325980
2018	122086	59691	43358	78510	349164
2019	131879	62528	45166	82303	372983
2020	142111	65366	46933	86060	397552

Table 5.1: Installed base for Cellular Telephone in Study Area (in numbers)

Source: Census 1991, 2001 & 2011, Telecom Regulatory Authority of India (TRAI), Department of telecommunications (DOT)

Table 5	Table 5.2: Installed base for Fixed Line Telephone in Study Area (in numbers)										
Year	Baloda	Dhamtari	Gariaband	Mahasman	Raipur						
2006	15657	10658	7776	13379	50488						
2007	13504	8882	6485	11207	42951						
2008	16025	10188	7444	12915	50289						
2009	15007	9226	6748	11745	46476						
2010	14119	8395	6149	10729	43162						
2011	13213	8095	6050	10454	41135						
2012	13080	7752	5776	10049	40203						

Year	Baloda	Dhamtari	Gariaband	Mahasman	Raipur
2013	12950	7426	5514	9661	39304
2014	12822	7117	5265	9287	38438
2015	12697	6823	5028	8928	37604
2016	12574	6545	4802	8583	36800
2017	12453	6281	4586	8251	36025
2018	12335	6031	4381	7932	35278
2019	12219	5793	4185	7626	34558
2020	12105	5568	3998	7331	33864

Source: Census 1991, 2001 & 2011, Telecom Regulatory Authority of India (TRAI), Department of telecommunications (DOT)

Table 5.3: Installed base for Computers in Study Area (in numbers)

	Year	Baloda	Dhamtari	Gariaband	Mahasman	Raipur
	2006	1317	814	431	951	10188
	2007	2120	1311	695	1532	16402
	2008	3562	2202	1167	2573	27556
	2009	6092	3765	1996	4400	47120
	2010	9838	6081	3223	7106	76099
	2011	15544	9608	5092	11228	120236
	2012	24715	15277	8096	17853	191176
	2013	40285	24901	13197	29100	311617
	2014	63706	39377	20868	46017	492773
	2015	102404	63297	33544	73970	792109
	2016	164610	101747	53921	118903	1273278
	2017	264603	163554	86676	191131	2046734
	2018	425337	262906	139327	307234	3290029
	2019	683708	422608	223962	493864	5288566
	2020	1099029	679323	360008	793864	8501120
C	0	1001 0001 2 0011	ATT MICCO			

Source: Census 1991, 2001 & 2011, MAIT, NSSO

Table 5.4: Installed base for Printers in Study Area (in numbers)

Year	Baloda	Dhamtari	Gariaband	Mahasman	Raipur
2006	198	122	65	143	1528
2007	318	197	104	230	2460
2008	463	286	152	335	3582
2009	1157	715	379	836	8953
2010	2361	1459	773	1706	18264
2011	2798	1729	917	2021	21643
2012	3707	2292	1214	2678	28676
2013	5640	3486	1848	4074	43626
2014	6317	3904	2069	4563	48862
2015	7075	4373	2318	5110	54725
2016	7924	4898	2596	5724	61292
2017	8875	5486	2907	6410	68647
2018	9940	6144	3256	7180	76885
2019	11132	6881	3647	8041	86111
2020	12468	7707	4084	9006	96444

Source: Census 1991, 2001 & 2011, MAIT, NSSO

Table 5.5. Installed base for TV in Study Alea (in humbers)								
	Year	Baloda	Dhamtari	Gariaband	Mahasman	Raipur		
	2006	51243	36911	20486	41668	238631		
	2007	56672	39569	22272	44565	257665		
	2008	62529	42326	24157	47564	277786		
	2009	68842	45186	26151	50667	299056		
	2010	68209	45879	28155	52988	295692		
	2011	74836	48800	29913	56259	317581		
	2012	81968	51830	31718	59643	340711		
	2013	89642	54975	33573	63143	365155		
	2014	97893	58240	35479	66763	390986		
	2015	106763	61632	37436	70506	418285		
	2016	116293	65156	39446	74376	447135		
	2017	126529	68821	41511	78377	477626		
	2018	133862	71110	42279	80134	502956		
	2019	149316	76600	45808	86783	543909		
	2020	161973	80731	48044	91196	579908		
C	0	1001 0001 1 0011 DT	CTAT & ATOOO					

Table 5.5: Installed base for TV in Study Area (in numbers)

Source: Census 1991, 2001 & 2011, ELCINA, NSSO

Table 5.6: Installed base for AC in Study Area (in numbers)

Year	Baloda	Dhamtari	Gariaband	Mahasman	Raipur
2006	257	227	49	207	2183
2007	290	251	58	221	2422
2008	326	278	68	235	2681
2009	366	306	79	250	2961
2010	349	303	93	260	2908
2011	390	333	101	276	3200
2012	436	365	110	292	3516
2013	485	399	119	309	3857
2014	540	436	128	326	4225
2015	600	476	139	343	4623
2016	665	519	149	362	5052
2017	737	565	161	380	5515
2018	816	614	173	400	6014
2019	902	668	186	419	6553
2020	997	725	200	440	7133

Source: Census 1991, 2001 & 2011, ELCINA, NSSO

Table 5.7: Installed base for Washing Machine in Study Area (in numbers)

Year	Baloda	Dhamtari	Gariaband	Mahasman	Raipur
2006	371	292	117	183	2298
2007	417	321	130	197	2562
2008	466	351	144	212	2842
2009	519	383	159	227	3139
2010	505	385	174	237	3113
2011	558	417	186	252	3412
2012	614	450	197	267	3728
2013	674	485	208	281	4062
2014	739	521	220	296	4414

Year	Baloda	Dhamtari	Gariaband	Mahasman	Raipur
2015	807	559	232	311	4785
2016	881	598	244	326	5177
2017	959	640	256	340	5589
2018	1042	683	269	355	6022
2019	1131	728	282	369	6478
2020	1226	775	295	384	6955

Source: Census 1991, 2001 & 2011, ELCINA, NSSO

Table 5.8: Installed base for Refrigerator in Study Area (in numbers)										
Year	Baloda	Dhamtari	Gariaband	Mahasman	Raipur					
2006	590	490	153	350	4264					
2007	685	559	177	392	4933					
2008	791	636	203	437	5678					
2009	910	720	235	484	6505					
2010	900	740	271	523	6643					
2011	1028	832	297	575	7551					
2012	1170	934	325	630	8557					
2013	1329	1045	355	688	9671					
2014	1506	1168	387	749	10902					
2015	1704	1303	421	814	12262					
2016	1924	1451	458	882	13764					
2017	2170	1614	498	954	15420					
2018	2444	1793	541	1031	17245					
2019	2749	1989	587	1111	19255					
2020	3088	2204	636	1195	21467					
Source: Census 1	991, 2001 & 2011, ELC	TNA, NSSO								

Analysis of **Table 5.1** to **Table 5.8** shows that cell phone have the highest installed base followed by Computers, TV, printers, fixed line telephone, refrigerators, washing machines and Air Conditioners. In Raipur cellular phone, fixed line phone, TV, Air condition, washing machine and refrigerator has the highest installed base followed by Baloda, Dhamtari, Gariaband and Mahasmund districts of

5.3 Obsolescence Rate / Average Life

Raipur division.

Obsolescence rate / Average life for electrical and electronic equipment (EEE) has been calculated based on results of the sampling carried out for consumers, dismantlers, retailers and dumpsites along the E-waste "trade value chain" described in chapter 3 & chapter 4 and summarized in **Table 5.9**. The storage time takes into account storage at owner's premises, collection agency (scrap dealer) & dismantler's premises.

Table 5.9: Average Life and Storage of E-waste									
EEE Item	Average Life & Reuse (Years)	Storage (Years)							
Cellular Phone	3	0.5 - 1							
Computer	7	0.5 - 1							
Printer	5	0.5 - 1.0							
Washing Machine	12	0.5 - 12							
TV	10	1							
Refrigerator	12	0.5 - 1							
Air Conditioners	12	1 - 2							
Fixed Line Telephone	5	0.5 - 1							

A conservative estimate of the average life of each EEE item has been prepared by considering highest values of average life and storage time considering the consumer behavior in five districts. This estimate has been summarized in Table 5.10.

Table 5.10: Obsolescence Rate of Tracer EEE								
Sr. No.	EEE	Average Life (Years)						
1	Cellular Phone	3						
2	Computer	7						
3	Printer	5						
4	Washing Machine	12						
5	TV	10						
6	Refrigerator	12						
7	Air Conditioner	12						
8	Fixed Line Telephone	5						

The average weights of each of the six items considered for computing E-waste inventory is given in Table 5.11.

I able 5.11: Average weight of EEE						
Item	Average Weight (Kg)					
Cellular Phone	0.100					
Computer / Laptop / Server	27.2 / 2.5 to 3 / 650					
Printer (MFP)	6.5 – 7					
Washing Machine	55					
TV (CRT) / LCD / LED	31.6 (CRT) / 12 – 15 (LCD / LED)					
Refrigerator	35					
Air Conditioner	55					
Fixed Line Telephone	0.5 - 1.5					

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5.4 Weee/E-Waste Inventory

The projected district wise E-waste inventory estimates both in numbers and weights for Raipur division starting from 2011 till 2020 have been described in Table 5.12 to Table 5.21 and presented in Figure 5.1 to Figure 5.7.

Table 5.12: E-waste Inventory of Baloda Bazar District (in numbers)

		Fixed			Washin			
		Line			g			Air
	Cellular	Telephon	Compute		Machin		Refrigerat	Condition
Year	Phone	e	r	Printer	e	TV	or	er
2011	35226	15657	622	198	68	29576	102	112
2012	47814	13504	884	318	153	33259	201	123
2013	58746	16025	1317	463	184	37245	249	142
2014	61406	15007	2120	1157	216	41555	303	163
2015	69727	14119	3562	2361	251	46213	363	187
2016	78004	13213	6092	2798	289	51243	431	200
2017	86358	13080	9838	3707	329	56672	506	227
2018	94878	12950	15544	5640	371	62529	590	257
2019	103634	12822	24715	6317	417	68842	685	290
2020	112687	12697	40285	7075	466	68209	791	326

		Fixed			Washin			
		Line			g			Air
	Cellular	Telephon	Compute		Machin		Refrigerat	Condition
Year	Phone	e	r	Printer	e	TV	or	er
2011	5.28	15.66	13.03	1.38	3.75	914.34	3.57	6.13
2012	7.17	13.50	18.51	2.23	8.41	1028.20	7.04	6.77
2013	8.81	16.02	27.58	3.24	10.10	1151.42	8.73	7.82
2014	9.21	15.01	44.40	8.10	11.90	1284.66	10.61	8.99
2015	10.46	14.12	74.59	16.53	13.82	1428.66	12.72	10.28
2016	11.70	13.21	127.54	19.59	15.87	1584.17	15.07	11.02
2017	12.95	13.08	205.98	25.95	18.07	1752.02	17.71	12.50
2018	14.23	12.95	325.45	39.48	20.42	1933.08	20.67	14.14
2019	15.55	12.82	517.47	44.22	22.94	2128.26	23.98	15.94
2020	16.90	12.70	843.48	49.52	25.63	2108.69	27.69	17.93

Table 5.13: E-waste Inventory of Bodala Bazar District (in Tons)



Figure 5.1: Item wise E-waste Projection of Baloda Bazar District

				J		(
		Fixed			Washin			
		Line			g			Air
	Cellular	Telephon	Compute		Machin		Refrigerat	Condition
Year	Phone	e	r	Printer	e	TV	or	er
2011	22397	10658	385	122	69	24934	103	112
2012	29394	8882	546	197	138	27167	186	121
2013	34929	10188	814	286	161	29477	226	137
2014	37623	9226	1311	715	186	31869	269	155
2015	41323	8395	2202	1459	211	34345	317	174
2016	44730	8095	3765	1729	237	36911	369	183
2017	47931	7752	6081	2292	264	39569	426	204
2018	50988	7426	9608	3486	292	42326	490	227
2019	53946	7117	15277	3904	321	45186	559	251

Table 5 14. E-waste Inventor	v of Dhamtari District (in numbers)
Table 5.14. L-waste mitchtor	y of Difamilian Distinct (in manifolis)

2020	56838	6823	24901	4373	351	45879	636	278
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		Fixed			Washin			
		Line			g			Air
	Cellular	Telephon	Compute		Machin		Refrigerat	Condition
Year	Phone	e	r	Printer	e	TV	or	er
2011	3.36	10.66	8.06	0.85	3.79	770.84	3.60	6.15
2012	4.41	8.88	11.44	1.38	7.58	839.87	6.50	6.65
2013	5.24	10.19	17.04	2.00	8.88	911.29	7.90	7.56
2014	5.64	9.23	27.44	5.01	10.21	985.22	9.42	8.53
2015	6.20	8.39	46.10	10.22	11.59	1061.78	11.09	9.58
2016	6.71	8.10	78.84	12.11	13.02	1141.09	12.92	10.08
2017	7.19	7.75	127.32	16.04	14.50	1223.29	14.92	11.24
2018	7.65	7.43	201.17	24.40	16.04	1308.51	17.13	12.48
2019	8.09	7.12	319.86	27.33	17.64	1396.91	19.57	13.83
2020	8.53	6.82	521.37	30.61	19.32	1418.35	22.25	15.28

Table 5.15: E-waste Inventory of Dhamtari District (in Tons)



Figure 5.2: Item wise E-waste Projection of Dhamtari District

	Table 5.10. L-waste inventory of Gallabalid District (in numbers)											
		Fixed			Washin							
		Line			g			Air				
	Cellular	Telephon	Compute		Machin		Refrigerat	Condition				
Year	Phone	e	r	Printer	e	TV	or	er				
2011	16364	7776	204	65	8	12771	11	15				
2012	21500	6485	290	104	54	14173	60	17				
2013	25584	7444	431	152	64	15640	72	21				
2014	28115	6748	695	379	74	17177	85	26				
2015	30788	6149	1167	773	84	18790	100	31				
2016	33215	6050	1996	917	95	20486	115	35				
2017	35462	5776	3223	1214	106	22272	133	41				
2018	37573	5514	5092	1848	117	24157	153	49				

Table 5.16: E-waste Inventory of Gariaband District (in numbers)

2019	39577	5265	8096	2069	130	26151	177	58
2020	41500	5028	13197	2318	144	28155	203	68

Table 5.17: E-waste Inventory of Gariaband District (in Tons)

		Fixed			Washin			
		Line			g			Air
	Cellular	Telephon	Compute		Machin		Refrigerat	Condition
Year	Phone	e	r	Printer	e	TV	or	er
2011	2.45	7.78	4.27	0.45	0.42	394.81	0.40	0.81
2012	3.22	6.48	6.06	0.73	2.99	438.15	2.10	0.95
2013	3.84	7.44	9.03	1.06	3.53	483.51	2.53	1.17
2014	4.22	6.75	14.54	2.65	4.07	531.03	2.99	1.41
2015	4.62	6.15	24.43	5.41	4.62	580.91	3.49	1.69
2016	4.98	6.05	41.78	6.42	5.20	633.33	4.04	1.92
2017	5.32	5.78	67.48	8.50	5.81	688.55	4.66	2.28
2018	5.64	5.51	106.61	12.93	6.45	746.82	5.37	2.69
2019	5.94	5.27	169.52	14.48	7.15	808.45	6.18	3.17
2020	6.23	5.03	276.31	16.22	7.90	870.42	7.12	3.73



Figure 5.3: Item wise E-waste Projection of Gariaband District

	Tuble citer 12 muste inventory of infantabiliting District (in humbers)											
		Fixed			Washin							
		Line			g			Air				
	Cellular	Telephon	Compute		Machin		Refrigerat	Condition				
Year	Phone	e	r	Printer	e	TV	or	er				
2011	28390	13379	450	143	75	28608	112	131				
2012	37420	11207	638	230	96	31041	146	137				
2013	44641	12915	951	335	110	33560	175	150				
2014	48583	11745	1532	836	125	36169	206	163				
2015	53571	10729	2573	1706	139	38871	239	176				
2016	58192	10454	4400	2021	153	41668	274	179				

Table 5.18: E-waste Inventory of Mahasmund District (in numbers)

T 7	Cellular	Fixed Line Telephon	Compute	D • • •	Washin g Machin		Refrigerat	Air Condition
Year	Phone	e	r	Printer	e	TV.	or	er
2017	62551	10049	7106	2678	168	44565	311	193
2018	66717	9661	11228	4074	183	47564	350	207
2019	70742	9287	17853	4563	197	50667	392	221
2020	74664	8928	29100	5110	212	52988	437	235

Table 5.19: E-waste Inventor	v of Mahasmund District	(in Tons)
Tuble 5.17. L waste meentor	y of manabiliana District	(111 1 0110)

		Fixed			Washin			
		Line			g			Air
	Cellular	Telephon	Compute		Machin		Refrigerat	Condition
Year	Phone	e	r	Printer	e	TV	or	er
2011	4.26	13.38	9.41	1.00	4.11	884.43	3.91	7.22
2012	5.61	11.21	13.37	1.61	5.30	959.63	5.12	7.53
2013	6.70	12.92	19.92	2.34	6.07	1037.50	6.13	8.23
2014	7.29	11.74	32.07	5.85	6.86	1118.16	7.21	8.95
2015	8.04	10.73	53.88	11.94	7.64	1201.68	8.35	9.69
2016	8.73	10.45	92.13	14.15	8.44	1288.17	9.57	9.87
2017	9.38	10.05	148.79	18.75	9.24	1377.72	10.87	10.61
2018	10.01	9.66	235.09	28.52	10.04	1470.43	12.25	11.36
2019	10.61	9.29	373.79	31.94	10.85	1566.38	13.72	12.14
2020	11.20	8.93	609.27	35.77	11.67	1638.13	15.28	12.94



Figure 5.4: Item wise E-waste Projection of Mahasmund District

	Table 5.20: E-waste Inventory of Raipur District (in numbers)										
	Fixed				Washin						
		Line			g			Air			
	Cellular	Telephon	Compute		Machin		Refrigerat	Condition			
Year	Phone	e	r	Printer	e	TV	or	er			
2011	110546	50488	4815	1528	674	157748	1007	1072			
2012	148080	42951	6837	2460	1005	172198	1474	1159			

Table 5.20: E-waste Inventory of Raipur District (in numbers)

Vaaa	Cellular	Fixed Line Telephon	Compute	Dringen	Washin g Machin	'T'X 7	Refrigerat	Air Condition
rear	Phone	e	r	Finter	e	1 V	or	er
2013	179583	50289	10188	3582	1190	187460	1820	1316
2014	191173	46476	16402	8953	1386	203584	2208	1487
2015	214311	43162	27556	18264	1594	220623	2640	1672
2016	236749	41135	47120	21643	1815	238631	3124	1757
2017	258884	40203	76099	28676	2049	257665	3663	1961
2018	280998	39304	120236	43626	2298	277786	4264	2183
2019	303306	38438	191176	48862	2562	299056	4933	2422
2020	325980	37604	311617	54725	2842	295692	5678	2681

Table 5.21: E-waste Inventory of Raipur District (in Tons)

		Fixed			Washin			
		Line			g			Air
	Cellular	Telephon	Compute		Machin		Refrigerat	Condition
Year	Phone	e	r	Printer	e	TV	or	er
2011	16.58	50.49	100.82	10.70	37.08	4876.78	35.25	58.96
2012	22.21	42.95	143.16	17.22	55.25	5323.50	51.58	63.72
2013	26.94	50.29	213.30	25.08	65.44	5795.32	63.71	72.38
2014	28.68	46.48	343.42	62.67	76.23	6293.81	77.27	81.77
2015	32.15	43.16	576.95	127.85	87.68	6820.56	92.41	91.95
2016	35.51	41.14	986.58	151.50	99.82	7377.28	109.33	96.66
2017	38.83	40.20	1593.32	200.73	112.72	7965.72	128.20	107.88
2018	42.15	39.30	2517.45	305.38	126.40	8587.75	149.24	120.04
2019	45.50	38.44	4002.75	342.03	140.92	9245.31	172.66	133.21
2020	48.90	37.60	6524.48	383.07	156.32	9141.32	198.73	147.46



Figure 5.5: Item wise E-waste Projection of Raipur District

Table	5.22: /	A11 E-	waste	Items	Inventory	of R	lainur	Di	vision	(in	Tons'
I ante	J.22. 1	- m - L	waste	Items	mentory		aipui	$\mathbf{\nu}$	131011	(111)	1 0113

Year	Baloda	Dhamtari	Gariaband	Mahasman	Raipur	Total
2011	963.15	807.32	411.40	927.72	5186.66	8296.25

Year	Baloda	Dhamtari	Gariaband	Mahasman	Raipur	Total
2012	1091.83	886.70	460.70	1009.37	5719.60	9168.20
2013	1233.72	970.10	512.10	1099.81	6312.46	10128.20
2014	1392.88	1060.71	567.66	1198.13	7010.32	11229.69
2015	1581.17	1164.95	631.32	1311.95	7872.70	12562.10
2016	1798.18	1282.85	703.72	1441.51	8897.81	14124.07
2017	2058.27	1422.25	788.36	1595.41	10187.61	16051.90
2018	2380.41	1594.81	892.03	1787.36	11887.71	18542.32
2019	2781.18	1810.34	1020.15	2028.72	14120.81	21761.20
2020	3102.54	2042.52	1192.95	2343.19	16637.87	25319.07



Figure 5.6: District wise Total E-waste Inventory Projection



Figure 5.7: Total E-waste Inventory Projection in Raipur Division from 2011 to 2020

The results of E-waste inventory estimates in (Tons) for Raipur division is given in **Table 5.22**. Major inferences, which can be drawn from E-waste inventory results, are given below.

- 1. Inventory estimates in Raipur division indicate that E-waste generation ranges from **8296.25** tons in 2011 to **25319.07** tons in 2020.
- In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 88% of the total inventory followed by refrigerator (1%), Washing machine (1%), Air conditioner (1%), Cellular phone (1%), Computer (6%), Fixed Line Phone (1%) & Printer (1%) as shown in Figure 5.8.
- 3. In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (60%), computer will constitute about 35% of the total inventory followed by Refrigerator (1%), Air conditioner (1%), Washing machine (1%), Cellular phone (0%), Printer (2%) & Fixed Line Phone (0%) as shown in **Figure 5.9**.



Figure 5.8: Item-wise E-waste in Percent for Raipur Division in 2015



Figure 5.9: Item-wise E-waste in Percent for Raipur Division in 2020

5.5 E-waste Processing in Raipur Division

There are various processes involved for dismantling, recycling / reuse of E-waste in Raipur division. These processes for different types of electronic items are given in **Table 5.23**. The photodocumentation of some of these processes observed. An analysis of the different processes observed to recover metals indicates that no chemical process is occurring in study area. Only physical processes, which prepare raw material for recycling industry is observed in the study area. Iron recovered from E-waste is recycled through induction arc furnace route in the study area.

Sr.		Process Sta		Process Statu	us		
No.	Process name	Baloda	Dhamtari	Gariaband	Mahasmund	Raipur	
1	IC's Extraction from PCB	No	No	No	No	No	
2	Surface Heating of PCB and Extraction of components	No	No	No	No	No	
3	Dissembling of Monitor & TV and extraction of components	Yes	Yes	Yes	Yes	Yes	
4	Yoke core and Copper	No	No	No	No	No	
5	Metallic Core of Transformer and Copper	Yes	Yes	Yes	Yes	Yes	
6	Rare Earth Core of Transformer and Copper	No	No	No	No	No	
7	Rare Earth Core of Static Transformer	No	No	No	No	No	
8	Wire PVC and Copper	Yes	Yes	Yes	Yes	Yes	
9	Plastic Shredder	No	No	No	No	No	
10	Dismantling of Refrigerator and Compressor	Yes	Yes	Yes	Yes	Yes	
11	Gold Extractions from Pins and Comb	No	No	No	No	No	
12	Acid Bath for PCB	No	No	No	No	No	
13	Regunning CRT's	No	No	No	No	No	
14	Glass Recovery from CRT	No	No	No	No	No	
15	Gold Recovery	No	No	No	No	No	

Table 5.23: E-waste dismantling process occurring in the study area

Trade Economics

Trade economics has been studied in terms of various processes, which occur along the trade value chain. Each stakeholder in the processes studied is linked to the other and the trade between the two takes place based on value added. The fundamental parameters governing this trade are same as that of any other trade. These parameters are described below.

- 1. Input cost
- 2. Operating Margin
- 3. Selling price

Input costs have been classified into the following costs.

- 1. Raw material cost
- 2. Labour cost

Selling price is the price at which the products are sold. The difference between the selling price and the input costs gives the operating margin. Operating margin is an indicator of the profit and has been computed in terms of operating margin per kg of raw material.

The entire trade economics of each of the processes is summarized in **Table 5.24**. **Table 5.24** does not include capital, depreciation, taxation and transportation cost. Labour refers to workers involved in e-waste extraction industry only and only 300 working days in a year.

Item	Rate / piece	Input Cost per Kg.	Labour Cost per Kg.	Output Price per Kg.	Profitability	%
TV	600	20.00	0.39	20.83	0.44	2.18
Ref	1000	22.22	0.39	34.07	11.46	50.69
WM	750	18.75	0.39	32.17	13.03	68.06
AC	3000	54.55	0.39	73.33	18.40	33.49
PC	1100	35.48	0.39	42.85	6.98	19.45
Mobile	38	38.00	0.39	62.59	24.20	63.04

Table 5.24: Trade economics of Raipur Division E-waste market

Some major observations from **Table 5.24** are as follows:

- 1. Operating margin for Television waste per kilogram is Rs. 0.44
- 2. Operating margin for waste refrigerator is Rs. 11.46 per kilogram
- 3. For that of Washing Machine is Rs. 13.03 per kilogram
- 4. For that of Air Conditioners is Rs. 18.40 per kilogram
- 5. For scrap old Personal Computer is Rs. 6.98 per kg and
- 6. For waste cellular phones is Rs. 24.20 per kg
- 7. The operating margin ranges from Rs. 0.44 to Rs. 24.20 per kilogram. Scrap of Mobile / cellular phones gives the maximum operating margin of Rs. 24.20 while scrap from television gives the minimum profit of Rs. 0.44 per kilogram. This indicates that informal sector if brought into formal sector considering taxation involved will only dismantle / recycle cellular phones followed by ACs and WMs to some extent. Therefore, there is a need to formulate financial instrument for making dismantling / recycling of white goods viable.

5.6 Market Risks

Market risks based on the assessment of demand, supply, collection and transportation primarily address availability (quantity) of raw material as E-waste. These risks have been assessed and described below based on duration (short term, long term) along with their intensities.

- 1. Risks of availability of raw material (E-waste)
- 2. Risk associated with collection
- 3. Risk associated with transportation

Risk profiling giving the intensities as part of market assessment has been highlighted in Table 5.25 given below.

Risks/ intensities		High	Medium	Low
Risks of availability	Short term			
of raw material	Long term		\checkmark	
Risk associated with	Short term	\checkmark		
collection	Long term		\checkmark	
Risk associated with	Short term			\checkmark
transportation	Long term			\checkmark
	Long term		\checkmark	

Table 5.25: Market Risk Matrix

The intensities have been fixed as per following analysis.

- 1. Risks of availability of raw material has been assessed as medium since enough Ewaste potential exists in Raipur division to be processed both in the short term and long term especially after 2014. This will depend on the implementation of regulatory regime, which will enable the E-waste generators to send the waste to dismantling / recycling facility.
- 2. Risk associated with collection is expected to be high in the short term as there is no formal collection mechanism in place in the study area. In this situation, the recycling facility will face the risk of collecting E-waste from the source, which could be geographically dispersed. In the long term this risks expected to be medium as collection and transportation mechanism is expected to be institutionalized. In the short term, the recycling facility is expected to be making their own arrangements for collection from vendors.
- 3 Risk associated with transportation is expected to be low in both short and long term as there is transportation mechanism in place both at the local and national level to carry hazardous waste. Since some E-waste is already being transported outside study area, therefore transportation risk is expected to be of low intensity

5.7 Conclusions

Market risks matrix highlight the availability of raw material, its collection and transportation as risks of high & medium intensities. Collection mechanism directly impacts the availability of raw material. Therefore, there is a need for both strict implementations of regulations as well as financial instrument for diverting E-waste inventory in to the formal sector.

Chapter 6: Conclusions & Recommendations

Major conclusions & recommendations, which have been arrived after assessment of E-waste regulations, E-waste material flow chain and inventory estimates are given below.

- Implementation of E-waste regulation is a major challenge
- There is no organized mechanism for collection, transportation and disposal of E-Waste in Raipur division.
- No mechanism exists in the state to monitor and track its inventory, collection, transportation and disposal.
- Currently, a majority of producers use call centre as well as dealer's network for collection of E-waste.
- Electronic items go to mechanic shops from households for repairing, and mechanic replace damaged / defunct parts/components from it and then they sold it to scrap dealers.
- Major conclusions, which can be derived, include growing market of EEE in Raipur division. This growth may lead to increasing E-waste generation, which may further lead to higher pollution loads, health impacts and loss of recoverable items.
- Mechanics sell E-waste to scrap dealer by weight / Pcs. mainly of ICT items (IT as per Schedule 1); TV circuit Rs. 15-45/kg; Compressor Rs. 300-400/Pcs.; Washing Machine Motor Rs. 200/Pcs.; Copper Rs. 200-350/kg; DVD Circuit Rs. 20-25/kg; Mobile kit Rs. 1000-2000/kg; SMPS Rs. 50/Pcs, Mother Board Rs. 90/Pcs.; Hard disk Rs. 120/Pcs.; CD Writer Rs. 35-40/Pcs.
- Scrap vendors sold E-waste to scrap dealer by weight at Rs. 150-250 per kg
- Scrap vendors sold damage mobile phone to scrap dealer as individual piece at Rs. 30-50 per piece
- Scrap dealer comes from Delhi yearly twice/thrice for collecting of E-waste.
- Since no mechanism exist for tracking purchase of EEE by bulk consumers and producers are not required to declare quantity of EEE placed in the market since 2012, E-waste inventory assessment has to rely on available historical market research data as well as data from collectors, dismantlers / recyclers.
- Data matrix versus methodology used for E-waste inventory assessment indicates "Market Supply" method and "Carnegie Mellon" method can be applied for E-waste inventory assessment in five districts of Raipur Division in Chhattisgarh. However, a combination of Carnegie Mellon method & tracer tracking has been selected for inventory assessment since it covers all the aspects of material flow chain.
- Analysis shows that cell phone have the highest installed base followed by Computers, TV, printers, fixed line telephone, refrigerators, washing machines and Air Conditioners. In Raipur cellular phone, fixed line phone, TV, washing machine and refrigerator has the highest installed base followed by Baloda Bazar, Dhamtari, Gariaband, Mahasmund and Raipur districts of Raipur division.
- Inventory estimates in Raipur division indicate that E-waste generation ranges from **8296.25** tons in 2011 to **25319.07** tons in 2020.
- In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 88% of the total inventory followed by refrigerator (1%), Washing machine (1%), Air conditioner (1%), Cellular phone (1%), Computer (6%), Fixed Line Phone (1%) & Printer (1%).
- In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (60%), computer will constitute about 35% of the total inventory followed by Refrigerator (1%), Air conditioner (1%), Washing machine (1%), Cellular phone (0%), Printer (2%) & Fixed Line Phone (0%).

- An analysis of the different processes observed to recover metals indicates that no chemical process is occurring in study area. Only physical processes, which prepare raw material for recycling industry is observed in the study area. Iron recovered from E-waste is recycled through induction arc furnace route in the study area.
- Some major observations are that Operating margin for Television waste per kilogram is Rs. 0.44. Operating margin for waste refrigerator is Rs. 11.46 per kilogram. For that of Washing Machine is Rs. 13.03 per kilogram. For that of Air Conditioners is Rs. 18.40 per kilogram. For scrap old Personal Computer is Rs. 6.98 per kg and For waste cellular phones is Rs. 24.20 per kg. The operating margin ranges from Rs. 0.44 to Rs. 24.20 per kilogram. Scrap of Mobile / cellular phones gives the maximum operating margin of Rs. 24.20 while scrap from television gives the minimum profit of Rs. 0.44 per kilogram. This indicates that informal sector if brought into formal sector considering taxation involved will only dismantle / recycle cellular phones followed by ACs and WMs to some extent. Therefore, there is a need to formulate financial instrument for making dismantling / recycling of white goods viable.
- Market risks matrix highlight the availability of raw material, its collection and transportation as risks of high & medium intensities. Collection mechanism directly impacts the availability of raw material. Therefore, there is a need for both strict implementations of regulations as well as financial instrument for diverting E-waste inventory in to the formal sector.

List of producers – Annexure 1

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
	Television	LCD	BPL	Address Not Available Customer Care Number 1800 – 425 – 1800, 1800 – 425 – 2355
			Daenyx	A-30 & 31, Hosiery Complex, Phase II Extn. Noida - 201305 Uttar Pradesh (INDIA) Ph. No. +91-120- 3042721
			Haier	B-1/A-14, Mohan Co-operative Industrial Estate, Mathura Road, New Delhi-110044 Ph. No. 011-39496000/30674000 Toll Free No. 1800-200-9999 (24X7)
		Branch Offices	Hitachi	Hitachi India Pvt. Ltd. Units 802A and 802B, Tower 2, 8th Floor, Konnectus Building, Bhavbhuti Marg, Near Minto Bridge, Connaught Place, New Delhi – 110001 Ph. No. +91 (11) 30605252
				Hitachi India Pvt. Ltd Bangalore Branch Office Unit 103, 1st Floor, Shah Sultan Complex, No 17, Cunningham Road, Bangalore 560 052, India Ph. No. +91 (80) 2238 6986 / 987 / 984
				Hitachi India Pvt. Ltd. Mumbai Branch Office 508, Ascot Center, Next to Hilton hotel, Sahar Road, Andheri East, Mumbai 400099, India Ph. No. +91-22-28215625
				Hitachi India Pvt. Ltd. Chennai Branch Office 206, Apeejay House, No.12, Haddows Road, Nungambakkam, Chennai 600 006, India Ph. No. +91 (44) 2821 3108 / 3109
				Hitachi Ltd. Infrastructure Systems Company Mumbai Branch Office 707, Trade Centre, Opp. to MTNL Bldg Bandra-Kurla Complex.

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
No.	1100000100110	Category		
				Bandra (East) Mumbai 400 098
				Ph. No. +91+22-2650-0031
				Allied JB Friction Private
				Limited
		Group		A-12, Site IV, Industrial Area,
		Companies		Sahibabad – 201010, Dist.
				Ghaziabad (UP), India.
				Ph. No. 0120 4539600 - 700
				Aloka Trivitron Medical
				Technologies Pvt. Ltd.
				Plot # A5, Sipcot Industrial Park,
				Irrungattukottai Sri Perambudur
				Taluk, Kanchipuram – 60211/,
				IAMIL NADU
				Ph. No. 044-3/183/50
				Plyjac Logistics Pvt. Ltd.
				D – 1, 205, 2110 FI, Bootherang,
				Downi Andhori Fast Mumbai 400
				072
				Dh No 022 3359 5900
				Hitachi Chemical India
				Private Limited
				708 7th Floor Time Tower M G
				Road Gurgaon $- 122.002$ Ph
				No. 0124 - 4246498
				Hitachi Consulting Software
				Services India Private Limited
				Plot No 9, Gachibowli,
				Hyderabad – 500032, IndiaPh.
				No. 040 - 4034 3000
				Hitachi Consulting India
				Private Limited
				Incubation Space A2, Magarpatta
				City SEZ, Hadapsar Road, Pune
				411013
				Ph. No. 020 – 6511 1001/2
				Hitachi Data Systems India
				Pvt. Ltd.
				#278/23, Trident Towers, 3rd
				floor, 10th Main, T. Mariappa
				Road, Jaynagar 2nd Block,
				Bangalore 560 011, India
				Ph. No. +91 (80) 2657 6295
				Hitachi Hi-Rel Power
				Electronics Pvt. Ltd.B-52, 5th
				Floor, "Corporate House", Near
				Judges Bungalow, Bodakdev,

Sr. No.	Product Name	Product Sub	Brand	Address / Contact Details
		Category		
				Ahmedabad – 380 054 Gujarat –
				$\frac{1101a}{DL} = 1.01.70 + 4000.2200$
				Ph. No. +91 /9 - 4900 2300
				Hitachi High Technologies
				(Singapore) Pre. Ltd.
				Free Comparete Terrare Nehm
				Place
				Now Dolhi 110 019 India
				Ph. No. ± 91 (11) 4651 8450
				Hitashi Homo and Life
				Solutions (India) Ltd
				10th floor Abbijoot
				Mithalzhali Six Road
				Abmodobad 380 006 Cujarat
				Ph. No. ± 91 (79) 3041 4800
				Hitachi Koki India I td
				Plot No. 9A 1st Phase Peenva
				Industrial Area Bangalore 560
				058 India
				Ph No ± 91 (80) 4117 0777
				Hitachi Lift India Pyt Ltd
				Units 304-306 3rd Floor ABW
				Elegance Tower Jasola District
				Centre New Delhi 110 025 India
				Ph No ± 91 (11) 4060 5290
				Hitachi Maxell Ltd Chennai
				Liaison Office
				DBS Office Business Center
				Room No. 103, 31A Cathedral
				Garden Road. Near Palmgrove
				Hotel, Nungambakkam, Chennai,
				India
				Ph. No. +91 (44) 4264 9495
				Hitachi Maxell, Ltd. Mumbai
				Liaison Office
				No.401, 4th Floor "BANARASI
				HERITAGE" Mind Space, Link
				Road, Malad (West), Mumbai,
				India
				Ph. No. +91 (22) 3212 8193
				Hitachi Metals (India) Pvt.
				Ltd.
				Plot No. 94 & 95, Sector 8, IMT
				Manesar, Gurgaon - 122050 (HR)
				Ph. No. +91 (124) 4124800 /
				4812300 / 4812400
				Hitachi Metglas (India) Pvt.

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Ltd.
				Manesar Gurgaon - 122050 (HR)
				Ph. No. +91 (124) 4124800 /
				4812300 / 4812400
				Hitachi NeST Control Systems
				Pvt. Ltd.
				No.103, First Floor, Shah Sultan
				Complex No.17, Cunningham
				Koad, Dangalofe -300 032
				Ph. No. 080 - 6789 8700
				Hitachi Plant Technologies
				India Pvt. Ltd.
				DPC 101, 102 and 103, First
				Floor, Block No. 4A, DLF
				Corporate Park, MG Road, Phase
				- III, DLF City, Gurgaon, Haryana
				Ph. No. +91+12-4455-2344
				India Pyt I td
				116 & 117 1st floor Rectangle -
				1, D-4, District Centre, Saket,
				New Delhi 110 017, India
				Ph. No. +91 (11) 4052 5200
				Tata Hitachi Construction
				Machinery Co. Ltd.
				Jubilee Building, 44 Museum
				Road, Bangalore -500.025 Dh. No. 080 - 6605 3301 ~ 03
				Toyo Machinery & Metal Co
				Ltd. (India Liason Office)
				Units 304-306, 3rd Floor, ABW
				Elegance Tower, Jasola District
				Centre, New Delhi-110025
				Ph. No. 011 – 4060 5252
				LG Electronics India Pvt. Ltd,
			IC	Plot No. 51, Udyog Vihar,
			LG	Greater Noida: 201306
				Uttar Pradesh
				SGV Industries
				Plot No.41 & 42,
		Manufasturia-		Sector-6A, Sidcul Indl Area,
		Facilities	Markson	Haridwar (Uttrakhand)
		1 40111105		Pin Code - 249401
				Ph. 01334-239662/63/64
				Fax No. 01334- 239661
Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
------------	--------------	----------------------------	------------	--
				Email Id -
				store@sgvindustries.com
				Contact - Mr. Sunil Jain (Vice
				President) Mob. 9212669498
				Mr. Rajender Sharma (Facility
				Incharge) Mob. 9212669503
				SINK Industries
				Plot No.6A & 6B, Cabriel Boad, Sector 2
				Parwanoo (H P)
				Pin Code - 173220
				Ph. 01792- 232711
				Contact- Mr. Alok Kumar
				(Facility Incharge) Mob.
				9212669513
				SNR Electronics Ltd.
				Plot No.2, HPISDC Indl. Area,
				Baddi, Tehsil Nalagarh,
				Dist. Solan,(H.P.).
				Pin Code - 173205
				Ph.01795-244703
				Fax - 01/95-244/05
				(Facility Incharge) Mob
				9212669513
				PLOT No. 378, F.I.E,
				PATPARGANJ, DEHLI -
		Head Office		110092
				Ph. No. +91-11-43086501-502,
				22157662-63
				43B, Okhla Industrial Estate,
		Corporate ở	M D	New Delhi - 110020. India.
		Head Office	Moser Baer	1ei +91 11 40594444, 91 11 26011570 74
				$E_{ax} + 91 \ 11 \ 41635211 \ 26911860$
				Chennai
				Moser Baer India Ltd.
				81, IInd Floor
		Branch Offices		Valluvarkottam High Road
				Nungambakkam,
				Chennai - 600 034
				Tel: Ph.+91-44-42664358-59
				M & ES Office
				Moser Baer India Ltd.
				167-169, IInd Floor, Anna Salai,
				Saidapet, Chennai - 600 015
				101. +91-44-45050041-42-45

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Chennai Project Office
				Moser Baer Solar Limited
				OZ-2,OZ-3,OZ-4
				Hi-TECH-SEZ, Sipcot Industrial
				Part-3
				Oragadam, Sriperampudur Taluk
				Kancheepuram District
				Tamil Nadu - 602105
				Mumbai
				Moser Baer Entertainment Ltd
				Mukti Foundation Building,
				A Wing, 1st Floor,
				141- A, Model Town, Village
				Ambivali,
				Behind Kokilaben Dhirubhai
				Ambani Hospital,
				Four Bungalows, Andheri-West,
				Mumbai - 400053
				Domestic Marketing & CE
				Moser Baer India Ltd.
				510- Maker Chambers V
				5th Floor, Nariman Point
				Mumbai-400 021
				Telefax: +91-22-66157930-31
				Bangalore
				Moser Baer India Ltd.
				Raheja Plaza, Unit No.103
				17 Commissariat Road
				Bangalore - 560025
				Telefax : 080-41649712
				Kolkata
				Moserbaer Entertainment
				Limited
				1st Floor, 13 FLT. LT.
				Tapan Chowdhury Avenue,
				Mudiali,
				Kolkata - 700026
				Tel: +91-33-65419945-54
				Delhi
				235, Okhla Industrial Estate
				Phase III
				New Delhi -110 020
				Tel: +91-11-47624100
				Pune
				Moser Baer Photo Voltaic Ltd.
				311, IIIrd Floor
				Connaught Place
				28 Bund Garden Road
				Pune - 411 001

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
10.		Category		
				USA Distributor
				Media Masters LLC
				#440, 2601 S. Minnesota
		Representative		Ave., Ste 105 Sioux Falls,
		& Distributor		SD 5/105-4/50 USA
				Phone: +1-(888)-243-4465
				Fax: $+1-(877)$ 835-2834
				E-mail: sales@mediamastersdisc
				.com
		M		BOM & M& ES
		Manufacturing		66, Udyog Vinar,
		Facilities		Greater Noida (U.P.) - 201 306
				1ei: 0120-4386000
				Solid State Media
				A-104, Sector - 80 ,
				Phase - II, Noida (UP)
<u> </u>				MDV & MD Solar
				KIDFV & MID Solar
				Greater Noide (U.P.) 201306
				$T_{el}: 0120 \ 4658000$
				BOM & SSM
				$A_{-1}64$ Sector - 80
				Phase - II Noida (UP) - 201 305
				Tel: 0120-4307000
				PV Technologies India Ltd.
				Oz-2, $Oz-3$, $Oz-4$
				Hi-Techsez, Sipcot Industrial
				Park-3 Oragadam, Sriperampudur
				Taluk
				Kancheepuram District
				Tamilnadu - 602105
				MIRC Electronics Ltd.
				Onida House, G-1, M.I.D.C,
				Mahakali Caves Road, Andheri
		Componato		(E), Mumbai - 400 093.
		Address	Onida	Tel: 022 - 28200435 / 66975777.
		2-1uuress		Email: response@onida.com
				For Institutional Sales:
				corporate.sales@onida.com
				For Service: service@onida.com
			Panasonic	Ph. No. 1800 108 1333 / 1860
				425 1860 / 1800 103 1333
				Samsung India Electronics
				6th, 7th & 8th Floors, Ifci Tower,
			Samsung	61, Nehru Place,
				New Delhi,
				Tel: 011 3030 8282

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Samsung Corporation
				Room No 355, Hotel Taj Palace,
				Chanakyapuri
				New Delhi, DL
				011 2688 9817
				Philips Electronics India
				Limited
				9th Floor, DLF 9-B,
			Philips	DLF Cyber City,
				Sector 25, DLF Phase - 3,
				Gurgaon - 122002, India
				Tel: +91 - 124 - 4606000
				Philips Electronics India
				Limited
				7, Justice Chandra Madhab Road,
				Kolkata - 700020, India
				Tel:+91-33-24753621/27
				Philips Electronics India
				Limited
				The Estate, 4th floor (North
				Wing), (Next to Manipal Centre),
				121, Dickenson Road,
				Bangalore - 560042, India
				Tel: +91 - 80 - 66929898
				Philips Electronics India Limited
				MFAR Manyata Tech Park,
				Nagavara, Bangalore - 560045,
				India
				Tel: +91 - 80 - 41890000
				Philips Electronics India
				Limited
				Temple Towers, 5th Floor,
				Old No : 476, New No : 672,
				Anna Salai, Nandanam,
				Chennai - 600035, India
				Tel : +91 - 44 - 66501000
				Philips Electronics India
				Limited
				6-3-1109/1/P/103, 3rd Floor,
				Jewel Pawani Towers,
				Raj Bhavan Road, Somajiguda,
				Hyderabad - 500082, India
				Tel : +91 - 40 - 66467676
				Philips Electronics India
				Limited
				Technopolis Knowledge Park,
				Mahakali Caves Road,
				Chakala, Andheri (E),

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Mumbai - 400093, India Tel : +91 - 22 - 66912000
			Salora	D-13/4, Okhla Industrial Area, Phase-II New Delhi – 110 020, India Phone: +91-11-49207100 / 101
			Sansui	Adheshwar Arcade, Ist Floor, Andheri Kurla Road, Andheri East, Mumbai: 400 093
				No.62, 3rd floor, 1st main, 3rd cross, 2nd stage, Yeshwantpur Industrial Area, Bangalore – 560022
				Plot No. 296, Udyog Vihar Phase -2, Gurgaon – 122015
			Sharp	Sharp India Limited Gat No. 686/4, Koregaon Bhima, Tal: Shirur, Dist: Pune Pin – 412216 Phone: 02137-252417, 02137- 666520
			Sony	Sony India Registered Office A - 31, Mohan Co-operative Industrial Estate, Mathura Road New Delhi - 110044 Ph No : 66006600 Fax No : 26959141
				Sony India Branch Offices City Center, 3rd Floor, Plot A-5/1, Unit-IX, Sachivalaya Marg, Bhubaneswar Pin – 751022
				3rd Floor, NH Center Point Building, Opposite Bora Service, G S Road, Guwahati Ph No : 0361-2462858, 2462859
				White House, 2nd Floor, Block 2D, 119 Park Street, Kolkata - 700016 Ph No : 033-40071751/52/53/ 54/55 Fax No : 033 - 40071763 4th Floor, Block-B,
1				Sai Corporate Park,

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
No.	i foduce i valle	Category	Diana	
				Rukanpura, Bailey Road,
				Patna - 800 014
				Phone No : 0612-3269866
				3rd Floor, Adarsh Mall, Plot No
				50, Industrial and Business Park,
				Phase-2, Chandigarh - 160002
				Ph No : $01/2-6655555$,
				Fax No: 01/2-06 555 66
				Unit $\#$ 405 - 407, 4th Floor,
				Copia Corporate Suites,
				Now Delbi 110010
				$C_{\text{optact}} : 1800 \ 103 \ 7700 \ \text{(Toll)}$
				E_{ree} Eax No : 011 42458844
				SCO 38-39 G 1st Floor
				BRS Nagar Ludhiana -141 012
				Ph No : 0161-463 2222
				24 Advocate Chambers
				2nd Floor, RDC Rai Nagar
				Ghaziabad. Uttar Pradesh
				Ph No : 0120 - 4940150
				Fax No : 0120 - 4940180
				C-7, Sultan House, 1st floor,
				Sawai Jai Singh Highway, Bani
				Park, Jaipur - 302016
				Ph No : 0141-4041896, 4041897
				Fax No : 0141-4041894
				4th Floor, Eldeco Corporate
				Chambers, Vibhuti Khand
				Opposite Kisan Mandi Bhawan,
				Phase I Gomti Nagar
				Lucknow Pn No : 0522-
				4041251/32/35/34/35
				Plot No. 83 Sector 20
				City Centre, Gurgaon
				Harvana - 122002
				Ph No : 0124 - 4896200
				Fax: 0124 - 4896220
				No.768, 100 Feet Main Road
				HAL, IInd Stage, 12th Main,
				Indira Nagar, Bangalore - 560038
				Ph No : 080-66605555
				Fax No : 080-25294987
				#2-1-2/6(2), First Floor,
				Hill Groove, Chilimbi Hills, 2nd
				Cross, Mangalore - 575006
				2nd Floor, Hameedia Centre,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				No 14/43, Haddows Road,
				Nungambakkam,
				Chennai - 600006
				Ph No : 044 - 28242571
				Fax No : 044-28234853
				2nd Floor, Muscat Tower
				S.A.Road, Kadavanthara
				Cochin - 682 020
				Ph No : 0484-2318616, 2318618,
				2318619, Fax No : 0484-2318629
				III Floor, 1025/1 Skanda Square,
				Avinashi Road
				Coimbatore - 641018
				Ph No : 0422-4334455
				Fax No : 0422-4334456
				6-3-676/A/2/3/4,
				Punjagutta X Roads, Punjagutta
				Hyderabad - 500082
				Ph No : 040-66115000
				Fax No : 040-23400014
				Door No. 59-10-1/A,
				Matha Towers , 4th Floor,
				Ring Road, Patamatalanka,
				Vijayawada-520 010
				Mohans Arcade, 1st Floor, 47-
				11-5, Dwarka Nagar
				Vishakhapatnam - 530016
				101, Parth Complex, Ground
				floor, Swastik Cross Road
				Navrangpura
				Ahmedabad - 380009
				Ph No : 079-26441040,
				26441041
				Fax No : 26460839
				25/1 Ground Floor,
				Yashwant Niwas Road,
				Shirish Chamber
				Indore - 452003
				Ph No: 0731-4055762, 4042013,
				4042033
				2nd floor, Crimpage
				Corporation.
				Plot No. 57, Street No.17, MIDC
				Andheri East.
				Mumbai - 400093
				Ph No : 022-6128 8000
				Fax No : 28312935

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
		Gutegory		Office No.2. 3rd floor
				G.O.Square, Aundh-Hinjewadi
				Road, Near Mankar Square
				Wakad, Pune - 411057
				Ph No : 020-67917200
				Fax No : 020-67917299
				Office - 18 A, 04th Floor,
				Empress Mall,
				Behind Raman Science Centre,
				Sir Bezonji Mehta Marg,
				Nagpur – 440018
				Ph No : 0712-6471533-557
				TCL India Holding Pvt. Ltd.
			ТСІ	Sco 254, 2nd Floor, Sector 44 C
			1 CL	Chandigarh, CH
				Tel: 0172 464 6211
				TCL India Holding Pvt. Ltd.
				B-8/3, Uppal Industrial Area,
				Uppal, Hyderabad, AP
				Tel: 040 2344 9350
				TCL India Holding Pvt. Ltd.
				302, Vidhyapati, 17, Race Course
				Road, Race Course Road
				Indore, MP
				Tel: 0/31 400 3365
				ICL India Holding Pvt. Ltd.
				82, Phase 5, Oknia Industrial
				estate, New Denn, DL
-				Laybro Manufacturing Company
				W-53 MIDC Area Bhosari Indl
			T-Series	Estate $PMC = 411026$
				Maharashtra
				TOSHIBA INDIA PVT. LTD.
				3rd Floor, Building No. 10 Tower
				- B, Phase - II
			Toshiba	DLF Cyber City,
				Gurgaon - 122 002,
				Haryana, India
				Board No. + 91-124-4996600
				TOSHIBA INDIA PVT. LTD.
				C&B Square Building , 6th Floor,
				Plot No 601, 127, Andheri Kurla
				Road, Chakla Andheri, (East),
				Mumbai 400059
				Tel: + 91-22-61911500
				TOSHIBA INDIA PVT. LTD.
				284 Hothur Square, 2nd Floor.

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
140.		Category		
				100 Feet Road Indiranagar,
				Bangalore - 560038,
				Karnataka, India
				Tel: + 91-80-25190800
				Toshiba India Pvt. Ltd.,
				Business Communication Centre
				Chiramel Chambers, Kurisupally
				Road, Ravipuram, Kochi-682 015
				Tel: + 91-484-2357107
				Toshiba India Pvt. Ltd.,
				Plot No 1-4, Vatika Business
				center, 3rd Floor, NSL Icon,
				Road No 12, Banjara Hills,
				Hyderabad-500034
				Tel: + 91-40-44311152
				Toshiba India Pvt. Ltd.,
				219, Regus Centre, 3rd Floor,
				Altius Olympia Technology
				Park, Sidco Industrial Estate,
				Guindy, Chennai - 600032, India
				Tel: + 91-44-42994353
				Videocon Industries Ltd.
				14 Kms Stone, Aurangabad-
			Videocon	Paithan Road,
				Chitegaon, Iq. Paithan,
				Dist. Aurangabad - 451 105
				Corporate Office
				221 Dr DN Road Fort Mumbri
				400.001 (INDIA)
				Corporate Office (Marketing
				Service & Support):
				296 Udvog Vibar Phase-II
				Gurgaon Harvana Phone No
				0124-3273091
				Westway Electronics Limited
				B-102 Phase – II Noida –
			Weston	201305 (U.P)
				Phone: 0120 4543114
				Fax: 0120 4543115
				Westway Electronics Limited
				C-189. Naraina Industrial Area
				Phase-I
				New Delhi 110028
				Phone: 011 45035222
				Fax: 011 41411110

Sr.	Product Name	Product	Brand	Address / Contact Details
No.	Floduct Maine	Category	Drand	Address / Contact Details
		LED	LG	Given Above
			Samsung	Given Above
			Panasonic	Given Above
			Toshiba	Given Above
			Onida	Given Above
				Corporate office
				Global Brands Enterprise
				Solutions Pvt. Ltd.
			Akai	Plot No. 97, Sector-44, Gurgaon -
				122 002, INDIA
				Phone No: 0124-4305000, Fax
				No.: 0124-4305020
				Global Brands Enterprise
				Solutions Pvt. Ltd.
				Flat No. 51, 3rd Floor,
				Path East Paring Canal Paad
				Patha 800.001
				Tel No: 0612 2524302
			Haier	Given Above
			Hitachi	Given Above
			Philips	Given Above
			Sony	Given Above
			T-series	Given Above
			Salora	Given Above
			Videocon	Given Above
		Plasma and		Given Above
		HDTV	Hitachi	
			LG	Given Above
			Panasonic	Given Above
			Samsung	Given Above
		~ ~ ~	Sansui	Given Above
		Flat	BPL	Given Above
			Daenyx	Given Above
			Haier	Given Above
			LG	Given Above
				Next Retail India Limited,
				3rd Floor, Aadeshwar Arcade
			Nume	Above Loop Gallary,
			INext	Andhari Kurla Baad
				Mumbai 400 102
				Phone: +91-7498218860
			Onida	Given Above
			Panasonic	Given Above
			Samsung	Given Above
	<u> </u>		Philips	Given Above
			Salora	Given Above

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
			Sansui	Given Above
			Sharp	Given Above
				SANYO India Pvt. Ltd.,
				'Jubilee Building', 2nd Floor,
			Sapro	45, Museum Road,
			Sanyo	Bangalore 560025, India,
				Tel: +91-80-43418200,
				Fax: +91-80-43418222
			TCL	Given Above
			T-Series	Given Above
			Texla	TEXLA ELETROVISION A-72, OKHLA INDUSTRIAL AREA, PHASE-II, New Delhi - 110020, India 91-11-26384589/26387153
			Videocon	Given Above
			Weston	Given Above
		CTV	Daenyx	Given Above
			Haier	Given Above
			LG	Given Above
			Markson	Given Above
			Moser Baer	Given Above
			Panasonic	Given Above
			Next	Next Retail India Limited, 3rd Floor, Aadeshwar Arcade Above Loop Gallary, Opp. Sangam Cinema, Andheri Kurla Road, Mumbai 400 102 Phone: +91-7498218860
			Philips	Given Above
			Salora	Given Above
			TCL	Given Above
			T-Series	Given Above
			Videocon	Given Above
			Weston	Given Above
	Washing Machine	Semi Automatic	BPL	Given Above
			Beltek	BELTEK INDIA LTD. B-89 SEC-5 201301 NOIDA - UTTAR PRADESH Phone No.:- 0091 95 1202421676
			Daenyx	Given Above
			Electrolux	PE Electronics Ltd. Corporate Centre, 5th Floor, Andheri Kurla Road, Andheri (East), Mumbai – 400059 Phone No. +91-22-61171000

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
			Gem	Gem Equipments Pvt. Ltd. S.F. No. 103, Avanashi Road, Arasur, Coimbatore – 641407 Ph. No. +91 422 2363800
			Godrej	Godrej Industries Limited. Pirojshanagar, Eastern Express Highway, Vikhroli, Mumbai - 400079, INDIA. Tel: +91-22-2518 8010 / 2518 8020 / 2518 8030 Fax: +91-22-2518 8074
				Godrej & Boyce Manufacturing Company Limited. Pirojshanagar, Vikhroli, Mumbai - 400079, INDIA. Tel: +91-22-6796 5656 / 5959
			Haier	Given Above
			Kelvinator	
			Kenstar	
			LG	Given Above
			Onida	Given Above
			Samsung	Given Above
			TCL	Given Above
			T-Series	Given Above
			Videocon	Given Above
			Weston	Given Above
			Whirlpool	Given Above
		Fully Automatic	BPL	Given Above
			Daenyx	Given Above
			Electrolux	
			Godrej	Given Above
			Haier	Given Above
			IFB	Corporate Address: IFB Industries Limited Corporate Off.: Flat No.IND-5, Sector-1,East Kolkata Township, Kolkata – 700 107 Ph: +91 33 39849524/39849475
				Fax: +91 33 39849676
				Koikata Factory: IFB Industries Limited No:14, Taratolla Road, Kolkata - 700 088. Ph: +91 33 30489299 Fax: +91 33 30489230

Sr. No.	Product Name	Product Sub	Brand	Address / Contact Details
		Category		
				Bangalore Factory: IFB Industries
				Limited
				Estate
				Off Whitefield road Bangalore -
				560048.
				Ph: + 91 80 30589620
				GM: +91 80 30589604
				MKTG: +91 80 30589641
				Fax:+91 80 30589611
			Kelvinator	
			LG	Given Above
			Kenstar	
			Onida	Given Above
			Panasonic	Given Above
			Samsung	Given Above
			Toshiba	Given Above
			Videocon	Given Above
			Whirlpool	Given Above
				Corporate Headquarters
				Kasturi Buildings,
		XX7. 1	DI (Mohan I Advani Chowk,
	Air Conditioner	Window	Blue star	Jamshedji Tata Road,
				$\mathbf{T}_{a1} (01) (22) 66654000$
				Fer: $(91)(22) 66654151$
				Divisional Headquarters
				Chennai
				9 Bazullah Road
				T Nagar
				Chennai - 600 017
				Tel: (91) (44) 4344 4000
				Fax: (91) (44) 28158015 / 4344
				4072
				Mumbai
				Bandbox House
				4th Flr, 254 D
				Dr Annie Besant Road
				Worli
				Mumbai - 400 030
				1 el: (91) (22) 66544000
				Fax: (91) (22) 00544001
				Chennai
				No 104 Old No 46
				Garuda Buildings Cathedral
				Road
				Chennai - 600 086

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
No.		Category		
				Tel: (91) (44) 42444000
				Fax: (91) (44) 42444190
				Mumbai
				Blue Star House
				9A, Ghatkopar
				Link Road
				Sakinaka
				Mumbai - 400 072
				Tel: (91) (22) 66684000
				Fax: (91) (22) 66684004
				Kolkata
				7, Hare Street
				Kolkata - 700 001
				Tel: (91) (33) 22134000
				Fax: (91) (33) 22134102
				New Delhi
				Block 2-A, DLF Corporate Park
				DLF Qutab Enclave
				Phase III
				Gurgaon - 122 002 (Haryana)
				Tel: (91) (124) 4094000
				Fax: (91) (124) 4094004
				Manufacturing Facilities
				Ahmedabad
				501/3, 503/2, Tejpur Road
				Sarkhej Baula Highway
				Changodar,
				Ahmedabad- 382213
				Tel: (91) (2/17) 294490
				Bharuch
				Plot Nos. 4 and 5
				GIDC Industrial Estate
				Narmada Nagar post
				Bharuch - 392.015
				Iei: (91) (2642) 246116
				Fax: (91) (2042) 240020
				Dadra
				Survey No. 265/2
				Defini Road
				LUT Of Dedre & Neger Herreli
				T_{a1} (01) (02(0) 26(8617 /
				2668618
				E_{av} (01) (0260) 2668503
				Kale Amb
				Nahan Road
				Rappur Lattan
				Kala Amb

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
		gj		District Sirmour
				Himachal Pradesh 173030
				Tel \cdot (91) (01702) 238760
				Fax: (91) (01702) 238461
				Kala Amb
				Nahan Road
				Village Ogli
				Kala Amb
				District Sirmour
				Himashal Dradosh 172020
				T_{a1} (01) 08160 13443
				Fer: (91) 98100 13443
				Fax: (91) (01/02) 238/61
				I hane
				IInd Pokhran Road
				Majiwada
				Thane - 400 601
				Tel: (91) (22) 67924000
				Fax: (91) (22) 67924020
				Wada
				Village-Vasuri Khurd,
				Khanivali Road,
				PO - Khupari,
				Taluka - Wada,
				Dist - Thane, 421312
				India
				Sales and Service Offices
				Ahmedabad
				Abhishree Avenue,
				3rd Floor, Near Nehru
				Nagar Cross Roads,
				Ambawadi Road,
				Ahmedabad - 380 006
				Tel: (91) (79) 4022 4000
				Bengaluru
				Ozone Manay Technology Park
				Sv.No 56/18 & 55/9
				Hongasandra Village
				Begur Hobli
				Garvebhavinalva
				Bangalore - 560.068
				Tel: (91) (80) 41854000
				Bhubaneswar
				3A Satua Nagar
				2nd Eloon
				2110 FIOOF, Physhem agreem 751,007
				Dhubaneswar $/51 00/$
				1 cr: (91) (0/4) 25/2403 / 2572(70) (2570024)
				25/30/0 / 25/0024
1	1	I		Fax: (91) (6/4) 25/0544

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Chandigarh
				Adarsh Mall,
				4th Floor, Plot No. 50,
				Industrial & Business Park,
				Phase - II,
				Chandigarh - 160 002
				Tel: (91) (172) 5024000
				Fax: (91) (172) 5004007
				Chennai
				Blue Star Limited
				620, Anna Salai,
				Modern School Road,
				Chennai - 600006
				Tel: (91) (44) 40444000
				Fax: (91) (44) 40444001
				Ghaziabad
				C 53A, Third Floor,
				Raj Nagar District Center
				(RDC), Raj Nagar,
				Ghaziabad - 201001.
				Uttar Pradesh
				Tel: (91) (120) 2821400
				Guwahati
				2nd Floor, New Star Freeze
				Bldg., Opp. Kunjalata Bibah
				Bhawan, G S Road,
				Guwahati - 781005
				Tel: (91) (361) 2340620
				Indore
				1st Floor, Shri Krishna
				Classic, 139,
				Fadnis Colony, A B Road,
				Indore - 452 010
				Tel: (91) (731) 4001211/
				4001311
				Jaipur
				A-19, First Floor,
				Main Sahakar Path,
				Nr. Sahakar Bhavan, Jaipur
				Tel: (91) (141) 4141100/
				2744033/35
				Kochi
				Millenium Plaza
				Alinchuvadu
				MKK Nair Road
				Near Palarivattom Junction
				Kochi - 682024
				Tel: (91) (484) 4499000
				Fax: (91) (484) 4499190

Sr. No	Product Name	Product Sub	Brand	Address / Contact Details
110.		Category		
				Lucknow
				1///4,Faizabad Road
				Lucknow 226 007
				Tel: (91) (522) 4034000
				Fax: (91) (522) 4034004
				Mumbai
				59 Forbes Street
				Mumbai 400 001
				Tel: (91) (22) 22844660
				Mumbai
				Unit G-2
				Shalimar Ind. Estate
				Dharavi Road
				Matunga
				Mumbai - 400.019
				Tel: (91) (22) 24042098
				Mumbai
				Unit I Prabhadevi
				Industrial Estate
				Prabhadevi,
				Mumbai - 400025
				Tel: (91) (22) 2422/305
				Fax: (91) (22) 24376041
				Nagpur
				219 Bajaj Nagar, 1st Floor, South
				Ambazari Road, Nagpur - 440010
				Tel: (91) (712) 6624000
				Fax: (91) (712) 6624002
				E-44/12, Okhla Industrial
				Area, Phase II,
				New Delhi - 110 020
				I el: (91) (11) 41494000
				Fax: (91) (11) 41494001
				Panjim (Goa)
				First Floor, Buddhaseth
				Apts, Tonca, Caranzalem,
				$Goa = 403\ 002.$
				Tel:(91) (832) 2462/89
				Pune
				201/A, Nityanand Complex
				24//A Bund Garden Road
				Pune - 411011
				1 el: (91) (20) 4104 4000
				Fax:(91) (20) 4104 4001
				Kaipur
				Alaska Corporates,
1	1	1	1	3rd Floor, Opp VIP Road,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Jivan Vihar Colony,
				G E Road, Raipur,
				Chattisgarh - 492 006
				Tel: (91) (771) 6544000
				Secunderabad
				207 Sikh Road
				Bantia Estate
				Secunderabad - 500 003
				Tel: (91) (40) 4400 4000
				Fax: (91) (40) 4400 4001 / 4190
				Thane
				IInd Pokhran Road
				Maijwada
				Thane - 400601
				Tel: (91) (22) 67154500
				Fax:(91)(22)67924020
				Thiruvananthanuram
				TC IV/962 Chandrika
				Sree Chitra Nagar
				Dipo lipo Road Kawdiar
				The mile Road, Rawdiar,
				T_{a1} (01) (471) 2425025
				Ferry (91) (471) 2435025
				Fax: (91) (4/1) 2434065
				Ramkrishna Chambers
				Productivity Road
				Alkapuri
				Vadodara
-				Tel: (91) (265) 6614000
				Visakhapatnam
				D. No. 49-24-65/1,
				Resapuvani Palem Village,
				Madhura Nagar Mandal,
				Near Sankarmattam Road,
				Vishakapatnam 530 016
				Tel: (91) (891) 274 8405
				Fax: (91) (891) 270 1041
				INDIAN HEADQUARTERS :
				Carrier Airconditioning &
				Refrigeration Limited
			Carrier	Delhi - Jalpur Highway, Narsingpur,
				Harvana 122 004 India
				Ph. No. $+91-124-4825500$
				Fax No. +91- 124- 2373 241
				Carrier Airconditioning &
				Refrigeration Ltd
				U & I Building,Plot No-83,
				Sector-29,
				Near Bikaner Sweets

Sr.	Product Name	Product	Brand	Address / Contact Details
No.	Product Name	Category	Drand	Address / Contact Details
				Gurgaon 122 002 (Haryana)
				Tel:- 0124 - 4707333
				Fax:- 0124 - 2565050
				Carrier Airconditioning &
				Carrier Complex
				Vill Narsinghour Kherki Daula
				Post.
				Gurgaon – 122 004
				Tel:- 0124 - 482 5500
				Fax:- 0124 - 237 2230
				Carrier Airconditioning &
				Refrigeration Ltd
				Shop No # 201 E, 2nd Floor,
				Mahagun Metro Mall,
				Near Ansal Plaza, Vaishali,
				Ghaziabad (Uttar Pradesh)
				16!:-0120-4185260
-				Carrier Airconditioning &
				Refrigeration Ltd
				Unit No.402 B & 403
				4th floor, Shalimar Square,
				126/3 B B.N.Road,Lalbagh,
				Lucknow - 226001
				Tel:- 0522 - 2202346, 2230598
				Fax:- 0522 - 2230050
				Carrier Airconditioning &
				Retrigeration Ltd
				SCO 301/302, 1st Floor,
				Sector $= 58$ D, Chandigarn - 100 030 Tal: 0172 - 500 7548 / 50
				Fax:= 0172 = 5007160
				Carrier Airconditioning &
				Refrigeration Ltd
				1st Floor, S.S.Tower, New Colony
				Behind Jyanti Market,
				Jaipur - 302 001
				Tel Nos :- 0141 - 511 3444, 511 3999
				Carrier Airconditioning &
				Refrigeration Ltd
				C/o Bhairav Distributors,
				Shop No:- 5 & 6, Victor Bldg
				Cujira - St Cruz Panaji Margao Highway
				Paniim Goa - 403 005
				Tel:- 0832 - 244 7028
				Fax:- 0832 - 244 7027
				Carrier Airconditioning &
				Refrigeration Ltd
				605A, Lokmat Building,
				Lokmat Square, Vardha Road,
				Ramdas Peth, Nagpur

Sr. No.	Product Name	Product Sub	Brand	Address / Contact Details
1.00		Category		
				Tel:- 0712 - 663 0214, 645 3790
				Fax:- 0/12 - 045 5/90
				Refrigeration Ltd
				C/o Suman Enterprises
				Behind ITL Sham Nagar
				Raipur -492006
				Tel:- 0771 - 401 3245
				Carrier Airconditioning &
				Refrigeration Ltd
				1st Floor, Milestone, Drive In Road
				Thalte ₁ , Ahmedabad $-380\ 052$
				1e! - 0/9 - 4026 / / / / E = 070 - 4026 7700
				Fax:- 0/9 - 4026 / /99
				Carrier Airconditioning &
				Shreepresed Office No. 4 4th floor
				Plot No 74 Sheela wher colony
				Opp. Planet ford. Paud Road
				Pupe -411 038
				Tel:- 020 - 41051000/ 02025437741
				Fax:- 020-25437742
				Carrier Air-conditioning &
				Refrigeration Ltd.
				Unit No 4 3rd Floor
				Phoenix Market City
				15 L B S Marg Kurla (West)
				MUMBAL 400.070
				Telephone: 022.61700700
				Carrier Airconditioning &
				Refrigeration Ltd
				315-316 Shagun tower
				7 Commercial Sector PU 4 Scheme
				No 54.
				Vijay Nagar Square, A.B. Road,
				Indore – 452010
				Tel:- 0731-4070378
				Fax:- 0731 - 252 6365
				Carrier Airconditioning &
				Refrigeration Ltd
				C/o Om Sai Enterprises,
				Pushpanjali Complex,
				Second Floor, Lake Road,
				$\text{Kanchi} = 834\ 001$
				$\begin{array}{cccccccccccccccccccccccccccccccccccc$
				Carrier Airconditioning &
				Refrigeration I td
				C/o. Candida Enterprises
				R.G. Baruha Raod. Sunderpur
				Guwahati - 781 005
				Tel:- 0361 - 259 5003
				Fax:- 0361 - 220 3508

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Carrier Airconditioning &
				Refrigeration Ltd
				204, Adarshila Complex
				South Gandhi Maidan
				Patna – 800 001
				Tel:- 0612 - 232 3517
				Telefax:- 0612 - 266 8591
				Carrier Airconditioning &
				Refrigeration Ltd
				P-339/1, CIT Road, Scheme VI-M,
				Phulbagan, Kolkatta – 700 054
				Tel:- 033 - 4020 1300
				Fax:- 033 - 2364 9766
				Carrier Airconditioning &
				Refrigeration Ltd
				Flat No:- 201, Shanti Niwas Housing
				Plot No:- 33/1747, Rasulgarh
				Bhuvaneshwar – 751010
				Tel:- 0674 - 258 7178/ 258 5893
				Fax:- 0674 - 258 7178
				Carrier Airconditioning &
				Refrigeration Ltd
				6-2-976, Raj Bhawan Road
				Khairatabad,
				Hyderabad – 500 004
				Tel:- 040 - 4546 2888
				Fax:- 040 - 4011 8146
				Carrier Airconditioning &
				Refrigeration Limited
				3rd Floor, Block-III,
				Prestige Blue Chip, No.9, Hosur
				Road,
				Bangalore – 560 029
				Tel :- +91 80 43442000
				Fax:- +91 80 41321222
				Carrier Airconditioning &
				Refrigeration Ltd
				Shivas Complex
				263/5, Mettupalayam Road
				Coimbatore – 641 043.
				Tel:- 0422 - 438 4151, 438 5403
				Fax:- 0422 - 2436485
				Carrier Airconditioning &
				Refrigeration Ltd
				39/6641, Perumanoor,
				M.G. Road, (Opp. Cochin Shipyard)
				Cochin – 682 015
				Tel:- 0484 - 402 9001/ 0
				Fax:- 0484 - 235 9214
				Carrier Airconditioning &
				Refrigeration Ltd
				GRR Zone
				271/2, Maraimalai Adigal Salai

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Pondicherry – 605 001 Tel:- 0413 - 222 5853, 2226 676 Fax:- 0413 - 234 4695
				Carrier Airconditioning & Refrigeration Ltd Old No. 248, New No.114 Royapettah High Road, Royapettah, Chennai – 600 014. Phone : 044 – 42222888
			Daenyx	Given Above
			General (ETA)	ETA General Pvt Ltd ETA House ,3rd Floor #71/63,Opp.Loyola College Sterling Road, Nungambakkam, Chennai.6000034 . Tamilnadu 044- 43402345
				ETA General Pvt. Ltd.Flat no - 642 D, Ram AppartmentsOpp. Laksmi MillsPapanaicken PalayamCoimbatore - 641 037Tel. #:0422 - 2554732
				ETA General Pvt Ltd ETA House, Behind Green Park Hotel 7-1-27/5, Plot No:9, Greenlands, Ameerpet HYDERABAD - 500 016 Tel.#:040 - 66103530 / 31
				ETA General Pvt. Ltd. D NO.40-1-119, Old BATA GodownOpp. Jyothi Mahal Benz Circle, VIJAYAWADA – 522 010 Tel : 0866 - 6460278 / 3074029
				ETA General Pvt. Ltd. PLot No.153, 2nd Floor , 9th Main Road 3rd Block, Jayanagar BANGALORE - 560 011 Tel: 080-40926531 / 40926538
				ETA General Pvt. Ltd. Bldng #:30/2001-D, 'Atham' 1st Floor, Opp.Gold Souk Grande Ponnurunni Road Ponnurunni, Vytilla P.O Cochin - 682 019 Telefax : 0484 – 4011623

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
		gj		ETA General Pyt Ltd
				101-102 1st Floor Grotto
				Heritage
				Opp Orlem Church Marve Road
				Malad – West
				Mumbai - 400 064
				Tel: $022 - 42455300 / 02$
				FTA General Pyt 1 td
				203 2nd Floor Sankaln Square
				Near Gurukul Temple
				Drive In Road
				AHMEDABAD - 380 054
				Tel $\cdot 0.079_{-27467991} \pm 0.058991$
				ETA Coporal Dut Ltd
				SCO 2475 - 76
				Sector 22 - C 2nd Floor
				CHANDICAPH 160.022
				$T_{\rm al} = 0172 = 5087288 = 4421121$
				ETA Conoral Dut 1 td
				C 10 Sector I
				C - 19, Sector - J
				A = A = A = A = A = A = A = A = A = A =
				$T_{2} = 1.0522 + 4006870$
				ETA Conoral Drivato Limited
				Suprise Mall 2nd Elect
				Suffrise Mail, 2nd Floor,
				Tel: 0120 4201121
<u> </u>				ETA Conoral Dut Ltd
				221 Lat floor
				Okhla Indl. Area
				Now Dolb: 110020
				$H = 0.11 \ A = 0.27777$
				FTA Conoral Dat Ltd
				203 2nd Eleon
				ZUS, ZHU FIOOT
				Opp SMS Stadium Topk Dood
				LAIDUR 202015 (Pringtham)
				$\frac{1}{2} \frac{1}{2} \frac{1}$
				ETA Caparel Dat Ltd
				LIA General PVL Ltd.
				"Star Canach Control"
				216 AIC Bose Boad
				1210, AJC DOSE ROAD
				$T_{\rm ol} \cdot 033 = 40602006$
		<u> </u>	Codroi	Civen Above
			Goure	Given Above
			Hitachi	Given Above
				Given Above
1	1	1	LG	Given Above

Sr. No.	Product Name	Product Sub	Brand	Address / Contact Details
		Category	Onida	Circa Abarra
			Samauna	Given Above
			Samsung	Given Above
			TCI	Given Above
			ICL	Given Above
				Voltas Limited
	Commente			Voltas House
	Corporate		V-lto-	A BIOCK
	Headquarters		Voltas	Dr. Babasaheb Ambedkar Koad
				$\begin{array}{c} \text{Mumbai } 400 \ 0.53 \\ \text{T-1} \ 0.22 \ ($
				1el: 022-00030 000
	Factories			2nd, Poknran Koad,
				$1 \text{ hane } -400\ 601$
				Tel: 022-6/920111
				Dadra Plant (EM&RBG)
				Shreenath Industrial Estate, C
				Building
				Survey NO.197, Nr. Dadra Check
				Post Pin $= 396230$
				Tel: 0260-6619999 / 2669648
				Uttarakhand Plant
				(EM&RBG)
				Plot No.1, Sector 8
				I.I.E. Pant Nagar Industrial Area
				Dist U.S. Nagar, Rudrapur
				$P_{11} = 203145$ T-1, 05044, 250007 / 9
				Tel: 05944-250006 / 8
				Dist NO 2 5 Sector 9
				Plot NO.2-5, Sector 8
				Dist U.S. Nagar Budropur
				Dist U.S. Nagar, Kudrapur
				$T_{\rm nl} = 203135$ $T_{\rm ol} = 05044, 250000$
			Whithersel	Cince Above
		Salit	Phys. star	Given Above
		Spiit	Gamian	Given Above
			Carrier	Given Above
			Daenyx	Given Above
			General (ETA)	Given Above
			Godrej	Given Above
			Haier	Given Above
			Hitachi	Given Above
			LG	Given Above
			Onida	Given Above
				Gurgaon Head Office
				2nd Floor, Tower A & B, DLF
			Mitsubishi	Cyber Greens, Dlt Cyber City,
				DLF Phase -III,Gurgaon-122002, India

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Phone: +91 (124) 463-0300 +91 (124) 673-9300 Fax: +91 (124) 463-0399 / 398
				Delhi Registered Office M-38/1, Middle Circle, Connaught Place, New Delhi- 11000, India Please contact Gurgaon head office for Delhi inquiries.
				Bangalore Sales Office Prestige Emerald, 6th Floor, Municipal No. 2, Madras Bank Road (Lavelle Road), Bangalore 560001, India Phone: +91 (80) 4020-1600 Fax: +91 (80) 4020-1699
				Pune FAID Head Office Emerald House, EL-3, J block M.I.D.C Bhosari, Pune -411026, Phone: +91 (20) 2710-2000 Fax: +91 (20) 2710-2100
				Pune Sales Office 301-302, Lunkad sky Station, near HDFC Bank, Viman Nagar, Pune-411 014, India Phone: +91 (20) 4131-4868 Fax: +91 (20) 4131-4851
				Pune Sales Office F-2, Gurutej Bahadur, Housing Society, Aundh Road, Khadki, Pune - 411003, India Phone: +91 (20) 2582-0447/ 448 / 449 Fax: +91 (20) 2582-0450
				Mumbai Sales Office 305-306, 3rd Floor, "Windfall", Sahar Plaza Complex, Next to Kohinoor Hotel, Andheri Kurla Road, J. B. Nagar, Andheri (E.) Mumbai-400 059, India Phone: +91 (22) 6611-6200 Fax: +91 (22) 6611-6299
				Chennai Sales Office Citilights Corporate Centre No.1, Vivekananda Road, Srinivasa Nagar, Chepet, Chennai-600 031, Tamilnadu, India Phone: +91 (44) 4923-2222 Fax: +91 (44) 4923-2249

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
		outegory		Hyderabad Sales Office
				4th Floor, Unit No.407, Ashok
				Securidorabed A P 500 003
				Andhra Pradesh India
				Phone: $\pm 91 (40) 4343-8888 \text{ Fax}$
				+91 (40) 4343-8899
				Chandigarh Sales Office
				SCO 176 First Floor Sector 38
				C. Chandigarh $-$ 160036. India
				Phone: +91 (172) 460-1645
				Iaipur Sales Office
				111 Ground Floor Apex Mall
				Tonk Road, Jaipur, India
				Phone: $+91$ (141) 401-1109
				Ahmedabad Sales Office
				303 / A, 3rd Floor, Primate, Judges
				Bungalow Cross Road, Bodakdev,
				Ahmedabad Gujarat – 380054, India
				Coimbatore Sales Office
				No 551A, West Lokmanya Street,
				DB Road, RS Puram , Coimbtore
				- 641002, India
				Phone: +91 (422) 438-5600
				Vadodara Sales Office
				A - 1/2, 2nd Floor, Status Plaza,
				Opp Relish Resort Aksar Square,
				O.P Road, Vadodara - 590020,
				$\frac{11013}{11000} = 101(2(5))2214(00)/225$
				Phone: +91 (265) 251-4699/ 255-
				Kashi Salas Office
				Rochi Sales Office
				$C_{\rm C}$ 30/5102 Å 6 Notace
				Arcada Church Landing Road
				Ernaculum Kochi (82016 India
				$Phope: \pm 01.0846013451 / \pm 01$
				8120445670
				Mitsubishi Elevator ETA India
				Pyt I td
				Chennai Citi Centre 5th Floor
				10 & 11 Dr R K Salai Mylapore
				Chennai - 600004 India
				Phone: +91 (44) 2847-7370 Fax:
				+91 (44) 2847-7374
			Panasonic	Given Above
			Samsung	Given Above
			Sanvo	Given Above
			TCL	Given Above

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
No.		Category		
			Toshiba	Given Above
			Videocon	Given Above
			Voltas	Given Above
			Whirlpool	Given Above
	Refrigerators	Direct Cool	BPL	Given Above
			Electrolux	Given Above
			Gem	Given Above
			Godrej	Given Above
			Haier	Given Above
			Kelvinator	
			LG	Given Above
			Panasonic	Given Above
			Samsung	Given Above
			Videocon	Given Above
			Whirlpool	Given Above
		Frost Free	BPL	Given Above
			Electrolux	
			Godrej	Given Above
			Haier	Given Above
			Hıtachı	Given Above
			Kelvinator	
			LG	Given Above
			Panasonic	Given Above
			Samsung	Given Above
			Videocon	Given Above
			Whirlpool	Given Above
			Toshiba	Given Above
			Sharp	Given Above
				Registered & Corporate Office
				150, Pandurang Budhkar Marg,
			Siemens	Worll, Manarashtra,
				Tal: $\pm 01.22.3967.7000$
				$F_{ax} + 91 22 3967 7000$
				Acer India Private Limited
				Ground Floor B- 28 Okhla
	Mobile Phones		Acer	Phase - L New Delhi -
	niconic i noneo			110020 Delhi India
				Tel: $+(91)$ - (11) -40568000
		1		India Office
				TCT Mobile International
				Limited,
			Alcatel	Elegance Tower, Regus Business
				Centre, 2nd Floor, Room
				No.252B Jasola, New Delhi-
				110025
				Distributors

Sr. No.	Product Name	Product Sub	Brand	Address / Contact Details
1101		Category		
				Encon Impex Private Limited,
				Super Distributor
				No 45 2nd Eloor Winevelve
				Floatropic Diazo 1st Cross S D
				Road Bangalore 560.002
				Kochi Kerala
				Talktime Telesystems Super
				Distributor
				Talktime Telesystems, 48/425B.
				Main road. Elamakkara.Kochi-
				682026.
				Tirunelveli, Tamil Nadu
				KM Enterprises,Super
				Distributor
				KM Enterprises, No 41 E/3,
				Vasanthapuram, South Bye-Pass
				road, Tirunelveli-62/005
				Karimnagar, Andhra Pradesh
				SK Technologies, Micro
				SP Technologies No 1 5 80
				Aravindh Nagar Jagtial
				Karimpagar Andhra Pradesh
				Amazon Development Center
				India Pvt Ltd
				O-city. 2nd Floor-Block A &
				Block B
				Survey Number-109,110,111/2,
			Amazon	Nanakramguda Village
				Serlingamplayy Mandal, Ranga
				Reddy Dist.
				Hyderabad - 500032
				Ph: 040 39921111
				Divyashree Building, Ground
				Hi Tech City Layout Surray No.
				64/Part) Madhapur Village
				Serilingampally Mandal
				Hyderabad - 500081
				Ph: 040 43451000
				9th & 10th Floor.
				Bulding #9, Raheja Mindspace
				Madhapur
				Hyderabad - 500081
				Ph: 040 40005111
				#40,3rd Floor, SP Infocity
				M G R Salai, Perungudi

Sr. No.Product NameProduct SubBrandAddress /	/ Contact Details
Category	1
Kandanchava	ady
Chennai-600	090
Ph: 044 5088	5088 Star Tomor
2nd Floor, 52	Toolano north
No 3 Ali Ani	lear Pood
NO.3, All ASI Bangaloro - 5	560052
Dangalore - 5 Db 080 4107	700052
Brigade Cate	way 6th floor
26/1 Dr Ba	ikumar Road
Malleshwarat	m(W)
Bangalore-56	50055
Ph: 080 3327	73000
Apple India	Private Limited
19 Floor. Co	ncorde Tower C
Apple UB City No	24 Vittal Mallva
Road	_ + + 10001 101001 j 0
Bangalore 56	60-001
Presentec G	ambH
Große Elbst	raße 117
Benefon DE-22767 H	lamburg
Phone: +49	(0)40 300 6683 0
$Fax: +49 (0)^{2}$	40 300 6683 29
BenQ India I	Pvt. Ltd.
B G 3rd Floor, 9F	3 Building,
BenQ DLF Cyber (City, DLF Phase 3,
Gurgaon 122	2002, Haryana.
Ningbo Bird	Co.,Ltd.
No.999, Dac	heng East Road,
Fenghua City	y, Zhejiang Province,
P.R.China	
Bird Tel : +86 574	4 88953465, +86 755
36878286	
Fax: +86 574	4 88951025, +86 755
36878284	
Postcode: 31	5500
US & Latin	Americas
Tel: +86 574 8	88953465
Mobile: +86 1	3/384/0409
	ead Office
BlackBerry B) Dity Arro E
Diad-Derman	sity Ave. E
Blackberry Waterloo, Ol	in, Canada
	9 7465
Terr (519) 88	0-7403 22 7227
FaX: (519) 88	Inited States
DiackDerry U DiackDerry U	States
5000 Riversi	de Drive

Sr. No.	Product Name	Product Sub	Brand	Address / Contact Details
		Category		Irving
				TX 75039
				Tel: (972) 373-1700
				Fax: (972) 650-2006
				BlackBerry Europe
				BlackBerry
				200 Bath Road
				Slough, Berkshire
				United Kingdom SL1 3XE
				Tel: +44 (0)1753 667000
				Fax: +44 (0)1753 669970
				Manufacturing Facility
				BlackBerry
				451 Phillip Street
				Waterloo, Ontario
				Canada N2L 3X2
				Tel: (519) 888-7465
				Fax: (519) 888-0021
				Ottawa
				BlackBerry
				4000 Innovation Drive
				Kanata, Ontario
				Canada K2K 3K1
				Tel: (613) 599-7465
				Fax: (613) 599-1922
				Mississauga
				BlackBerry
				4701 Tahoe Boulevard
				Mississauga, Ontario
				Canada L4W 0B5
				Tel: (905) 629-4746
				Fax: (905) 629-4869
				BLU Products
			BLU	10814 NW 33 rd St# 100
			210	Doral, FL 33172
				(305) 715 - 7171
				Bosch Sicherheitssysteme GmbH
			D	Robert-Bosch-Ring 5
			Bosch	85630 Grasbrunn
				GERMANY
				1 el: +49 (0) 89 6290-0
				Bosch Security Systems
				130 Perinton Parkway
				Fairport, New York, 14450
				USA T 1 + 1 505 000 1070
				1ei: +1 585 223 4060
				Bosch Security Systems Pte Ltd 11 Bishan Street 21

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
140.		Category		
				Singapore 573943
				SINGAPORE
				Tel: +65 6571 2808
				Bosch Security Systems B.V.
				Postfach 80002
				5600 JB Eindhoven
				THE NETHERLANDS
				Tel: +31 (0) 40 25 77 284
				Casio India Co. Private Ltd.
				210, 1st Floor, Okhla Industrial
			C ·	Estate, Phase-III,
			Casio	New Delhi-110020
				Tel: 011-66999200
				Fax: 011-41054330
				601, 6th Floor, Crescent Plaza,
				Telly Gulli, Andheri(E).
				Mumbai-69
				Ph.: 022-60605005
				No 7 Shah Complex 2nd Floor
				9th Main 5th Block Javanagar
				Bangalore- 41
				Ph : 0.80-60605005
				3rd Floor, Heera Pappa Complex
				124/1 G N Chatty Road
				T Nagar Channai 17
				1.1 Nagar, Chemiai-17, Db : 044 60605005
				2 rd Elson 2 4 620
				Dadma Diava Opposite Batas
				Callaga
				Numerous and Hadached 20
				Dh - 040 COC05005
				Ph.: 040-00003003
				4C, Lansdowne Place,
				$2\pi d$ Floor, Kolkata-29,
				Ph.: 053-00005005
				CELKON IMPEX PVI LID.
				Std floor, 2nd block, MY HOME
			Celkon	
				Madhapur, Hyderabad - 500081,
				Andhra Pradesh, India.
				Contact : +91 90523 456/8
				Spectrum House, Dunstable
				Koad, Redbourn, Hertfordshire,
			Chea	AL3 7PR
				Tel: 01923 383828
				International: +44 (0)1923
L				383828
			Dell	Dell Computer Corporation
				One Dell Way

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
No.		Category		
				Round Rock, Texas 78682
				Tel: (888) 560-8324
				(800) 915-3355
				ERICSSON INDIA PRIVATE
				LIMITED
				Ericsson Forum DLF Cyberciti
			Ericsson	Sector-25A, Gurgaon Haryana
				Postal code: 122 002
				Phone: +91 124 4080808, +91
				124 2701001
				Shiodome City Center
			D 0.	1-5-2 Higashi-Shimbashi, Minato-
			Fujitsu Siemens	ku
				Tokyo 105-7123, Japan
-				1el: +81-3-6252-2220
			C: 1 /	Gigabyte Technology India
			Gigabyte	Private Limited
			II.	+91-22-40633222
			Haier	Given Above
				Dert L td
				24 Salamouria Arana
				Adugodi
			HP	Hosur Road
				Bapgalore 560.030
				Phone: (080) 33824000 /
				33829000
				Hewlett-Packard India Sales Pyt
				Ltd
				501. 5th Floor, Satkar Complex
				Behind Swagath Building
				Off C.G.Road, Navrangpura
				Ahmedabad - 380 001
				Hewlett-Packard India Sales Pvt.
				Ltd.
				24, Salarpuria Arena Building
				Adugodi, Hosur Road
				Bangalore - 560 030
				HP GR Tech Park Facility
				10th & 11th floor, B wing, Akash
				Block,
				6-9 floor, B wing, Akash Block,
				0-3rd Floor, B wing, Akash
				Block,
				Salarpuria GR Tech Park,
				Sy No.69/3, Whitefield Road,
				Next to ITPL,
1		1		Bangalore - 560 066. India.

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Hewlett-Packard GlobalSoft
				Limited
				HP Avenue
				39/40, Electronics City-I
				Hosur Road
				Bangalore - 560 100
				Global e-Business Operations
				Pvt. Ltd.
				Wind Tunnel Road
				Tower 1, GVH, Murugeshpalya
				Murugeshpalya
				Bangalore - 560 017
				Hewlett-Packard India Sales Pvt.
				Ltd.
				No. 66/2, Ward No. 83,
				Bagmane Tech-Park
				4th Floor, Wing A,
				Embassy Prime, CV Raman
				Nagar,
				Bangalore - 560 093
				Survey No. 192,
				Whitefield Road,
				Mahadevpura Road,
				Bangalore - 560 048
				III Floor, Khanija Bhavan,
				49, Race Course Road,
				Bangalore - 560 001
				Surya Park 2,
				No.100, Ring road,
				Bangalore - 560 100
				Surya Wave,Sy # 61(p),
				Electronic City, Hosur Road
				Bangalore - 560 100
				Pratnik Tech Park,
				Survey No 95/1, Veerasandra
				Attibulation of the second sec
				Electronic City Extension
				Paraslara 560 100
				Howlett Deckard India Salas
				Dert L td
				No 2 KBM Plaza
				Harrington Road
				Chetnet
				Chennai - 600 031
				Plot 1 Olympia Technology park
				Citius block SIDCO industrial
				estate.

Sr. No.	Product Name	Product Sub	Brand	Address / Contact Details
		Category		Guindy
				Chennai - 600 032
				Block 1, 4F - 6F
				Block 1, G - 3F
				First Software Park,
				110 Mount Poonamalle Road,
				Porur
				Chennai - 600 116
				Ground floor, Crowne Plaza,
				New Friends Colony,
				New Delhi - 110065 .
				Hewlett-Packard India Sales Pvt.
				Ltd.
				No.18, ilabs Centre,
				4th Floor, D- Block,
				5th Floor, C - Block,
				Sth Floor, D - Block,
				Huderabad 500.081
				Hewlett Packard India Sales
				Private Limited
				Building No:-02 DLF
				Cybergreen
				1st to 4th floors. Towers D & E
				DLF Cyber City. Phase III.
				Gurgaon – 122 022, Harvana,
				India
				Phone:(0124) 3886000
				Fax: (0124) 3886941
				Hewlett-Packard India Sales Pvt
				Ltd.
				Plot No. 9-11A & 35-37A,
				Sector-V
				Integrated Industrial Estate,
				Pantnagar (SIDCUL),
				Rudrapur, US Nagar - 263 153.
				Uttaranchal State, India
				No 08, Major Arteral Road,
				Block -AF New Town 1st Floor,
				Kajarnat, Kallasta 700 156
				West Bengal
				West Deligal. Upit No. 16N & 17 16th & 17th
				Floor
				Oberoi Commerz International
				Business Park
				Oberoi Garden City Off
				Western Express Highway.

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
No.	Troduct Traine	Category	Diana	
				Goregoan,
				Mumbai - 400 063
				Maharastra.
				Hewlett-Packard India Sales
				Level 6 Pentagon P-2
				Magarpatta City
				Hadapsar
				Pune - 411 028
			HTC	1800 266 3566
				Huawei Telecommunication
				(INDIA) Co. Pvt Ltd.
				7th Floor, Tower A,
			Huawei	Spaze I-Tech Park, Sohna Road,
				Sector-49
				Gurgaon, Haryana-122001 India \mathbf{T}_{1}
				Ferr $\pm 01, 124, 4774863$
				Huawei
				9th Floor, Tower 6. The Gateway.
				No. 9. Canton Road. Tsim Sha
				Tsui,
				Kowloon, Hongkong
				Tel: 00852-21253888
				Fax: 00852-21253889
				Karbonn Mobiles
				#39/13, off 7th main, HAL 2nd
			Karbonn	stage
				Appareddy Palya, Indiranagar,
				$T_{al} \cdot 0.80 \ 40.894888$
				Karbonn Mobiles
				D-170. Okhla Industrial Area.
				Phase-1
				New Delhi - 110020
				011 46604660
				KYOCERA Corporation
				Cutting Tool Group
			17	6 Takeda, Tobadono-cho,
			Kyocera	Fushimi-ku, Kyoto 612-8501,
				Japan $\frac{1}{2}$ Dhope: +81 75 604 3473
				$F_{ax} + 81-75-604-3472$
				KYOCERA Asia Pacific India
				Pvt. Ltd.
				1001A, 1001B, 1002, 10th Floor
				JMD Regent Square, M.G. Road
				Gurgaon-122 002 Harvana, India

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Phone: +91-124-402-5000 Fax: +91-124-402-5001
			Lenovo	Lenovo India Pvt.Ltd Ferns Icon, Level -2, Doddenakund Village, Marathhalli Outer Ring Road, Marathhalli Post, Kr Puram Hobli, Bangalore-560037 Phone No. :080-30533000
				Lenovo India Pvt.Ltd Vatlka Business Park 1st floor,Badshah Pur Road, Sec-49, Sohna Road, Gurgaon-122001 Phone No. : 0124-4315600
				Lenovo India private ltd MLS Business Centres India Pvt. Ltd. 6th Floor, Block A, 22, Camac Street Kolkata - 700 016. MPh no: 033 - 4019-2234 TO 4019-2239 FAX - 033 - 40192240
				#1011-12, Solitaire Corporate Park, Building No.10,1st Floor,Andheri Ghatkopar Link Road, Chakala, Andheri (East), Mumbai-400093 Phone No. : 022- 30847000/100
				Lenovo India Pvt Ltd 2nd Floor Kuppu Arcade, 4 Venkatanarayana Road, T.Nagar, Chennai 600 017 Phone No. : 044-39159273
			LG	Given Above
			Maxon	Maxon CIC Europe Ltd Maxon House Cleveland Road Hemel Hempstead Herts HP2 7EY United Kingdom Tel: +44 (0) 1442 267777
			Meizu	Future Technology Enterprise Ltd. Unit 01-02, 19/F, Hollywood
Sr		Product		
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No.	Product Name	Sub	Brand	Address / Contact Details
		Category		Plana (10 Nathan Road
				Mangkak Kowloon Hong Kong
				Tel: (852) 2388 8022
				Micromax House,
				90B,Sector-18,Gurgaon
			Micromax	Pin Code - 122015
				Tel: +91-124-4811000
				Fax: +91-124-4009603
				Micromax House,
				90B,Sector-18,Gurgaon
				Pin Code - 122015
				Tel: +91-124-4811000
				Fax: +91-124-4009603
				Micromax House,
				90B,Sector-18,Gurgaon
				Pin Code - 122015
				Tel: 18605008286
				Fax: +91-124-4009603
				Micromax Informatics Ltd, Plot
				No.234, HPSIDC Industrial Area,
				Tehsil Nalagarh, Distt Solan
				(HO)-173205
				Microsoft Corporation
			Microsoft	One Microsoft Way
				Redmond, WA 98052-6399
				MiTAC products or general
			Mitac	company enquiries
				Tel: 886-2-26525888
			Mitsubishi	Given Above
				Motorola Mobility, Inc.
			Motorola	600 North U.S. Highway 45
				Libertyville, Illinois 60048 USA

SI No	Address		Latitude			Longitude			
51. 190.	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.		
	Raipur			<u> </u>	<u> </u>	I			
1.	Trade & Trade, Faradih, Raipur	21	15	52.0	81	38	13.7		
2.	Goyal Sales, Khatamtai, Bilaspur Road, Raipur	21	16	28.3	81	38	10.5		
3.	Amit Sales, GE Road, Raipur	14	21	14	41.4	81	36		
4.	Sony Center, GE Road, Raipur	15	21	14	40.2	81	36		
5.	Modern Electronics, GE Road, RK College, Raipur	16	21	14	34.4	81	36		
6.	Dhamani Enterprises, GE Road, Raipur	17	21	14	32.4	81	37		
7.	Leelas (LG Shoppe), MG Road, Raipur	18	21	14	42.1	81	38		
8.	Roop Enterprises, MG Road, Raipur	19	21	14	43.7	81	38		
9.	Kailash Raidio TV Center, MG Road, Raipur	20	21	14	44.3	81	38		
10.	Sunil Electronics, MG Road, Raipur	21	21	14	44.9	81	38		
11.	Vishal Electronics, MG Road, Raipur	22	21	14	45.5	81	38		
12.	Subham Electronics (Samsung), MG Road, Raipur	24	21	14	47.0	81	38		
13.	BRG Electronics, MG Road, Raipur	21	14	51.9	81	37	59.3		
14.	Reliance Digital, CG Center City Mall, Raipur	21	15	15.7	81	38	46.5		
15.	Atlani Corporation (LG Shoppe) , Near Bus Stand, Pandari, Raipur	21	15	9.2	81	38	54.7		
16.	Naresh Marketing (AC Shop), Near Bus Stand, Pandari, Raipur	21	15	8.9	81	38	54.9		
17.	Samsung Smart Plaza, Near Bus Stand, Pandari, Raipur	21	14	59.4	81	38	45.0		
18.	Sony Center, Near Bus Stand, Pandari, Raipur	21	14	58.3	81	38	43.9		
19.	Panasonic, Near Bus Stand, Pandari, Raipur	21	14	57.0	81	38	42.6		
20.	Lotus Electronics, Kachori Chowk, Raipur	21	14	51.9	81	38	29.3		
21.	Atul Electronics, Indira chowk, Arang, Raipur	21	11	44.1	81	57	45.2		

Partial List of Distributor, Trader & Retailer in Raipur Division – Annexure 2

SI No	Address		Latitude			Longitude			
51. 190.	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.		
22.	Mukund Electronics, Indira chowk, Arang, Raipur	21	11	43.1	81	57	48.5		
23.	Kumkum Enterprises, Indira chowk, Arang, Raipur	21	11	41.8	81	57	51.8		
24.	Pankaj Electronics, Mahamaya Para, Arang, Raipur	21	11	39.3	81	57	54.9		
25.	Satyam Electronics, Mahamaya Mandir, Arang, Raipur	21	11	38.9	81	57	55.1		
26.	Dinesh Electronics, Near Bus stand, Arang, Raipur	21	11	35.8	81	57	58.5		
27.	Lilesh Electronics, Near Bus stand, Arang, Raipur	21	11	34.5	81	57	59.3		
28.	Dipti Electronics, Near Bus stand, Abhanpur, Raipur	21	3	14.0	81	44	48.2		
29.	Chopra Electronics, Main Road, Abhanpur, Raipur	21	3	13.2	81	44	46.3		
30.	Astha Electronics, Dhamtari Road, Abhanpur, Raipur	21	3	7.5	81	44	36.2		
31.	Hari Om Electronics, Dhamtari Road, Abhanpur, Raipur	21	3	7.9	81	44	35.0		
32.	S.S.D Electronics, Dhamtari Road, Abhanpur, Raipur	21	3	7.6	81	44	33.9		
	Dhamtari		I		I	I	<u> </u>		
33.	Ganpati Electrical & Electronics, Near Bus Stand, Dhamtari	20	43	6.4	81	33	2.8		
34.	Shradhha Enterprises (Samsung) , Raipur Road, Dhamtari	20	43	13.7	81	33	5.0		
35.	Shree Laxmi Electronics, Gram Arjuni, Dhamtari	20	44	2.0	81	33	31.3		
36.	Anil Radio, Sihawa Chowk, Dhamtari	20	43	45.0	81	32	56.9		
37.	Vijay Enterprises, Near Amar Takies, Dhamtari	20	42	35.9	81	32	54.7		
38.	Rajasthan Enterprises, Bastar Road, Dhamtari	20	42	34.3	81	32	50.3		
39.	Lalwan TV, Dev Shree Takies Chowk, Dhamtari	20	42	29.5	81	32	45.3		
40.	Guru Nanak Radio, Ratna Bandh, Dhamtari	20	42	32.6	81	32	38.6		
41.	Ayush Enterprises, Ratna Bandh, Dhamtari	20	42	32.2	81	32	38.3		
42.	Shanti Radio & Electronics, Ratna Bandh, Dhamtari	20	42	32.2	81	32	37.7		
43.	Swaroop Enterprises, Ratna Bandh, Dhamtari	20	42	32.9	81	32	36.3		

SI No	Address	Latitude			Longitude			
01. 1 10.		Deg.	Min.	Sec.	Deg.	Min.	Sec.	
44.	Khatri Radio TV Center, Ratna Bandh, Dhamtari	20	42	33.3	81	32	35.8	
45.	Geeta Electronics, Ambedkar Chowk, Dhamtari	20	42	3.8	81	32	8.4	
46.	Hazi Electronics & furniture, Bastar Road, Dhamtari	20	42	29.6	81	32	37.2	
47.	Sachdev Electronics, Station Road, Dhamtari	20	42	40.2	81	32	56.1	
48.	Chitra Palace, Station Road, Dhamtari	20	42	43.1	81	32	56.5	
49.	Ashish Electronics, Near Bus Stand, Dhamtari	20	43	3.4	81	33	2.6	
50.	Gori Enterprises, Chameli Chowk, Dhamtari	20	42	16.2	81	33	2.1	
51.	National Electronics, Chameli Chowk, Dhamtari	20	42	15.5	81	33	1.9	
52.	Gautam Furniture & Electronics, Rambagh, Dhamtari	20	41	51.2	81	33	9.9	
53.	Novkar Enterprises, Ambedkar Chowk, Dhamtari	20	42	3.2	81	32	16.0	
54.	Prakash Radio, Main Road , Nagri	20	20	55.7	81	57	31.1	
55.	Jain Electrical & Electronics, Bajrang Chowk, Nagri	20	20	53.0	81	57	33.3	
56.	Dipak Electronics, Sakra Road, Nagri	20	20	47.0	81	57	38.1	
57.	Mahavir Enterprises, Sakra Road, Nagri	20	20	48.8	81	57	37.0	
58.	J.K Electronics, Sakra Road, Nagri	20	20	50.6	81	57	34.5	
59.	Nishar Watch & Radio Center, Near Bus Stand, Nagri	20	20	55.7	81	57	30.4	
60.	Star Radio, Sakra Road, Nagri	20	20	53.6	81	57	32.1	
61.	Sumit Electronics, New Bus Stand, Nagri	20	20	59.7	81	57	25.4	
62.	Santosh Electronics, Kurud Road, Magarlod	20	44	59.7	81	51	2.6	
	Gariband			ł	,	1	1	
63.	Subham Enterprises, Bus stand, Nayapara Rajim, Gariaband	20	57	15.7	81	51	27.8	
64.	Shree Vaibhav Laxmi Electronics , Ganj Road, Rajim, Gariaband	20	58	5.3	81	51	31.5	
65.	Jagdamba Electronics, Ganj Road, Rajim, Gariaband	20	58	5.8	81	51	31.9	

SI No	Address		Latitude			Longitude			
51. 140.	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.		
66.	Dev Shree Agency, Ganj Road, Rajim, Gariaband	20	58	4.6	81	51	33.9		
67.	Vinay Electricals, Ganj Road, Rajim, Gariaband	20	58	1.5	81	51	41.0		
68.	Shailesh Electronics, Ganj Road, Rajim, Gariaband	20	58	1.0	81	51	43.5		
69.	Shree Ram Radio Center, Ganj Road, Rajim, Gariaband	20	57	58.7	81	51	48.1		
70.	Hari Sales, Sadar Bazar, Rajim, Gariaband	20	58	4.4	81	52	7.1		
71.	Jain Radio, Sadar Bazar, Rajim, Gariaband	20	48	6.4	81	52	1.8		
72.	Diwangan Radio Center, Sadar Bazar, Rajim, Gariaband	25	58	10.4	81	51	42.6		
73.	Unique Electronics , Champaran Chowk, Rajim, Gariaband	20	58	21.3	81	51	42.0		
74.	Sunil Electonics, Main Market, Chhura, Gariaband	20	48	35.2	82	12	28.6		
75.	Sachdev Traders, Main Market, Chhura, Gariaband	20	48	36.1	82	12	31.1		
76.	Raj TV Center, Main Market, Chhura, Gariaband	20	48	41.6	82	12	38.9		
77.	Laxmi Enterprises, Main Market, Chhura, Gariaband	20	48	42.0	82	12	39.5		
78.	Vrindawan Electronics, Near Bus stand, Gariaband	20	37	52.7	82	3	47.7		
79.	Sri Ram Sales, Mainpur Road, Gariaband	20	37	50.5	82	3	50.1		
80.	Deep Sales, Deobhog Road, Gariaband	20	37	55.0	82	3	47.0		
81.	Nitin Electronics, Tiranga Chowk, Gariaband	20	37	59.5	82	3	42.7		
82.	Pravin Electronics, Raipur Road, Gariabad	20	38	1.6	82	3	41.5		
83.	Jai Shree Electronics, Raipur Road, Gariabad	20	38	6.5	82	3	38.8		
84.	Raja Traders, Raipur Road, Gariabad	20	38	7.4	82	3	37.7		
85.	Nisha Electronics, Main Road, Gariabad	20	38	0.1	82	3	45.3		
86.	Kanha Telecom, Main Road, Gariabad	20	38	3.0	82	3	49.4		
	Baloda Bazar								
87.	Neha Enterprises, Sabji Mandi, Baloda Bazar	21	39	22.9	82	9	45.7		
88.	Ambika Marketing, Sabji Mandi, Baloda Bazar	21	39	23.5	82	9	43.9		

SI No	Address		Latitude			Longitude			
51. 140.	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.		
89.	Mittar Furniture & Electronis , Sabji Mandi, Baloda Bazar	21	39	21.1	82	9	44.4		
90.	New Chawla Music, Mandi Road, Baloda Bazar	21	39	17.8	82	9	40.5		
91.	Kiran Electronics, Mandi Road, Baloda Bazar	21	39	18.1	82	9	40.5		
92.	Jai Bajran Electronics, Mandi Road, Baloda Bazar	21	39	16.9	82	9	40.3		
93.	Bajrang Farmiture & Electronics, Gandhi Chowk, Baloda Bazar	21	39	17.0	82	9	32.6		
94.	Kediya Electronics, Gandhi Chowk, Baloda Bazar	21	39	17.4	82	9	32.8		
95.	Shivom Electronics, Gandhi Chowk, Baloda Bazar	21	39	20.1	82	9	36.0		
96.	S. Sons Electronics, Gandhi Chowk, Baloda Bazar	21	39	21.3	82	9	36.4		
97.	Suresh & Company, Gandhi Chowk, Baloda Bazar	21	39	19.3	82	9	38.1		
98.	Guru Kripa Enterprises, Gandhi Chowk, Baloda Bazar	21	39	20.5	82	9	39.9		
99.	Kesharwani Electronics, Gandhi Chowk, Baloda Bazar	21	39	21.5	82	9	40.5		
100.	Nikhil Mobile & Electronics, Gandhi Chowk, Baloda Bazar	21	39	22.8	82	9	41.9		
101.	Shree Mobile & Electronics, Gandhi Chowk, Baloda Bazar	21	39	23.1	82	9	41.9		
102.	Rajesh Time center, Gandhi Chowk, Baloda Bazar	21	39	23.6	82	9	42.1		
103.	Amar Electronics, Sadar Bazar, Bhatapara, Baloda Bazar	21	44	12.3	81	56	50.0		
104.	Jagdamba Electronics , Sadar Bazar, Bhatapara, Baloda Bazar	21	44	13.4	81	56	50.0		
105.	Manoj Enterprises , New Bus Stand, Bhatapara, Baloda Bazar	21	44	38.7	81	56	54.4		
106.	Verma Enterprises , Mahasati Mandir Road, Bhatapara, Baloda Bazar	21	44	20.9	81	56	52.9		
107.	Durga Enterprises , Ram Saptah Chowk, Bhatapara, Baloda Bazar	21	44	8.6	81	56	44.9		
108.	Modi Electronics , Ram Saptah Chowk, Bhatapara, Baloda Bazar	21	44	7.1	81	56	41.1		

SI No	Address		Latitude			Longitude			
01. 1 10.		Deg.	Min.	Sec.	Deg.	Min.	Sec.		
109.	Kiran Radio , Jai Sthambh Chowk, Bhatapara, Baloda Bazar	21	44	7.7	81	56	38.6		
110.	Chhatisgarh Enterprises , Jai Sthambh Chowk, Bhatapara, Baloda Bazar	21	44	7.2	81	56	38.7		
111.	Manoj Electronics, Main Road, Simga, Baloda Bazar	21	37	46.1	81	42	21.5		
112.	Arun Electronics, Bilaspur Road, Simga, Baloda Bazar	21	37	44.5	81	42	21.6		
113.	Ashok Electronics, Jai Sthambh Chowk, Simga, Baloda Bazar	21	37	40.2	81	42	20.2		
114.	Hari Om Electronics, Bemetra Chowk, Simga, Baloda Bazar	21	37	34.0	81	42	18.1		
115.	Jai Electronics, Sadar Road, Simga, Baloda Bazar	21	37	40.4	81	42	13.0		
116.	Pankaj Electronics, Main Market, Kasdol, Baloda Bazar	21	37	25.9	82	25	20.5		
117.	Shree Shyam Ji Electronics, Main Road, Kasdol, Baloda Bazar	21	37	22.2	82	25	22.1		
118.	Satguru Electronics, Main Road, Kasdol, Baloda Bazar	21	37	16.2	82	25	26.0		
119.	Sunil Cycle & Electronics, Main Road, Kasdol, Baloda Bazar	21	37	12.9	82	25	29.0		
120.	Babloo Electronics, Main Road, Kasdol, Baloda Bazar	21	37	15.1	82	25	35.4		
121.	Sanjay Electronics, Main Road, Kasdol, Baloda Bazar	21	37	15.8	82	25	35.7		
122.	Bajrang Agency, Main Road, Kasdol, Baloda Bazar	21	37	16.5	82	25	38.4		
	Mahasamund		I			I	<u>I</u>		
123.	Ganesh Electronics, Shankar Nagar, Raipur Road, Mahasamund	21	6	53.1	82	5	31.5		
124.	Akanksha Electronics, Nehru Chowk, Mahasamund	21	6	36.3	82	5	45.1		
125.	Kishore Radio, Nehru Chowk, Mahasamund	21	6	35.1	82	5	43.3		
126.	Kishore Electronics, Nehru Chowk, Mahasamund	21	6	34.4	82	5	43.3		
127.	Agarwal Book Stall & Elctronics, Nehru Chowk, Mahasamund	21	6	34.2	82	5	43.2		

SI No	Address		Latitude			Longitude			
51. 190.	Address	Deg.	Min.	Sec.	Deg.	Min.	Sec.		
128.	Chhatisgarh TV Agency, Kachahri Chowk, Mahasamund	21	6	25.1	82	5	42.6		
129.	Adilya Communication, Barunda Chowk, Mahasamund	21	6	15.2	82	5	40.5		
130.	Dashmesh Enterprises, Indiar Market, Mahasamund	21	6	44.4	82	5	44.6		
131.	Kamal Enterprises, Ambedkar Chowk, Mahasamund	21	6	48.2	82	5	43.8		
132.	Vijay TV & Refrigration, Near Bus Stand, Mahasamund	21	6	48.2	82	5	42.8		
133.	Satyam Electronics, Main Road, Pithora, Mahasamund	21	15	2.7	82	31	4.7		
134.	Prince Electronics, Main Road, Pithora, Mahasamund	21	14	59.9	82	31	4.5		
135.	Gajanand Satynarayan Elecronics, Main Road, Pithora, Mahasamund	21	14	59.7	82	31	4.4		
136.	Jai Mata di Elecronics , Main Road, Pithora, Mahasamund	21	14	56.9	82	31	4.9		
137.	Narang Traders, Near Bus Stand, Pithora Mahasamund	21	15	53.1	82	31	5.0		
138.	Saket Electronics, Main Market, Pithora, Mahasamund	21	14	51.6	82	31	6.1		
139.	Maruti Sales, Rani Mahal, Pithora, Mahasamund	21	14	48.9	82	31	0.5		
140.	Agarwal Mobile & Electronics, Rajpoot Marg, Pithora, Mahasamund	21	14	52.6	82	30	59.9		
141.	Govind Ram Ashish Electronics , Bagbahra Road, Pithora, Mahasamund	21	14	47.2	82	31	5.3		
142.	Sahu Electronics, Main Market, Bagbahra, Mahasamund	21	2	45.0	82	23	8.1		
143.	Suresh Electronics , Main Market, Bagbahra, Mahasamund	21	2	46.1	82	23	46.1		
144.	Akanksha Electronics, Main Market, Bagbahra, Mahasamund	21	2	47.4	82	23	4.3		
145.	Nayak Electronics, Near Police Station, Bagbahra, Mahasamund	21	2	57.2	82	22	52.6		
146.	Gori Electonics, Jawahar Chowk, Bagbahra, Mahasamund	21	2	32.4	82	23	23.4		
147.	Raj Laxmi Electronics , Jawahar Chowk, Bagbahra, Mahasamund	21	2	32.5	82	23	24.1		

SI No	Name	Address	I	atitud	e	Longitude						
01. 1 (0.	i fuille	induicos	Deg.	Min.	Sec.	Deg.	Min.	Sec.				
		Raipur										
1	Zila Vyapar and Udhyog office	Raipur	21	14	43.9	81	38	40.8				
2	Mahila & bal Vikas	Raipur	21	14	44.0	81	38	41.3				
3	Nirvachan office	Raipur	21	14	44.9	81	38	38.9				
4	Nagar Palika Office	Arang	21	11	33.7	81	58	9.1				
5	Tahsil Office	Arang	21	11	34.2	81	58	28.8				
6	Janpat Panchayat Offie	Arang	21	11	35.4	81	58	31.8				
7	Tahsil Office	Abhanpur	21	3	12.8	81	44	43.1				
Dhamtari												
8	Nagar Palika Office	Dhamtari	20	42	10.1	81	33	0.3				
9	Tahsil Office	Dhamtari	20	42	12.9	81	32	56.8				
10	Lok Sewa Kendra	Tahsil, Dhamtari	20	42	11.8	81	32	56.5				
11	Collectrate office	Dhamtari	20	40	43.1	81	32	59.9				
12	Janpat Panchayat office	Dhamtari	20	40	44.4	81	33	16.5				
13	Tahsil Office	Nagri	20	21	2.6	81	57	22.2				
14	Lok Sewa Kendra	Nagri	20	21	2.7	81	57	22.9				
15	Janpat Panchayat office	Nagri	20	21	3.0	81	57	20.3				
16	Tahsil Office	Magarlod	20	44	46.7	81	51	1.9				
		Gariaband										
17	Tahsil Office	Rajim	20	58	30.6	81	50	38.0				
18	Tahsil Office	Chhura	20	48	5.9	82	12	18.5				
19	Post office	Gariaband	20	38	0.6	82	3	42.6				
20	Collectrate office	Gariaband	20	38	10.5	82	3	35.6				

Partial list of Bulk Consumers in Raipur Division- Annexure 3

Sl. No.	Name	Address	I	atitud	e	Longitude						
			Deg.	Min.	Sec.	Deg.	Min.	Sec.				
21	Tahsil Office	Gariaband	20	37	55.9	82	3	39.0				
22	Lok Sewa Kendra	Gariaband	20	37	55.9	82	3	39.0				
Baloda Bazar												
23	Collectrate office	Baloda Bazar	21	39	45.2	82	8	48.6				
24	Tahsil Office	Baloda Bazar	21	39	31.6	82	8	47.4				
25	Lok Sewa Kendra	Baloda Bazar	21	39	32.3	82	8	46.0				
26	Treasury office	Baloda Bazar	21	39	32.3	82	8	46.2				
27	Janpat Panchayat	Baloda Bazar	21	39	28.4	82	8	48.9				
28	Tahsil Office	Simga	21	38	8.9	81	42	34.6				
29	Tahsil Office	Kasdol	21	37	36.8	82	25	14.6				
30	Janpat Panchayat	Kasdol	21	37	35.5	82	25	13.7				
		Mahasamund		1								
31	Collectrate office	Mahasamund	21	6	10.1	82	5	0.5				
32	RTO office	Mahasamund	21	6	6.5	82	5	1.5				
33	Civil Court	Mahasamund	21	6	17.8	82	5	3.6				
34	Zila Shiksha Adhikari	Mahasamund	21	6	7.3	82	5	11.0				
35	Tahsil Office	Mahasamund	21	6	24.9	82	5	40.8				
36	Lok Sewa Kendra	Mahasamund	21	6	23.6	82	5	40.8				
37	Janpat Panchayat	Pithora	21	14	43.3	82	31	4.8				

SI No	Name of Shops	Address	I	Latitud	e	Longitude			
51. 1 40.	Traine of onops	nuiress	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
		Raipur	<u> </u>						
1	Glacier Refrigeration	Nagar complex, Khatamtai, Raipur	21	16	42.2	81	38	8.8	
2	LB Enterprises	Nagar complex, Khatamtai, Raipur	21	16	42.0	81	38	9.0	
3	Munna TV Repairing Shop	MG Road, Raipur	21	14	44.0	81	38	1.0	
4	AC & Refrigerator Repairing shop	Maudhapara, Raipur	21	14	51.0	81	38	13.8	
5	Annapurna Electronics	Kalik Chowk, Arang	21	11	46.1	81	57	37.0	
6	Bhupendra Electronics	Indira Chowk, Arang	21	11	40.3	81	57	57.6	
7	Shibu Electronics	Mahamaya Mandir, Arang	21	11	38.6	81	57	54.7	
8	Shubham TV Repairing	Mahamaya Mandir, Arang	21	11	38.4	81	57	54.3	
9	Narendra Electronics	Mahamaya Mandir, Arang	21	11	38.4	81	57	54.6	
10	Shubham TV Repairing Center	Mandir Chowk, Arang	21	11	38.7	81	57	54.8	
11	Punesh Electronics	Near Bus Stand, Arang	21	11	34.0	81	57	59.3	
12	Suraj Electronics	Near Bus Stand, Arang	21	11	33.6	81	57	59.3	
13	Kabir Electronics	Main Road, Abhanpur	21	3	9.9	81	44	59.5	
14	Laxmi Electronics	Main Road, Abhanpur	21	3	8.2	81	45	1.2	
15	Om Reprairing Center	Main Road, Abhanpur	21	3	8.0	81	45	1.6	
16	Shakti Electronics	Main Market, Abhanpur	21	3	7.5	81	44	35.8	
		Dhamtari	1	<u>I</u>		1	1	1	
17	Anjali Electronics	Sihawa Chowk, Dhamtari	20	42	48.8	81	32	58.6	
18	TV Repairing Shop	Ambedkar Chowk, Dhamtari	20	42	4.3	81	32	9.5	
19	Kundan Electronics	Rambagh, Dhamtari	40	41	42.5	81	33	20.5	

Partial list of Service Centers in Raipur Division- Annexure 4

SL No.	Name of Shops	Address	Latitude		Longitude						
			Deg.	Min.	Sec.	Deg.	Min.	Sec.			
20	D.K Electronics	Near Bus Stand, Nagri, Dhamtari	20	20	58.5	81	57	30.7			
21	Ali Computer & Mobile	Near Bus Stand, Nagri, Dhamtari	20	20	57.6	81	57	29.7			
22	Durga TV Center	Nagri, Dhamtari	20	20	47.1	81	57	33.2			
23	Sen Electronics	Near Bus Stand, Nagri, Dhamtari	20	20	58.7	81	57	28.0			
24	Hirani TV Repairing Center	Mandi Road, Naya Bazar, Magarlod	20	44	51.2	81	51	2.2			
25	A1 Electronics	Naya Bazar, Magarlod	20	44	55.8	81	51	2.7			
26	Hirwani Tv Center	Naya Bazar, Magarlod	20	44	56.0	81	51	4.4			
27	Sri Ram Electronics	Main Road, Magarlod	20	44	57.4	81	51	2.2			
Gariaband											
28	Gitika Refrigeration	Tarri Road, Nayapara, Rajim, Gariaband	20	58	0.1	81	51	15.0			
29	Mahul TV Repairing	Ganj Road, Rajim, Gariaband	20	58	2.4	81	51	39.4			
30	Om TV Center	Sadar Bazar, Rajim, Gariaband	20	58	7.2	81	51	59.9			
31	Arvind Electronics	Chhura, Gariaband	20	48	37.7	82	12	36.7			
32	Shree Vishnu Electronics	Chhura, Gariaband	20	48	40.2	82	12	38.8			
33	Sahu Computer Repairing	Raipur Road, Gariabad	20	38	8.4	82	3	37.0			
34	Khemu Radio	Main Road, Gariabad	20	38	0.5	82	3	45.5			
35	Modern Electronics	Main Road, Gariabad	20	38	1.9	82	3	47.4			
36	KGN Sale & Service	Raipur Road, Gariabad	20	38	5.8	82	3	52.3			
		Baloda Bazar		I	I	I	I	1			
37	Dev TV Service Center	Sabji Mandi, Baloda Bazar	21	39	21.0	82	9	46.1			
38	Patel TV Service	Sabji Mandi, Baloda Bazar	21	39	23.0	82	9	46.0			

SI No	Name of Shops Address		Ι	atitud	e	Longitude			
			Deg.	Min.	Sec.	Deg.	Min.	Sec.	
39	Ajay Electronics	Sabji Mandi, Baloda Bazar	21	39	22.9	82	9	43.8	
40	Eliyas Rink TV Repairing	Mandi Road, Baloda Bazar	21	39	21.6	82	9	43.1	
41	Ramesh Radio	Gandhi Chowk, Baloda Bazar	21	39	20.0	82	9	37.5	
42	Sai Mobile & Electronics	Bhagat Singh Ward, Bhatapra	21	44	14.9	81	56	57.9	
43	Seema TV Center	Ram Saptah Chowk, Bhatapara	21	44	7.1	81	56	44.1	
44	Yuvraj Electronics	Gandhi Mandir Ward, Bhatapara	21	44	9.0	81	56	29.5	
45	Chaman TV Repairing	Gandhi Chowk, Batapara	21	44	9.9	81	56	28.2	
46	Shree Satguru Electronics	Bemetara Chowk, Simga	21	37	32.1	81	42	17.3	
47	Patel TV Center	Sadar Road, Simga	21	37	39.7	81	42	16.6	
48	Sanjay Electronics	Sadar Road, Simga	21	37	41.8	81	42	20.3	
49	TV Center	Bilaspur Road, Simga	21	38	5.0	81	42	31.7	
50	Shree Shyam Ji Electronics	Main Market, Kasdol	21	37	23.2	82	25	22.0	
51	Ashok Tv Repairing Center	Main Market, Kasdol	21	37	16.7	82	25	25.3	
52	Chanchal Electronics	Main Market, Kasdol	21	37	15.2	82	25	36.5	
53	Sunil Electronics	Main Market, Kasdol	21	37	15.7	82	25	25.6	
-		Mahasamund		1					
54	Bhau Electronics	Near Bus stand, Mahasamund	21	6	44.8	82	5	42.6	
55	Aryan TV Center	Near Bus stand, Mahasamund	21	6	45.1	82	5	42.2	
56	Anand TV Service	Shankar Nagar, Near Bitholi Takies, Mahasamund	21	6	52.3	82	5	37.5	
57	Dharam Electronics	Shankar Nagar,Mahasamund	21	6	53.6	82	5	31.4	
58	Jyoti Electronics	Purani Bazar,Mahasamund	21	6	42.7	82	5	35.9	
59	Ram Tv Center	SCI Road, Mahasamund	21	6	36.7	82	5	48.5	

SI No	Name of Shops	Address	I	atitud	e	Longitude			
01. 1 (0.	i tunic of chops	indiress.	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
		Old Kachahari Chowk							
60	Gopal TV Center	Mahasamund	21	6	27.2	82	5	43.0	
61	Surendra Tv Center	Old Kachahari Chowk, Mahasamund	21	6	26.9	82	5	42.5	
62	Chandra TV Serice	Kachahari Chowk, Mahasamund	21	6	25.1	82	5	43	
63	Anand TV Service	Kachahari Chowk, Mahasamund	21	6	24.9	82	5	43.4	
64	Nitesh TV Repairing	Barunda Chowk, Mahasamund	21	6	15.7	82	5	42.4	
65	Sahu Electronics	Barunda Chowk, Mahasamund	21	6	15.6	82	5	40.8	
66	Rahul TV Center	Barunda Chowk, Mahasamund	21	6	12.7	82	5	36.2	
67	Sahu Radio & TV Center	Shastri Chowk, Mahasamund	21	6	12.3	82	5	35.9	
68	Ritesh Freeze Service	Shastri Chowk BTI Road, Mahasamund	21	6	12.5	82	5	35.6	
69	Vijay TV & Refrigration	Near Bus Stand, Mahasamund	21	6	48.2	82	5	42.8	
70	Sarwar Cooling Center	Main Road, Pithora, Mahasamund	21	15	2.3	82	30	4.5	
71	Mahendra Tv center	Main Road, Pithora, Mahasamund	21	15	1.8	82	30	59.7	
72	Prince Electronics	Main Road, Pithora, Mahasamund	21	14	59.9	82	31	4.5	
73	Global Computer Service	Rani Mahal, Pithora, Mahasamund	21	14	48.6	82	31	9.2	
74	Mahesh Electronics	Rajpoot Marg, Pithora, Mahasamund	21	14	52.6	82	31	0.2	
75	Om Electronics	Bagbahra Road, Pithora, Mahasamund	21	14	47.3	82	31	4.7	
76	Amar Freez, AC Repairing	Main Market, Bagbahra, Mahasamund	21	2	47.5	82	23	4.4	
77	Gopal TV Center	Main Market, Bagbahra, Mahasamund	21	2	52.4	82	22	58.3	

Sl. No.	Name of Shops	Address	I	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.	
78	Verma Electronis	Main Market, Bagbahra, Mahasamund	21	2	56.5	82	22	53.8	

Sl No.	Name	Address
1.	M/s Navrachna Recycling Pvt. Ltd.	Plot No 1B, Somni Industrial Area, Rajnandgaon
2.	M/S ADV Metal Combine Private Limited	Borai Industrial Growth Center, Durg

Inventory of Physically Established Collection Centers- Annexure-5

Partial inventor	y of Scrap	vendor/	Dismantler-	Annexure 6
		-		

Sl. No.	Name	Address	Ι	atitud	e	Longitude			
			Deg.	Min.	Sec.	Deg.	Min.	Sec.	
		Raipur							
1	Mohd. Ameen	Maudapara, Raipur	21	15	12.2	81	38	9.1	
2	Mohsin	Maudapara, Raipur	21	15	12.0	81	38	9.6	
3	Vikram	Bilaspur Road, Khatamtai, Raipur	21	16	26.1	81	38	10.3	
4	Vinay	Vyas Talab Birgaon, Raipur	21	18	19.2	81	38	4.6	
5	Ramesh	Durga nagar, Birgaon, Raipur	21	18	2.1	81	37	48.7	
6	Kausal	Gandhi Nagar, Birgaon, Raipur	21	18	3.4	81	37	54.6	
7	Akbar Bhai	Bhanpuri, Ring Road, Raipur	21	17	35.0	81	37	50.5	
8	Golu	Indira Chowk, Arang	21	11	42.6	81	57	52.5	
9	Balbinder Gandhi	Near Railway Crossing, Abhanpur	21	3	14.1	81	44	42.5	
		Dhamtari							
10	Mohd. Rustam	Arjun Basti, Raipur Road, Dhamtari	20	44	1.5	81	33	31.8	
11	Saiyad Saheed	Ratna Bandh, Dhamtari	20	42	33.2	81	32	37.3	
12	Mohd. Arif	Chameli Chowk, Dhamtari	20	42	16.2	81	33	4.9	
13	Abdul Samad	Rambagh, Dhamtari	20	41	39.7	81	33	22.9	
14	Dipal	Rudri Road, Shivaji Nagar, Dhamtari	20	41	0.4	81	33	14.4	
15	Mukesh	Sihawa Chowk, Dhamtari	20	42	52.2	81	32	59.0	
16	Idrish	Churiapara, Nagri	20	20	48.6	81	57	27.2	
17	Taheer	Dhamtari Road, Magarlod	20	45	0.9	81	51	3.2	
		Gariaband	<u> </u>					<u> </u>	
18	Abdul Gani	Nayapara, Rajim, Gariaband	20	58	14.3	81	51	27.1	
			•						

SL No.	Name	Address	I	Latitud	e	Longitude					
01.1101	- tunic		Deg.	Min.	Sec.	Deg.	Min.	Sec.			
19	Aslam	Tarri Road, Nayapara, Rajim	20	58	4.7	81	51	25.5			
20	Rizvi	Tarri Road, Nayapara, Rajim	20	57	56.7	81	51	10.8			
21	Mohd. Rustam	Ganj Road, Rajim,	20	58	0.2	81	52	12.1			
22	Roshan	Indira Market, Rajim,	20	58	6.3	81	52	12.1			
23	Ashar Bhai	Indira Market, Rajim,	20	58	7.3	81	52	12.2			
24	Kaku Bhai	Champaran Chowk, Rajim	20	58	22.8	81	51	44.6			
25	Kalu Khan	Main Road, Chhura	20	48	41.6	82	12	32.3			
26	Arif Bhai	Raipur Road, Gariabad	20	37	59.5	82	3	43.5			
27	Mohd. Sajid Khan	Main Road, Near Masque, Gariaband	20	38	4.4	82	3	50.3			
Baloda Bazar											
28	Gopal Sahu	Purani Basti, Baloda Bazar	21	39	26.3	82	9	47.7			
29	Mohd. Anwar	Bhagat Singh Ward, Baloda Bazar	21	44	14.4	81	56	53.0			
30	Javed Bhai	Bhagat Singh Ward, Bhatapara,	21	44	14.0	81	56	52.8			
31	Mohd. Rafiq	Bhagat Singh Ward, Bhatapara,	21	44	14.2	81	56	53.0			
32	Siddiq Meman	Bemetara Chowk, Simga	21	37	34.2	81	42	11.2			
33	Mohd. Aneesh	Sadar Road, Simga	21	37	41.0	81	42	8.1			
34	Mohd. Saleem	Sadar Road, Simga	21	37	41.6	81	42	3.3			
35	Kallu	Main Road, Kasdol	21	37	20.3	82	25	27.6			
36	Jivkaran Sahi	Main Road, Kasdol	21	37	21.1	82	25	24.9			
		Mahasamund						I			
37	Raju	Shankar Nagar, Mahasamund	21	6	53.4	82	5	30.6			
38	Arun Sahu	Purani Bazar, Mahasamund	21	6	38.2	82	5	40.2			

Sl. No.	Name	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
39	Ajay Sharma	Purani Bazar, Mahasamund	21	6	35.2	82	5	40.1
40	Umesh Tawri	Nayapara, Mahasamund	21	7	13.9	82	6	4.4
41	Vijay Sahu	Nayapara, Mahasamund	21	7	4.8	82	6	4.7
42	Madan lal		21	15	3.9	82	30	59.8
43	Babloo	Bagbahra Road, Pithora	21	14	35.4	82	30	55.1
44	Rambali Gupta	Main Road, Bagbahra, Mahasamund	21	2	56.2	82	22	53.6









Sample Photo Documentation- Annexure 8





Annexure - 9

Methods for Inventory Assessment

The Time Step Method

The calculation of WEEE/E-waste is made on the basis of private and industrial stock and sales data. Mathematically, the time step method is given below.

WEEE generation (t) =Stock (t1) – Stock (t)] private + [Stock (t1) - Stock (t)] industry + • Sales (n) - • WEEE (n) n=t1+1 to t-1 n=t1+1 to t with t1 < t

Stock private = Number of households * (saturation level of households / 100)

= Population / average size of household * (saturation level of households / 100)

Stock industry = number of work places * (saturation level in the industry / 100)

= number of employees / number of users per appliance *saturation level in the industry/100

The Market Supply Method

The calculation of WEEE/ E-waste is made from sales data, together with typical lifespan. The waste potential during collection phase at time t is calculated from sales figures and information about consumption patterns. Mathematically, the market supply method is given below.

WEEE generation (t) = sales $(t - d_N)$ + reuse $(t - d_S)$ Where,

- d_N Average lifetime of new items
- dS Average lifetime of second-hand items

The Carnegie Mellon Method

This method is a variation of "market supply method", where the calculation of WEEE/E-waste is made from sales data, assumptions about typical lifetimes, recycling and storage. The model considers consumer behaviour when disposing of end-of-life EEE. This method defines the pathways of electrical and electronic equipment from purchase to end-of-life. At the point of obsolescence, there are four options of reuse, storage, recycling & landfill available to the owner.

Approximation 1

The calculation of WEEE is estimated on the basis of stock and average lifetime data. This method has also been referred to as the 'Consumption and Use' method. This method was used to calculate WEEE/ E-waste in the Netherlands. Mathematically, the method is represented by the following equation.

WEEE generation (t) = [Stock private (t) + Stock industry (t)] / average lifetime

Stock private = Number of households *saturation level of the households / 100

= Population / average size of household *saturation level of the households / 100

Stock industry = number of work places *saturation level in the industry / 100

= number of employees/number of users per appliance *saturation level in the industry /

100

Approximation 2

This method is based on the assumption, that with the sale of a new appliance, an old appliance has to be disposed of. Mathematically, it can be represented as given below.

WEEE generation (t) = sales (t)

Methodology/Features	Requirements	Constraints	Advantages
The Time Step Method	 Information about domestic sales. Appliance stock levels for household. Industrial stock levels. 	 Household saturation levels are based on predetermined stock levels Industrial stock levels are assumed in the calculations because they are difficult to obtain and require assumptions. Assumption that all the WEEE/E- waste generated is collected and transferred to treatment and disposal facility. 	 Calculations can be carried out very easily. Method gives good results in a saturated market.
The market Supply Method	 Information about domestic sales. Average life of new and second hand items. 	 The average life is to a large extent is subjective because in most of the developed countries electrical and electronic equipment is often replaced and disposed of before it reaches its technical end-of-life. WEEE/ E-waste are often stored for years. Assumed that all appliances produced in the same year will be in line for disposal after exactly the average life. Assumption that the average variance in life of items of EEE does not change very much, whereas, in reality, lifetimes may 	 Necessary data need not be very wide-ranging Calculations can be carried out very easily using a simple formula Sales data is derived from official statistics from market research institutes or trade organisations and are of good quality and available for a large number of products.

Features of the five inventory assessment methods

Methodology/Features	Requirements	Constraints	Advantages
		become shorter in the future. Therefore, this method is not especially useful in the calculation of WEEE for a dynamic market where technology and life are changing rapidly.	
The Carnegie Mellon Method	Sales data, date for typical life times, recycling & storage.	 Assumptions are made regarding the pathways or "material flow" during reuse, storage, recycling and landfilling. These assumptions are both product and country specific and therefore demand a good knowledge of consumer behaviour and the disposal position. This model also requires a full coverage of sales data as early as possible in the WEEE/E-waste trade value chain. 	 The model allows for an electrical and electronic equipment to be purchased, reused, stored and finally recycled or landfilled representing "material flow" more precisely. This method is ideal for more extensive examination of individual products. Because of the larger amount of input data, the calculation of WEEE is clearly more extensively structured.
Approximation 1	The required input data for application of this method is stock data and assumptions about average lifetime of appliance.	 A product's constant mean lifespan is assumed in this method. This method is suitable for estimating WEEE in widely saturated markets with no major deviations from the mean lifespan, 	This method is particularly useful when reliable stock data for an appliance is available

Methodology/Features	Requirements	Constraints	Advantages
		which is a subjective variable.	
Approximation 2	Sales statistics is used to calculate WEEE/E-waste generation in a particular year assuming a saturated market.	 This method is only suitable in a fully saturated market where the purchase of a product leads to the same quantity of waste from the old product. Therefore, this method has limited application in dynamic and developing markets because in these markets a larger part of the sales serves to increase stock and does not initially contribute to waste. This method is unsuitable if the temporary storage or second use of old appliances plays a significant role in consumer behaviour. 	 This method is suitable for carrying out an initial assessment. Very limited range of input data required for application of this method. No historical data is required, only sales figures for a particular period of time are required.

Methodology/	Saturation Level		Number of	Calculated Sales			Stock Data		Average	Storage			
Requirement	Household	Industry	Household	Export Data	Import Data	Manufacturing /Production	Private	Industry	Lifetime	data	Reuse	Recycle	Landfill
Time Step Method	\checkmark	\checkmark		V	V		V	V					
Market Supply Method				V	\checkmark	\checkmark			V				
Carnegie Mellon Method				V	\checkmark	\checkmark			\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
Approximation 1	\checkmark		$\overline{\mathbf{v}}$						V				
Approximation 2					V	\checkmark							

Data Requirements for E-waste Inventory Assessment

Note: √ means 'Yes'



Generic E-waste material flow chain

Methodology

A two-prolonged approach was adopted for the collection of relevant data and arriving at the results. Firstly, a primary survey was undertaken for data collection from the end users side. The information was then projected to the all-India level using robust projection techniques. Secondly, All-India estimates were validated by the feedback obtained from the vendors and the trade channel members.



End User Survey

Two broad user segments were covered in this phase of data collection viz. business establishments (having at least a telephone connection) and households (SEC A, B, C and D/E households). The following paragraphs explain the method of arriving at the final estimates from the end users route.

Business Establishments

A representative sample of establishments was contacted personally by our trained field personnel and relevant information on the IT products installed in the establishment during April 2012 to March 2013 and the number of units of each installed etc. was obtained. This information was then projected to the universe of establishment stratified by the Principal activity carried out at the respective establishment and the number of employees working in the respective establishment.

The detailed sampling process is as explained below:

Stratification of the Universe of Establishment

The universe of establishment was stratified on the basis of "Principal Activity carried out at the respective establishment" Classified by "Employee size" (ACE), which has been ascertained through an extensive telephonic survey conducted as a part of ITOPS' 97 – the baseline study in the ITOPS series. During the survey, 32000 telephonic contacts ware made in the Top 22 cities to determine the distribution of telephone owning establishments among different (nature of) Activity X Employee size (ACE) cells. This provided the ACE grid distribution for each of the 22 cities.

The universe of establishment as well as the ACE grid obtained from ITOPS' 97 is continuously updated and used for this study.

On the basis of the ACE grid composition thus obtained for each of the 22 centres covered, sample quota were set for the number of establishments that had to be contacted for each cell formed by the intersection of the nature of activity and numbers of employees as in the ACE grid.

Random starting addresses were selected from the telephone directory and at each starting address, 5 interviews were conducted with telephone owning establishments.

The variables used in ACE grid are robust indicator, which explains consumption of IT and Office automation products.

The market size for establishments has been obtained by applying product acquisition rate in each employee band to the respective size of universe of establishments in each city.



Households

With the growing awareness of the benefits of using IT at home, this segment has grown well in the last 3-4 years and offers a huge potential for such products. A representative sample of affluent households (SEC A, B and C & D/E) was personally contacted and relevant information was obtained. The universe of households for projection purpose has been taken from National Readership Survey 2006.

The steps involved in the household sampling and the purpose of these steps have been explained in the following table:

Step	Purpose	
Random Listing	 To identify the target group household (SEC A/B/C/D/E) To determine the penetration of PC and other IT products in the households To stratify the household universe into 2 broad categories Pure households Home offices 	
Detailed interview with the Target	• To determine the market size and profile of the owners and non-	
Group Household	 To determine the brand share To determine the usage of IT products among the owners To determine the intention to own IT products among the non- 	

Step	Purpose	
	 And to obtain there relevant information as needed for the study.	

For the market size estimation for home offices and households, the acquisition rate in each SEC class in home offices and households were applied to their respective universe strata.

Validation from Vendors and Trade Channel

Major IT manufacturers of each of these products were contacted and their views and facts & figures on the sales during April 2012 to March 2013 and their likely share of the market were collected. This information was used to validate the findings of the End User Survey.

List of Sources of Data in the Study Area- Annexure 10

National/ Local Government Agencies	Industry/ Trade/ Recyclers/ Waste Disposal Operator's Association (Reports/ Published Data/ Field Work)	Market Research Agencies (Reports/ Published Data)
National Census Data, (1991, 2001 & 2011)	Major Trading Agencies, (Retailers)	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
National Census Data, (1991, 2001 & 2011)		
NSSO (1994 – 2010)	Industry Association, Scrap Dealers, Recyclers, EEE Retailers	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
TRAI, MOCIT, Govt of India.	Industry Association, Scrap Dealers, Recyclers, EEE Retailers	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
TRAI, MOCIT, Govt of India.	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications, Annual Reports of Major Brands
	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications, Newspapers
	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications
	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	
City Municipalities	Scrap Dealers, Recyclers, EEE Retailers	

FINAL REPORT

E-Waste Inventorization of Surguja Division





2016

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Executive Summary

E-waste is one of the fastest growing waste streams in the world. In developed countries, it equals 1% of total solid waste generation on an average. In this context, Ministry of Environment & Forest, Government of India at first notified E-waste guidelines followed by Hazardous Waste (Management, Handling & Transboundary) Rules in 2008. This was followed by formulation of E-waste (Management & Handling) Rules 2011, which came into effect from 1st May 2012. In order to implement these regulations, each state mandated to prepare their E-waste inventory which can assist State Pollution Control Boards (SPCB) to monitor & regulate E-waste Management as per E-waste rules. Each of the State Pollution Control Board's have been assigned the responsibility for inventorization of E-waste in their State, grant and renewal of authorization, registration of recyclers, monitoring of compliances of authorization and registration conditions and action against violation of these rules. In view of the dues and responsibility defined under the E-waste rule, 2011, Chhattisgarh Environment Conservation Board (CECB) has planned for inventorization of E-waste in the five divisions of this State. IRG Systems South Asia Pvt. Ltd. has been assigned the task to carryout the inventorization in the five districts of Surguja Division. The current effort will assist to prepare an inventory of E-waste generated in the state so that an action plan can be formulated for future interventions.

The objective of the E-waste Assessment is to identify and quantify the E-waste generation for reuse, recycle and final disposal in the study area by adopting uniform approach and methodology. SoW as per ToR includes assessment of E-waste generation, present handling practices, storage, and channelization for its recycling or disposal, by producers, consumer, or bulk consumers. The report shall also include the detail list of producers, consumer or bulk consumers, collection centers, dismantlers and recyclers with the name, address contact no. and their practices for E-waste handling & management. Finally, the inventorization of E-waste shall be done for different categories (Information Technology and Telecommunication and consumer / household appliances) listed in schedule – 1 of E-waste Rules 2012. The study area includes Surajpur, Surguja, Jashpur, Balrampur and Koriya districts of Surguja Division.

This Final Inventory Assessment Report has been compiled in six chapters. This report is being compiled giving inventory of various stakeholders and present handling practices, storages & channelization for recycling.

Some of the major features of E-waste regulation having implication on E-waste inventory assessment indicate that no target has been fixed to collect E-waste from the time of enforcement. Producer is not bound by any collection target. There are no mandatory provisions for producers in the rules to declare quantity of EEE placed in the market since 2012. No mechanism for tracking purchase of EEE by bulk consumers exists.

Therefore, monitoring of E-waste inventory through evaluation of Form 2 or Form 3 in accordance with Rule 4(9) of E-waste Rule by CECB in the state is possible only through the producers data obtained from centralized agency e.g. CPCB or the state where these producers are registered after 2012. CPCB data shows that as of September 2013. Therefore, CECB can track & monitor E-waste inventory in the state through the dismantler's / recycler's data obtained from centralized agency e.g. CPCB or the state where dismantler's / recycler's are registered. This also indicates that E-waste is either dismantled or recycled in informal sector in the state. Producers are majorly responsible for all the activities including financing of E-waste management. It indicates that producers may be fulfilling their responsibility through collection system catering to dismantlers & recycler within and outside the state. Therefore, collection centres registered in the state may offer a limited opportunity of E-waste inventory tracking & monitoring mechanism in the state. Assessment on the upstream side of the E-waste chain especially of both types of consumers (bulk & individual consumer), also indicate that only bulk consumer offer opportunity of E-waste inventory tracking & monitoring. Though, bulk consumers are required to maintain records of E-waste, they are not required to file the returns. Since no mechanism exist for tracking purchase of EEE by bulk consumers and producers are not required to declare quantity of EEE placed in the market since 2012, E-waste inventory assessment has to rely on available historical market research data. Therefore, there is need to identify different producers, profile of consumers & bulk consumers, collection centre, dismantlers & recyclers who are catering to E-waste in the state.

Tracer technique, which was pilot tested in Chhattisgarh has been used in major urban centers/towns in Chhattisgarh to fix E-waste trade value chain. A tentative E-waste trade value chain for study area which has emerged out of field work from tracer techniques indicates the following profile of stakeholders & their inventory.

<u>Producers</u>: EEE producers / manufacturers do not exist in the study area. However, their products are being sold in the division. Secondary data confirms that EEE producers do not have manufacturing facilities in the division and therefore they are not registered with CECB. Since these producers are responsible for their products under EPR, their detailed **inventory** as per schedule 1 of E-waste (Management & Handling) rules are given in Annexure 1.

<u>Distributors / Traders / Retailers</u>: EEE from these producers are sold in the study area through Distributor / Trader / Retail network as well as directly through the company. Items like Centralized Data Processing, Mainframes, Mini-computers of Schedule 1 are used by large corporate, State and Central Government agencies falling under the category of bulk consumers whose profile is given below. **Inventory** of Distributors / Traders / Retailers selling items other than mentioned above in the study area are given in Annexure 2. However, retailers / dealers do not fall under the purview of E-waste (Management & Handling) Rules 2011, unless they serve as collection centre or drop off point.

<u>Consumers</u>: There are two types of consumers, which are found in the five districts of study area, Individual Consumers & Bulk Consumers. **Inventory** of bulk consumers in the five districts is given in Annexure 3.

<u>Collection Centres / Channel</u>: Tracer analysis indicates that EEE, which becomes E-waste in the study area partly gets collected & transported in the informal sector and partly in formal sector. Primary survey carried out through Tracer technique indicates that bulk of E-waste generated in the study area goes to informal sector. Majority of the producer / manufacturer have established collection channel in the study area. These collection channels work through following mechanism.

- 1. Single point call centre
- 2. Distributors / Retailers
- 3. Service Centres
- 4. Physically established collection centre / drop off point

The producers use a combination of these mechanisms. Inventory of Service centres in the study area are given in Annexure 4. Inventory of Physically established collection centres are given in Annexure 5. Majority of producers use call centre as well as dealer's network for collection of E-waste. There are two possibilities of onward transportation & disposal of E-waste. The first possibility is the disposal through informal sector & the second is through registered recycler. An inventory location of major scrap vendor / dismantler, temporary stockpile site / informal collection centre & landfill site is given in Annexure 6.

Small scrap dealer purchase waste from Household / Commercial Area / Institution, etc. At first stage, they segregate the waste than break the item and collect valuable items like Aluminum, Copper, Iron & Steel, Compressor, motor, etc. from E-waste. They sell their collected item to the large scrap dealer. They visit nearby area on daily/weekly basis and purchase the waste. These scrap dealers are not licensed by the municipalities but are part of the networks of large scrap dealers. Dismantling and segregation of E-waste occurs in a major way at large scrap dealers Photo documentation captured district-wise of Surguja division of Chhattisgarh in given in Annexure 8. Some of the major findings of the disposal mechanism are:

- Electronic items go to mechanic shops from households for repairing, and mechanic replace damaged / defunct parts/components from it and then they sold it to scrap dealers.
- Mechanics sell E-waste to scrap dealer by weight / Pcs. mainly of ICT items (IT as per Schedule 1); TV circuit Rs. 15-45/kg; Compressor Rs. 300-400/Pcs.; Washing Machine Motor Rs. 200/Pcs.; Copper Rs. 200-350/kg; DVD Circuit Rs. 20-25/kg; Mobile kit Rs. 1000-2000/kg; SMPS Rs. 50/Pcs, Mother Board Rs. 90/Pcs.; Hard disk Rs. 120/Pcs.; CD Writer Rs. 35-40/Pcs.

- Scrap vendors sold E-waste to scrap dealer by weight at Rs. 150-250 per kg
- Scrap vendors sold damage mobile phone to scrap dealer as individual piece at Rs. 30-50 per piece
- Scrap dealer comes from Delhi yearly twice/thrice for collecting of E-waste
- There is no organized mechanism for collection, transportation and disposal of E-Waste in Surguja division.
- No mechanism exists in the state to monitor and track its inventory, collection, transportation and disposal.

<u>Repair Shops (AC/WM/REF)</u>: One person repairs one of these items every day. E-waste fractions/ waste Parts, like plastic body of these items, etc. is dumped into community bin and valuable item sold to nearby scrap dealer. Some of the respondent informed that Item which is not in repairable condition is returned to the owner of the product who in turn sells to the scrap dealer. Majority of the product are in repairable condition.

<u>Repair Shops (TV / PC / Mobile Phone)</u>: Majority of mobile phones, TV & computers repair shop owners are local citizens. Waste Parts, like plastic body of these items, etc. are dumped into community bin and valuable item sold to nearby scrap dealer. They also store valuable item and use it to repair other EEE. In case of mobile phone, they utilize maximum parts while waste parts are dumped in municipal bin. Majority of the product are in repairable condition.

Data matrix versus methodology used for E-waste inventory assessment indicates "Market Supply" method and "Carnegie Mellon" method can be applied for WEEE / E-waste inventory assessment in five districts of Surguja division. **However, a combination of Carnegie Mellon method & tracer tracking has been selected for inventory assessment since it covers all the aspects of material flow chain.** Assessment of data from these stakeholders through tracer tracking has resulted in assessment of obsolescence rate or average life of equipment described in chapter 5. Major sources of secondary data included Saturation Level – National census data was obtained from office of the Registrar General & Census Operation, Govt. of India, National Sample Survey Organization (NSSO), Department of Statistics, Government of India, State Statistics from Department of Statistics, Government of Chhattisgarh, Telecom Regulatory Authority of India (TRAI), Ministry of Communications & Information Technology (MOCIT), Government of India, Industry Association like Manufacturers Association for Information Technology (MAIT), Electronic Industries Association of India (ELCINA), Telecom Equipment Manufacturers Association of India (TEMA) & Research Institutions e.g. National Council for Applied Economic Research (NCAER). Data related to average life time, storage data, reuse, recycling & disposal at landfill site was obtained through "tracer tracking" technique & primary survey.

The description of each of this method also describes constraints and advantages of each of these methods. The data requirements for each methodology based on mathematical expressions are given in Annexure 9. The extent of data required depends on the extent of geographical boundary, which could be national, regional or city boundary. Conceptually, the source of data can be identified by understanding the "material flow chain" within the given geographical boundary. A list of sources of data in study area, which was required for application of inventory assessment methodology, is given in Annexure 10.

Analysis shows that Computers have the highest installed base followed by TV, Cellphones, printers, fixed line telephone, refrigerators, washing machines and Air Conditioners. In Surguja Computers, cellular phone, TV, fixed line phone washing machine and refrigerator has the highest installed base followed by Koriya, Jashpur, Surajpur and Balrampur of Surguja division.

Inventory estimates in Surguja division indicate that E-waste generation ranges from **3511.59** tons in 2011 to **10783.29** tons in 2020. In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 89% of the total inventory followed by Computers (6%), Printer (1%), Washing machine (1%), Refrigerator (1%), Fixed Line Phone (1%), AC (1%) & Cellular Phone)%. In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (63%), computer will constitute about 33% of the total inventory followed by Printer (2%), Refrigerator (1%), Washing machine (1%), Air conditioner (1%), Cellular phone (0%), & Fixed Line Phone (0%).

Some major observations are that Operating margin for Television waste per kilogram is Rs. 0.44. Operating margin for waste refrigerator is Rs. 11.46 per kilogram. For that of Washing Machine is Rs. 13.03 per

kilogram. For that of Air Conditioners is Rs. 18.40 per kilogram. For scrap old Personal Computer is Rs. 6.98 per kg. For waste cellular phones is Rs. 24.20 per kg. The operating margin ranges from Rs. 0.44 to Rs. 24.20 per kilogram. Scrap of Mobile / cellular phones gives the maximum operating margin of Rs. 24.20 while scrap from television gives the minimum profit of Rs. 0.44 per kilogram. This indicates that informal sector if brought into formal sector considering taxation involved will only dismantle / recycle cellular phones followed by ACs and WMs to some extent. Therefore, there is a need to formulate financial instrument for making dismantling / recycling of white goods viable.

Market risks matrix highlight the availability of raw material, its collection and transportation as risks of high & medium intensities. Collection mechanism directly impacts the availability of raw material. Therefore, there is a need for both strict implementations of regulations as well as financial instrument for diverting E-waste inventory in to the formal sector.

Chapter 1: Introduction & Background

1.0 Introduction & Background

E-waste is one of the fastest growing waste streams in the world. In developed countries, it equals 1% of total solid waste generation on an average. As the fastest growing component of municipal waste across the world, it is estimated that more than 50 MT of E-waste is generated globally every year. The rapid change in technology, low initial cost, and planned obsolescence has resulted in its fast growth. These rapidly increasing numbers of electronic equipment and appliances have the potential to create serious environmental and health impacts at the "end of life" if not treated and disposed in an environmentally sound manner. E-waste is also a source of resource as some of these materials and valuable parts used in manufacture of electrical and electronic (EEE) items can be recycled and re-used. The harnessing of E-waste as a "resource" provides potential economic opportunities through the development of collection, recovery and recycling facilities. As per CPCB / MoEF 2006 estimates, India generated 1, 46,000 metric tones of E-waste from six items, which were projected to exceed 7, 00,000 metric tones by 2012. A report of the United Nations predicted that by 2020, E-waste from old computers would jump by 500 percent on 2007 levels in India [2]. In this context, Ministry of Environment & Forest, Government of India at first notified E-waste guidelines followed by Hazardous Waste (Management, Handling & Transboundary) Rules in 2008. This was followed by formulation of E-waste (Management & Handling) Rules 2011, which came into effect from 1st May 2012. In order to implement these regulations, each state is mandated to prepare their E-waste inventory which can assist State Pollution Control Boards (SPCB) to monitor & regulate E-waste Management as per E-waste rules.

In this context, Chhattisgarh Environment Conservation Board invited Proposals for Inventorization of Ewaste in Raipur, Bilaspur, Durg, Bastar and Sarguja divisions of the State of Chhattisgarh. IRGSSA submitted its technical & financial proposal to CECB to carry out E-waste inventorization in Raipur, Bilaspur, Durg, Bastar and Sarguja divisions of the State of Chhattisgarh.

1.1 Need for Study

Despite of enactment of law for handling E-waste in India, this particular waste is being disposed off unaudited, in absence of appropriate inventory of E-waste in most of the states / cities. As per National Ewaste inventory estimates carried out by CPCB in 2006, Chhattisgarh state ranks among top twenty states generating E-waste in India. Therefore, in Chhattisgarh an effective inventory comprising the details of Ewaste and related components is yet to be created to manage & handle E-waste in eco-friendly manner and to combat the problem associated this waste. In this context, it is proposed to prepare an Inventory of Ewaste & related components in five divisions of Chhattisgarh viz. Raipur, Bilaspur, Durg, Bastar and Sarguja. The overall aim of this initiative is to assess the generators, quantity and present practices for handling of Ewaste in these divisions.

The current effort is aimed to prepare an action plan for E-waste for implementation of the legislations framed. The items to be covered in this assessment include personal computers, mobile phones, televisions, washing machines and refrigerators etc. as mentioned in E-waste (Management & Handling) Rules, 2011. A list of these items as per ToR is given in **Table 1.1**.

	Table 1.1: Categories of Electrical and Electronic Equipment
Sr. No.	Categories of Electrical and Electronic Equipment
i.	Information Technology and Telecommunication Equipment
	Centralized Data Processing
	Mainframes, Minicomputers
	Personal Computers (Central Processing Unit with input and output devices)
	Laptop Computers (Central Processing Unit with input and output devices)
	Notebook computers
	Notepad Computers
	Printers including cartridges
	Copying equipment

Sr. No.	Categories of Electrical and Electronic Equipment
	Electrical and Electronic typewriters
	User terminals and systems
	Facsimile
	Telex
	Telephones
	Pay telephones
	Cordless telephones
	Cellular telephones
	Answering systems
ii.	Consumer Electrical and Electronics
	Television sets (including sets based on liquid Crystal Display and Light Emitting Diode technology),
	Refrigerator, Washing Machine, Air conditioners excluding centralized air conditioning plants.

1.2 Objective

The objective of the Rapid E-waste assessment is to identify and quantify the E-waste generation for reuse, recycle and final disposal in the study area by adopting uniform approach and methodology. The main objectives of this study are as follows:

- ➤ To assess identify and quantify the WEEE generation.
- ► To examine the existing WEEE recycling system
- To study the problems / risks posed by the recycling system at present/ future
- > To estimate the existing and future quantity of WEEE in the study area
- To evaluate the capacities / capabilities of existing stakeholders and infrastructure for reuse, recycle and disposal of E-wastes
- > To analyze the environmental and social sustainability of present system.
- ▶ To determine E-trade economics for WEEE
- Preparation of directory of the stakeholders
- Conduct 01 sensitizing workshops in the each study area

1.3 Scope of Work (SoW)

In order to achieve the above objectives identified by CECB, IRGSSA has developed a comprehensive Methodology addressing the need to develop and implement an effective E-waste management based on the need to quantify and characterize this waste stream, identify major waste generators, assess risks involved and develop and implement a scientific, safe and environmentally sound management system, including policies and technologies.

The project aims to promote identification and implementation of environmentally sound and commercially viable technologies for the various elements of waste management *viz* collection, segregation, transportation, treatment, recovery and/ or recycle and disposal. The fundamental approach can be summarized in the following three phases.

Phase 1: Mobilization and work plan

Team will be mobilized & work plan will be prepared & presented to CECB.

Phase 2: Data Collection / Field Work

IRGSSA would be following the approach suggested by CECB. In order to execute this assignment, it is essential to establish the E-waste business chain linking different stakeholders to understand the trade economics and associated environmental impacts. An example of this chain is given in **Figure 1.1**.



Figure 1.1: Conceptual WEEE business chain

This chain will be mapped geographically in the study area to describe the following:

- ➢ The stakeholders
- > Their respective geographical distribution in the study area and
- ➢ WEEE generation cycle
- Material flow across stakeholders

Study Area: As per ToR, the study area is Raipur, Bilaspur, Durg, Bastar and Sarguja Division. However, the current report is being submitted for Surguja Division. In this division Surajpur, Surguja, Jashpur, Balrampur and Koriya five districts are covered.

This study would lead to the identification of stakeholders, classification of organization as organized / unorganized sector. Further their geographical location would be determined in the terms of their operating base coverage. Conceptually, some of the major stakeholders would include:

Ist Group

- ➢ The Importers, Manufacturers
- > The distributors, traders and retailers
- The consumers Individual households, Business sector, IT sector, BPO, teaching institutions, Railways, Airlines, Defence establishments, Transport Corporations, PUCs etc.

2nd Group

- > The Collectors Scrap dealers, Big Bazaars or malls who are buying the e-waste
- > The Recyclers dissemblers, dismantlers, material recoveries,
- The Road side vendors
- The authorized / unauthorized Auctioneers, the sellers of the used electronic goods on the footpaths.

The study would also aim at establishing E-waste trade chain using conceptual input output analysis. This idea has been developed based on "E-waste material flows" through region and on its way its disintegration and processing in numerous steps until it rejoins the raw streams or ends in a final disposal. This will be done through "tracer techniques", which includes identification of tracer for each item and its tracking through the chain from the start of dismantling process till its final disposal.

Inventorization

Inventorization of E-waste would be done as follows:

- Inventory of obsolescence rate of each electronic product (viz. Personal computer / TV / Mobile phones as mentioned in the e-waste rules and guidelines issued by CPCB) using scenario analysis from secondary / market research data.
- Confirm obsolescence rate from data of primary survey using "tracer technique".
- Identify a tracer for each product and follow it from the start of dismantling process till its final disposal.
- The inventorization other than households (on sample basis) would also be on actual basis.

The Inventorization other than households (whereas sample basis at least 500 nos in rural and urban area of each district) should be on actual basis.

Analysis of existing E-waste recycling system & quantification of E-waste

This will include description & documentation of each process used in dismantling of an EEE and the location details. Carry out photo documentation and geographical setting of each step. Estimate the quantity of material dismantled at each step. Estimate the quantity of E-waste for a particular year based on market projections & obsolescence rate.

Phase 3: Report findings

A Final Inventory Assessment Report will be prepared for each division & findings will be presented in one workshop, one each for five divisions.

1.4 Approach & Methodology

IRGSSA will follow a very comprehensive approach and methodology as described below. This is based on UNEP's manuals 1 and 2 and its application in a number of countries globally including India. The consortium will carry out the following activities and will follow the following step wise approach and methodology for each of these activities.

Activity 1: Development of Policy & Regulatory Framework

Step 1: Carry out due diligence on E-waste policy / laws / regulations eg. EPR.

- Step 2: Identify the gaps with respect to existing environmental regulations and recommend tentative content, extent and coverage of E-waste policy/ laws/ regulatory framework.
- Step 3: Carry out due diligence on expected E-waste institutional mechanism like collection and transportation system and registry e.g. Collective and clearing house system, B2C and B2B model. Identify the gaps with respect to existing collection and transportation system and recommend tentative collection and transport framework.

Activity 2: Assessment of E-waste Market

- Step 1: Determine E-waste item of interest as per Schedule 1 of E-waste (Management & Handling) Rules 2011. This will assist in studying the items of interest ex. PCs, TVs, cellular telephones, and refrigerators etc. Determine the brands, local, national and international, which are available in the market for each item and the year of their introduction in the market. Determine brands which existed earlier. This can be determined through review of secondary data from industry association or by interacting with local dealers. If the product is manufactured under a brand name, the broad feature of technology used to manufacture item is generally disclosed. This will also assist in identifying its dealer's network, existing facilities for item's manufacture and repair and its membership with local industry association.
- Step 2: Determine average weight and size of local, national and international E-waste item from each brand ex. capacity of refrigerator (liters) / washing machine, size of monitor / TV / cellular phone. The variation in size of each item should be documented under each brand. Average weight and size along with percentage composition should be estimated. This can be further confirmed while carrying out field survey for documenting dismantling operation.
- Step 3: Determine broad components out of the 26 components of E- waste items. Determine composition of E-waste item from available source like industry association / manufacturer. Determine technology of E-waste item e.g. ODS based refrigerator / 386 / 486 / Pentium series of PCs and laptops / CRT / front loading / top loading washing machines etc. Determine approximate quantity of recoverable elements from each item based on outputs of step 2. Determine possible hazardous substance in E-waste item.



Figure 1.2: Geographical mapping of different attributes

- Step 4: Establish geographical boundary / system boundary of study area. Procure maps of the area and prepare base map of the area with physical features marked on it. If the detailed map is not available easily then procure city map and fix up the municipal boundaries. Alternately, maps of the study area can be prepared based on standard map search engines available on the internet. The base map will be used for generation of different thematic layers as shown in **Figure 1.2**. This mapping will give an insight into the possible sources of E-waste and assist in carrying out the primary survey.
- Step 5: Identify different stakeholders from Group 1 & Group 2 who could be E-waste generators and mark them as layer two on the base map. Physically verify by carrying out preliminary reconnaissance survey of the identified locations of the stakeholders. Mark the tentative locations by taking latitudes and longitudes of the identified locations through GPS instrument. Identify the stakeholders, which are in the formal / organized sector and which are in the informal sector.
- *Step 6:* Prepare a tentative E-waste trade value chain as per conceptual life cycle; four phase model and E-waste trade value chain. These figures should be customized as per preliminary survey, which will be confirmed and established during field survey.
- Step 7: Identify E-waste dismantling sites, recycling sites and landfill / dump sites. Physically verify these sites by preliminary reconnaissance survey and marking the tentative locations by recording their latitudes and longitudes through GPS instrument.
- Step 8: Identify data needs from these stakeholders based on identified stakeholders in step 5 and trade value chain identified in step 6.
- Activity 3: Selection of Methodology for E-waste Inventory
- Step 1: Identify data requirements. This is carried out by classifying data needs under the heads of saturation level, households, calculated sales, stock data, average life, storage data, reuse, recycle and landfill for each electronic item ex. PC, TV, refrigerator, cellular phone, etc.
- Step 2: Identify tentative sources of data for each electrical and electronic item. This will be based on preparing preliminary or detailed interview guide / checklist / questionnaires for data collection for each time.
- Step 3: Document secondary sources of data for each electrical and electronic equipment and visit the respective agency to procure data i.e. published / unpublished / historical.
- Step 4: Check the availability, reliability, amount and range and completeness of data against following decision criteria.

<u>Availability of data</u>

- 1. Number of sources of data, which can provide data for study area. Generally, more than one source of data is preferred for item of interest.
- 2. In what format, data is available i.e. yearly, half yearly, cumulative or distributed.
- 3. Whether the data is published/ unpublished, confidential/ public.
- 4. Mode of procurement of data.

Reliability of data

- 1. Data of at least two sources should match.
- 2. If there is any variation in sources of data, check the methodology of calculating and compiling the data from each source. If there is a difference in the calculation and compilation of data, then check the factor responsible for the difference.
- 3. Check the trends from the data obtained from different sources and correlations with other data.

Amount and Range of data

- 1. Check the availability of historical data for each E-waste item.
- 2. Historical data should be available for more than anticipated average life time of the E-waste item.

Completeness of data

- 1. Historical data should be complete without any gap.
- 2. If gap exists then source, which provide data with minimum gap should be selected so that the gaps can be supplemented.
- 3. Incomplete data can be supplemented by trend analysis or by national / regional / city level assumptions.

Step 5: Prepare the constraint matrix by mapping outputs of steps 4 and step 5. Decide the most suitable and applicable methodology for E-waste inventory assessment

Activity 4: E-waste Inventory Assessment:

Sub Activity1: Establishment of the study area and its geographical limit

This activity will include the establishment of geographical limits of study area i.e. geographically defining the area. This will include assessment of landuse maps of the study area, fixing of rural and urban boundaries and mapping of tentative locations of stakeholders. The investigation team will geographically verify the tentative locations where generation, stockpiling, collection, handling and brokering, processing and production of other items from E-waste are taking place by using transect walk.

Sub Activity 2: Identification of E-waste and establishment of E-waste trade value chain

This activity will include identification of specific E-waste item and its tracer (CRT / Compressor / LCD screen / any other) followed by tracking of tracer's geographical movement within the identified geographical limits of the area to its final end of life, e.g. places where items are unloaded, traded, transported, dismantled, recycled, reused, repaired and disposed, using output of activity 1. The following steps are involved in field investigations.

- Step 1: Identify the E-waste streams of specific E-waste item
- Step 2: Identify the E-waste processes i.e. unloaded, treated, transported, dismantled, recycled, reused, repaired, and disposed.
- Step 3: Follow the E-waste tracer through the process in the E- waste stream by using tracer/ hazardous process walk.

A typical, E-waste trade chain will be established in a geographical context after verification of the tentative trade value chain obtained as an output of activity 1 and activity 2. This superimposition of E-waste trade value chain on a map will facilitate spatial analysis.

Sub Activity 3: Estimate the E-waste and obsolescence rate/ average life through secondary data by following "approach and methodology upstream of demarcation" mentioned. By using secondary data e.g. market research data like market supply and imports data, installed base of the E-waste item. The key to estimate E-waste is fixing of obsolescence rate based on market research data, industry data or on consumer behaviour. Since obsolescence rate is dynamic in nature, therefore, a range is fixed with upper and lower limits. Carry out sensitivity analysis for E-waste inventory using upper and lower limits of obsolescence rate.

Sub Activity 4: Verification of obsolescence rate / average lifespan through primary data. The obsolescence rate / average life can be verified through identification of E- waste stream and E-waste processes and tracking of tracer item. The following steps are involved in tracer verification.

- Step 1: Identify the tracer item
- Step 2: Follow the tracer item through the process in the E-waste stream

- Step 3: Identify all the organized and unorganized market of a tracer in the geographical area.
- Step 4: Establish the extent of dismantling / recycling happening in a geographical boundary.

The primary survey methodologies used for tracer technique and outputs are described in Table 1.2.

Objective	Detail	Primary Survey Methodologies	Output
WEEE / E- waste stream	Material flow	• Follow tracer materials: semi- structured interviews about quantities, quality, economics, and labor.	 Key-players are known (dealers, disassembly workers, recycler) Material flow (quantities / Labor in E-waste streams are identified
	Input quantities / Import	 Interviews with E- waste producers (manufacturers / retailers, auctions) to find out E-waste quantities Survey of key-players for import: structured questionnaires /interviews 	 E-waste quantity input is estimated Percentage of imported / household E-waste is known
	Reuse	• Surveys of scrap dealers, retailers, computer repair shops: structured interviews (using questionnaires)	 Quantities of reused entire equipment are estimated Quantities of reused equipment parts are estimated
	Disposal	• Sampling on different landfills (using questionnaires)	• Existence of E-waste fractions in landfills is known
Recycling technologies	Recycling technology	• Transect walks in different districts (semi-structured interviews)	 Applied recycling technologies are known Labor needed for different recycling processes is known
	Hazardous processes	 Semi-structured interviews in districts, where potentially hazardous processes. 	• Hazards in different recycling processes are identified

Table 1	2: Metho	odology for	estimation	of E-waste	quantity

The structured and semi structured interviews can be conducted using questionnaires. The questionnaire has been developed to quantify and photo document each step in the E-waste value chain.

Sub Activity 5: Identify the products, by products and waste products and back calculate E-waste dismantled.

Identify products, by products and waste products. This can be carried out by using a combination of qualitative and quantitative estimations with the identified stakeholders across the value chain using photo documentation of sampled E-waste tracer. Using this data, back calculate to check the best fit scenario of Ewaste inventory obtained as an output from activity 3. The output from back calculation should confirm the obsolescence rate / average life of E-Waste within the range used in activity 3. This obsolescence rate is used for calculating E-waste projections based on historical data.

Sub Activity 6: Establish E-waste trade economics

Each stakeholder in the dismantling processes is linked to the other and the trade between the two takes place based on profit. Therefore, the basic parameters driving this trade, which should be estimated, are as follows.

- 1. Input cost
- 2. Selling Price
- 3. Operating margin

Estimate input cost in terms of raw material cost / energy cost and labour cost. Estimate raw material cost / energy cost and labour cost using data collected from questionnaire add the two costs to arrive at input cost. Estimate selling price of the product by using data from questionnaire. Establish operating margin as the difference between selling price and input cost.

Sub Activity 7: Identify and assess the impacts

Identify the effluents / solid waste / emissions from each of the process. Establish their quantity if possible. Establish the geographical location of their discharge and history of the site. Classify impacts into environment, health and business impacts. Use relative ranking technique to quantify impacts. Relative ranking technique is based on scores where each sector i.e. health, environment and business are assigned with individual score subject to identified negative and positives impacts on the workers, surroundings and economy.

Activity 5: Compilation of draft & final reports.

Activity 6: Workshops in each division.

1.5 Format of the Report

This **Final Inventory Assessment Report** has been compiled in six chapters. The table of contents of each chapter is given below.

Chapter 1 Introduction and Background: Introduction; Objective of the Study as per ToR; Scope of Work (SoW) as per ToR; Approach and Methodology; Format of the Report.

Chapter 2 Policy & Regulatory Framework: Overview of Regulatory Framework; Policy, Regulations, their Scope and Institutional Responsibility; Reforms in Waste Management; E-waste and Environmental Legislation in India and Chhattisgarh.

Chapter 3 Assessment of E-waste Market: Introduction; E-waste Composition; Mechanism of E-waste Trade; Conclusions.

Chapter 4 Methodology for E-waste Inventory: Introduction; Methods for Inventory Assessment; Material Flow Chain, Data Sources and Data Gaps in Chhattisgarh; Constraints / Limitations and Selection of Methodology; Methodology / Approach & Instruments Used; Conclusion.

Chapter 5 E-waste Inventory Assessment: Introduction; Market Size Assessment of Electrical and Electronic Equipment (EEE) in Chhattisgarh; Obsolescence Rate / Average Life; E-waste Inventory; E-waste Processing in Chhattisgarh; Environmental Pollution; Market Risks; Conclusions.

Chapter 6 Conclusions & Recommendations: Regulations; E-waste Market; Methodology for Inventory Assessment; E-waste Inventory.

Chapter 2: Policy & Regulatory Framework

2.0 Overview of Regulatory Framework

E-waste management comes under the broad regulatory framework related to environment, foreign trade and local rules & regulations. A number of policy & regulatory initiatives have come into effect since 2006. The following sections describe the policy framework, relevant rules and regulations, which regulates E-waste management and emerging framework under extended producer responsibility (EPR). Further, their implications in the context of current situation in the study area have been described.

2.1 Policy, Regulations and their Scope

During the 1990s, Ministry of Environment & Forests (MoEF) adopted pollution control policy by formulating multi-pronged strategies in the form of regulations, legislations, agreements, fiscal incentives and other measures to abate pollution. National Environmental Policy, which was declared in 2006, identified pollution abatement as an important issue affecting human health and poverty. The policy focuses on optimizing resource efficiency and minimizing pollution loads. An analysis of policy statements reveals that there has been a gradual shift from simple pollution control to the pollution abatement leading to reduction, recovery and recycling. Policy states about strengthening informal sector through technological upgradation & incentivization. It states about promotion of segregation, reuse & recycling & benign disposal of waste. The policy further states involvement of private sector for hazardous waste management. The policy also focuses on optimizing resource efficiency and minimizing pollution loads. National Environment Policy clearly states about the need for preparation of guidelines & regulations for E-waste management in India.

2.1.1 E-Waste and Environmental Legislation in India

The Environment (Protection) Act 1986, an umbrella act also covers industrial waste and provides broad guidelines to address it. Under the umbrella act, a number of rules have been formulated to address hazardous waste like Hazardous Waste (Management Handling & Transboundary) Rules, Battery (Management & Handling) Rules & Bio Medical (Management & Handling) Rules. Specific laws for electronic waste have been notified in May 2011, effective from 1st May 2012 in the country. Further, India is also a signatory to international conventions like Basel Convention, whose provisions are applicable for export and import of E-waste. These provisions find expression in terms of Rules 13, 14, 15 & 16 of the HW (Management, Handling and Transboundary Movement) Rules, 2008. Therefore, there are two regulatory scenarios related to E-waste management as shown in **Table 2.1**. At first, E-waste (Management & Handling) Rules 2011 & Hazardous Waste (Management, Handling & Transboundary) Movement Rules 2008 have been described. This is followed by description of guidelines for implementation of regulations.

Table 2.1: E-waste Regulatory Scenario				
Regulations / Guidelines	E-waste M Pre 1 st May 2012	anagement Post 1st May 2012	Export & Imp Pre 1 st May 2012	port of E-waste Post 1 st May 2012
E-waste (Management & Handling) Rules 2011		\checkmark		
Hazardous Waste (Management, Handling & Transboundary) Rules 2008	\checkmark		\checkmark	\checkmark
Guidelines for Environmentally Sound Management of E-waste 2008	\checkmark	\checkmark		
Guidelines for Implementation of E-waste Regulations 2012	\checkmark	\checkmark		
Source: IRGSSA				

Table 2.1 clearly indicates that pre 1st May 2012 Hazardous Waste (Management Handling) Rules were used to regulate E-waste management. It is specifically relevant in case of E-waste recyclers, who got registered prior to 1st May 2012 & whose registration extends beyond this date.

CPCB data shows that as of September 2013, Chhattisgarh has M/s Navrachna Recycling Pvt. Ltd. & M/s ADV Metal Combine Private Limited has two E-waste dismantler / recycler, located at Rajnandgaon & Durg districts having a licensed. Therefore, this indicates that E-waste is either dismantled or recycled in both formal and informal sector in state because of their limited capacity.

2.1.2 E-Waste (Management and Handling) Rules, 2011

Salient features of the E-waste rules are given below.

- These rules are applicable to every producer(s), collection centre(s), dismantler(s), recycler(s), consumer(s) or bulk consumer(s) involved in the manufacture, sale, purchase and processing of electrical and electronic equipment or components as specified in Schedule-I. However, micro, small and medium enterprises are not covered under this regulation.
- The rules clearly define electrical and electronic equipment (EEE) and E-waste. Definition of E-waste categorizes them into two broad categories, i.e., IT and Telecommunication Equipment and Consumer Electrical and Electronics. As per Schedule-I of the rules, seventeen items have been specified under the IT and Telecommunication Equipment category and four items have been specified under the Consumer Electrical and Electronics category. The categories of E-waste covered under the rules are provided in Section 1.4 of Chapter 1.
- The rules also clearly define producers, bulk consumer, consumer, collection centre, transporter, dismantler and recycler. These form an integral part of material flow chain. The physical, financial & compliance responsibilities of each of the above stakeholders, as specified in the rules have been summarised in **Table 2.2** is given below.
- The rules provide direction to domestic EEE manufacturers/ producers to be RoHS (reduction in the use of hazardous substance) compliant within three years. It also allows imports of only RoHS compliant EEE.

Responsibilities		Producer	Consumer	Bulk Consumer	Collection Centre	Dismantler	Recycler / Reprocessor
Collection	Manufacturing	\checkmark					
	End of Life	\checkmark					
Take-back	Individual	\checkmark					
	Collectively	\checkmark					
Transportation to	Producer		\checkmark	\checkmark			
	Collection Centre	\checkmark	\checkmark	\checkmark			
	Dismantlers/ Recyclers	\checkmark	\checkmark	\checkmark		\checkmark	
	TSDF* Facility	\checkmark				\checkmark	\checkmark
Storage					\checkmark	\checkmark	\checkmark
Financing		\checkmark					
Registration		\checkmark			\checkmark	\checkmark	
Filing of Annual Returns		\checkmark			\checkmark	\checkmark	\checkmark
Return of Annual Inventory Handled		\checkmark			\checkmark	\checkmark	\checkmark

Table 2.2: Responsibilities of Stakeholders for Collection, Transportation, Storage and Disposal of E-waste

Note: \sqrt{means} "Yes", TSDF means Treatment Storage and Disposal Source: IRGSSA

Table 2.2 indicates that producers' major responsibility for all the activities including financing of E-waste management. Since, the state has two registered dismantler & recycler with limited capacity, it indicates that producers may be fulfilling their responsibility through collection system catering to dismantlers & recycler outside the state.

Therefore, there is need to identify different producers, profile of consumers & bulk consumers & collection centre in the study area and dismantlers & recyclers who are catering to E-waste.

2.1.3 The Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008

The Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008, defines hazardous waste as "any waste" which by reason of any of its physical, chemical, reactive, toxic, flammable, explosive or corrosive characteristics causes danger or likely to cause danger to health or environment, whether alone or when on contact with other wastes or substances, and shall include:

- Waste substances that are generated in the 36 processes indicated in column 2 of Schedule I and consist of wholly or partly of the waste substances referred to in column 3 of same schedule.
- Waste substances that consist wholly or partly of substances indicated in Schedule II, unless the concentration of substances is less than the limit indicated in the same Schedule.
- Waste substances that are indicated in Part A or Part B of Schedule III in respect of import or export of such wastes in accordance with rules 12,13, 14, 15 and 16 or the wastes other than those specified in Part A or Part B if they possess any of the hazardous characteristics in Part C of that schedule.
- Schedule IV includes E-waste as item 18 in its list of hazardous wastes requiring registration for recycling/ reprocessing. This item covers components of waste electrical and electronic assemblies comprising accumulators and other batteries included on list A, mercury switches, activated glass cullets from cathode ray tubes and other activated glass and PCB-capacitors, or any other component contaminated with Schedule 2 constituents (e.g. cadmium, mercury, lead, polychlorinated biphenyl) to an extent that they exhibited hazard characteristics indicated in part C of this schedule.
- Rule 9 of Chapter III on procedures for recycling, reprocessing or reuse of hazardous waste states that the occupier generating hazardous waste specified in schedule IV may sell it only to recycler having a valid registration from the CPCB for recycling or recovery.

2.1.4 Basel Convention and its Application to E-waste

The Basel Convention defines waste by disposal destination or recovery processes. These various processes are listed in Anne IV of the Convention. For example, virtually any material that will be recycled or processed in order to reclaim a metal, or to reclaim an organic or inorganic substance for further use, is deemed a waste. Electronic components that are used without further processing are likely to not be defined as a waste. The convention has provided for two lists. List A found in Annex VII is presumed to be hazardous and thus covered by the Basel convention; and list B, found in Annex IX, is presumed to be non-hazardous and thus not subject to Basel convention. The waste listed in list A is waste that poses serious threats to environment and human health. As a result of their adverse effects these substances require special handling and disposal processes.

The Basel Annex-VII hazardous waste lists the following applicable entries to e-waste:

A1010 Metal wastes and waste consisting of alloys of any of the following: antimony, arsenic, beryllium, cadmium, mercury, selenium, tellurium, thallium.

A1020 Waste having as constituents or contaminants, excluding metal waste in massive form, any of the following: antimony compounds, beryllium, beryllium compounds, cadmium, cadmium compound, lead, lead compounds, selenium, selenium compounds, tellurium, tellurium compound.

A1030 Wastes having as constituents or contaminants any of the following: arsenic, Arsenic compounds, mercury, mercury compound, thallium, thallium compounds.

A1160 Waste lead-acid batteries, whole or crushed.

A1170 Unsorted waste batteries excluding mixtures of only list B batteries. Waste batteries not specified on list B containing Annex I constituents to an extent to render them hazardous. [Note: List B batteries include: waste batteries conforming to a specification, excluding those made with lead, cadmium or mercury]

A1180 Waste electrical and electronic assemblies or scraps containing components such as accumulators and other batteries included on list A, mercury- switches, glass from cathode ray tubes and other activated glass and PCB- capacitors, or contaminated with Annex 1 constituents (e.g. cadmium, mercury, lead, polychlorinated biphenyl) to an extent that they exhibit hazard characteristics contain in Annex III.

A2010 Glass waste from cathode ray tubes and other activated glass destined for direct reuse and not for recycling or final disposal.

It is also important to note that the Basel convention's list B includes:

B1110 Electrical and electronic assemblies (including printed circuit board, electronic components and wires) destined for direct reuse and not for recycling or final disposal.

From the above we can conclude that at the very least, circuit board, CRTs, and other electronic boards or components and assemblies containing lead based solders and copper beryllium alloys (which include most computer circuit boards and much other electronic equipment), are hazardous wastes according to Basel convention. Likewise, whole, used, discarded computers, printers, and monitors that contain such circuit boards or CRTs that are not to be reused directly are to be considered as hazardous waste and subject to the Basel convention.

The provisions of Basel Convention & its provisions under Hazardous Waste Rules are not applicable currently in Chhattisgarh unless export and import of E-waste is carried out by any registered dismantler / recycler. Therefore, they have been described considering E-waste management intervention in future.

2.1.5 Guidelines for environmentally sound management of E-waste, 2008

Guidelines for environmentally sound management of E-waste have been formulated by CPCB in 2008, which provide broad framework to recyclers and regulators on the technologies as well as issues related to compliance.

The objective of these Guidelines is to provide guidance for identification of various sources of waste electrical and electronic equipments (E-waste) and prescribed procedures for handling E-waste in an environmentally sound manner.

These Guidelines are reference document for the management, handling and disposal of E-wastes. These are intended to provide guidance and broad outline, however, the specific methods of treatment and disposal for specific wastes needs to be worked out according to the hazardous / risk potential of the waste under question. These Guidelines provide the minimum practice required to be followed in the management of E-wastes and the State Department of Environment or State Pollution Control Board may prescribe more stringent norms as deemed necessary.

These Guidelines shall apply to all those who handle e-waste which includes the generators, collectors, transporters, dismantlers, recycler and stakeholders of E-wastes irrespective of their scale of operation

These guidelines under classification of E-waste, describe Composition of E-waste; Components of E-waste; Possible hazardous substances present in E-waste; E-waste scenario; Basis of Defining E-waste; Proposed definition of E-waste; Reduction of the Hazardous Substances (RoHS) in the Electronic & Electrical Equipments and Extended Producer Responsibility (EPR). It gives guidelines for environmentally sound

management for E-waste. Under this head, it describes E-waste Composition and Recycle Potential; Assessment of Hazardousness of E-waste; Recycling, Reuse and Recovery Options; Treatment & Disposal Options and E-waste Recycling / Treatment technologies in India.

Further, it describes environmentally sound treatment technology for E-waste, consisting of description of environmentally sound E-waste treatment technologies; Environmental Impacts of the 1st, 2nd and 3rd level E-waste treatment system; Technology Currently used in India; Best available technology and Available operating facilities. Lastly it describes guidelines for establishment of integrated E-waste recycling & treatment facility consisting of Facility operation requirements; Procedures for setting up & management of integrated E-waste facility and Procedures for compliance with the existing regulations and guidelines.

In the context of current study, these guidelines provide guidance related to assessment of current handling practices, storages & channelization of E-waste in the study area as per SoW.

2.1.6 Guidelines for Implementation of E-waste Rules, 2011

MoEF/CPCB after consulting various stake holders felt the need for preparing a guidance document for implementation of the provisions of the E-Waste (Management & Handling) Rules, 2011 that may help the Producers, Consumer & Bulk Consumer, Collection Center, Dismantler, Recycler and Regulatory agencies (SPCBs/PCCs) for effective compliance / implementation of these rules. This document also provides guidance on setting up collection mechanism, dismantling and recycling operations. Further, guidelines also clarifies issues related to RoHS e.g. the rules call for the reduction in the use of hazardous substances in electrical and electronic equipment. Every producer of equipment listed in Schedule 1 of the Rule shall ensure that the covered products do not contain lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls or poly-brominated di-phenyl ethers above a specified threshold. The threshold for cadmium is 0.01% by weight in homogeneous material, for all other substances, the threshold is 0.1% by weight in homogeneous material. Various clarifications offered by the guidelines are given below.

1. Clarification regarding definitions

- **Producer** is any person who, irrespective of the selling technique used, "manufactures and offers to sell electrical and electronic equipment under his own brand; or offers to sell under his own brand, assembled electrical and electronic equipment produced by other manufacturers or suppliers; or offers to sell imported electrical and electronic equipment" and has to take authorization under these Rules for implementation of EPR.
- **Bulk Consumers** are bulk users of electrical and electronic equipment such as central government or state government departments, public sector undertakings, banks, educational institutions, multinational organizations, international agencies and private companies that are registered under the Factories Act, 1948 and Companies Act, 1956; they have to maintain records on E-waste generated and channelized to registered/authorized collection centres / recycler / dismantler.
- Extended Producer Responsibility is a responsibility of any producer of electrical or electronic equipment, for their products beyond manufacturing until environmentally sound management of their end of life products.
- Collection Centre is a centre established individually or jointly or a registered society or a designated agency or a company or an association to collect E-waste which has to obtain authorization under E-Waste Rules, 2011.
- **Dismantler** is any person or registered society or a designated agency or a company or an association engaged in dismantling of used electrical and electronic equipment into their components that has to obtain authorization and registration E-Waste Rules, 2011. The association may include a consortium as well.
- Recycler is any person who is engaged in recycling or reprocessing of used electrical and electronic

equipment or assemblies or their component. Recycling facility may be set up by an individual or a company or a joint venture or a consortium.

• **SPCBs / PCCs** have been given the responsibility as regulatory agencies for ensuring implementation of the E-waste Rules in their respective States.

2. Clarification regarding scope and requirements for compliance to EPR:

- Producers intending to sell their EEEs listed in Schedule-I are required to take authorization only in the place where their manufacturing facilities and corporate head offices are located. In case, of producers importing EEEs listed in Schedule-I, authorization may be taken from SPCB of the State where the port of landing is located.
- Since these products are sold across the country, SPCB/PCC concerned granting the authorization would inform the CPCB of the details of the authorization granted. CPCB would maintain a centralized database on their website, which will be available to all stakeholders. Producers will also place this information on their website and provide details of products sold to the SPCB from whom they have obtained authorization. SPCBs will provide consolidated information to CPCB on an annual basis which CPCB will maintain on the centralized database.
- In the application for authorization, it should be clearly mentioned, how the producer would ensure channelization of the E-waste at the end of its life; details of his own collection centres or take-back systems or the collection centres authorized by him, shall be specified.
- As per the EPR under the Rules, the producers are required to achieve 100% collection and channelization of the end of the life equipment. However, for the purpose of monitoring, targets need to be fixed. Such targets should be based on the life of the product, type of the product, usage and consumption patterns and other relevant factors. CPCB will, therefore, set up a Committee, which will examine the issue of fixing targets, based on the aforesaid factors and also taking into consideration the level of compliance achieved during the first two years.
- Producer who has manufacturing facility shall comply with prevailing environmental regulations under Water (P&C) Act, 1974, Air (P&C) Act, 1981, Hazardous Waste (M, H&TM) Rules, 2008 and other relevant regulations. In the case of a manufacturer, who has obtained authorization under the Hazardous Waste (Management, Handling & Transboundary Movement) Rules, 2008 need not take separate authorization under the e-waste rules till the validity/expiry of that authorization. Subsequent authorization has to be taken under the E- waste rules, 2011 to ensure that electronic scraps, rejects etc. generated during the manufacturing shall be sent or channelized to registered E-waste recycling facilities. Such producer shall obtain authorization only from SPCB/PCC of the State where the manufacturing facility is located.
- The producer is required to maintain records in form 2 along with the details of the e-waste handled/generated and has to submit the annual returns in form 3 in accordance with Rule 4(9) of these Rules.
- Producer shall finance the EPR system either by setting up individual collection system or by joining a common collection system by authorizing them.

Scope of EPR for the Producer:

- i. Producer may assess their individual requirements and design a collection or product take back system as they deem appropriate as long as it facilitates channelization of E-waste for environmentally sound management.
- ii. Producer may arrange for collection from both, individual and bulk consumers and channelize the waste to collection centres or recyclers/dismantlers.
- iii. The producer may opt to implement EPR on his own individually or collectively. There can be

two distinct models; (i.) individual producer responsibility where producer implements EPR managed on his own by setting up his own authorized collection centres or (ii.) collective producers responsibility, where producers may authorize common collection centres (CCC) independently or by joining a consortium as a member. Producers importing EEE listed in schedule – I, may take authorization from the State where the landing port is located

iv. In the E-waste rules, the logo has been printed without a bar below the symbol, whereas the present practice commonly followed by the producer, the Logo has a bar below the symbol. Logo without the bar below the symbol and the logo with bar below the symbol as shown below are acceptable. Symbol may be placed on the products or printed in the accompanying product documentation.



- v. As per Rule 4(6) of the E-waste Rules, 2011 the producer is responsible for creating awareness for the consumer about the product that has been placed on the market. The information should essentially convey the message for the compliance under the rules and the responsibility undertaken by the producer on safe handling and disposal of the end-of-life product. Various modes for creation of awareness such as publications, advertisements, posters, information booklets, use of Television, radio, newspaper etc., could be adopted for communicating the information. The details of awareness programs under taken shall be provided to SPCBs/PCCs while submitting annual returns as per Form 3.
- vi. Under Rule 4(5) it is mandatory for the producer to publicize the contact details of the authorized collection centres and collection points or their collection mechanism to the consumers and such information should be periodically updated. The detailed information should comprise of the full address, telephone number, fax number e-mail etc for each State. The helpline number (like call centre) may also be publicized so that the consumer can reach the nearest collection centre from where he/she is located.
- vii. Awareness is essential regarding the hazardous constituents present in the equipment as well as the safe handling and disposal of the product after its use. In case of the products complying with the provisions of rule 13(1), the same should be indicated in the product information booklet.
- viii. Producer may manage a system directly or with a help of any professional agency on his behalf for collection and channelization system of E-waste by involving relevant stakeholders such as consumer, bulk consumer, NGOs, informal sector, resident associations, retailers, dealers, etc.
- ix. The scope of implementing the EPR by the producers is also explained in the schematic diagram given in **Figure 2.1**.



Figure 2.1: Scope of implementing EPR for Producers Source: E-waste Regulation Guidelines 2012

3. Clarifications regarding Collection Centres

A collection centre is a store/warehouse where the E-waste collected from consumers, bulk consumers, urban local bodies and retail outlets/collection-points/collection-bins/mobile-units etc. established by producers or collection centres, can be received and stored safely for necessary channelization for dismantling/recycling. These guidelines suggest the following options and requirements for setting up Collection Centres;

- i. Collection centres can be established by various ways. If a collection centre is set up for a particular producer, it may be called individual collection centre. If a collection centre caters the EPR requirements of multiple producers it may be called common collection centre. All collection centres require authorization from SPCBs / PCCs of respective States.
- ii. In case a producer himself sets up a collection centre, he shall take separate authorization from SPCBs / PCCs for setting up such individual collection centre.
- iii. Producer may organize take-back system through their retailers or through service centres and set up collection points or bins or drop-off points and link them to their authorized individual collection centres. Such collection points can also be set-up by authorized common collection centres.
- iv. Producer may organize take-back system through their retailers or service centres and set up collection points or bins and channelize the E-waste directly to registered dismantlers or recyclers.
- v. The collection points can be designated places where E-waste can be collected through residential areas, office complexes, commercial complexes, retail outlets, customer care stores, educational and research institutions, resident welfare associations (RWAs), NGOs working with rag pickers, etc. These collection points can be financed by producers or common collection centres (on behalf of producers) to channelize the E-waste to registered dismantler or recyclers. The E-waste collected through these points should be transported to collection centres or registered dismantling or recycling plants within a stipulated time period as per rule 12. These collection points do not require taking authorization from SPCBs/PCCs.
- vi. Collection Bins could be installed in public places such as kerbsides, restaurants, malls, offices etc. which can be owned by the authorized collection centres or the producer. The contact details of authorized collection agencies should be printed on these bins for reference purposes of the general public. The E-waste collected in these bins should be transported to collection centres or

channelized to registered dismantler or recyclers by the producers. These collection Bins do not require authorization.

- vii. Mobile collection vans can also act as collection systems for door to door collection of E-waste or from institutions / individuals / small enterprises and such vans shall be linked to collection centre or provided by producer to channelize the E-waste to collection centres or registered dismantler or recyclers. A mobile collection van does not require authorization but their detail has to be provided to SPCBs / PCCs while seeking authorization by the producers or collection centres.
- viii. SPCBs shall ensure that authorized collection centres comply with the provisions of the Rules and ensure that the E-waste collected by them is stored in a secured manner and no damage is caused to the environment during storage and transportation till the e-waste reaches registered dismantler (s) or recycler (s) by undertaking periodic inspections and verifications
- ix. The Rules specify that Collection Centres are allowed to store E-waste for a maximum period of 180 days. However, this period may be extended up to one year in the exceptional cases with genuine reasons when the Collection Centres are located in the States, which do not have any registered dismantling or recycling facility and are unable to send the e-waste for recycling within the stipulated time period.

The criteria for setting up collection centres are

- i. The collection, transportation, storage and handling of E-Waste in the collection centres has to be done carefully without breaking the end of life equipments.
- ii. Collection centers, established under these Rules, need not seek Consent to Establish and Consent to Operate under the Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981.
- iii. Producers who has pan India presence having large number of distributors/dealers in each of the State and has large warehouses already in place can use the space if available in these ware house for establishing collection centre. However, the space used for collection centre has to be clearly demarcated (by enclosure or partition) from the space meant for new goods.
- iv. The storage capacity of any collection centre should be commensurate with available area, volume of operations (in weight) and type of E-waste.
- v. The collection centre where Refrigerator and Air conditioners are also stored should have adequate facilities for handling / arresting leakage of compressor oils, CFCs/HCFCs if any.
- vi. Covered shed/spaces may be used for storage of E-Waste generated from IT and Telecommunication equipments while open spaces can be used for storage of refrigerators / washing machines /air conditioners. In case of storage of E-waste, generated from IT and Telecommunication equipment, in open spaces, containers with lids/covers may be used. E-waste comprising of IT & TE waste preferably be segregated and stored at collection centre in suitable racks/containers/bins.
- vii. Containers of appropriate size and shape may be used for segregation of E-waste items generated from IT and Telecommunication equipments to facilitate effective collection and handling operations. Containers can be made either of wood or plastic or mild steel or any appropriate material with sufficient strength and shapes (top open containers, caged boxes, rakes etc.) for holding the E-waste. These containers/racks may be placed in such a way that there should be adequate space for movement of workers and material.







viii. Producer can assess their individual requirements and design a collection or product take back systems as they deem appropriate as long as it facilitates channelization of WEEE for environmentally sound management.

4. Clarification regarding E-waste Dismantler

As per these rules any person or registered society or a designated agency or a company or an association can engage in dismantling of end of life electrical and electronic equipments into their components by obtaining registration and authorization from the respective SPCB/PCC.

- Dismantling operation can be manual, semi manual and automatic involving physical segregation operations for plastics, glass, steel, non-ferrous material, wires, gases, liquids and printed circuit boards. Dismantlers may perform the following operations.
 - 1. Decontamination
 - 2. Manual dismantling using appropriate tools, PPEs and dust control equipment.
 - 3. Hammering
 - 4. Shredding
 - 5. Segregation and
 - 6. Specialized separation processes
 - a) CRT cutting into funnel and panel including removal of phosphor coating from the panel as well as lead paste binding the panel with the funnel.
 - The first step is to decontaminate E-waste and render it non-hazardous by separating hazardous components and materials. Hazardous electronic components such Hg switches, Poly Chlorinated Biphenyl (PCBs) etc. can be recovered and sent to TSDFs for treatment and disposal. In case of refrigerators and air conditioner, the refrigerant gases such as chlorofluorocarbon (CFCs), hydrochlorofluorocarbons (HCFCs) etc. can be collected by using gas recovery equipment for their recovery and storage. The refrigerant gases may be re-used or may be diposed by thermal destruction adopting any of the following options:
 - i. By incineration in existing common HW incinerators
 - ii. By co-processing in cement kiln
 - iii. By plasma destruction
- Dismantling operations shall not include Fine grinding / wet shredding / wet grinding operations. Dismantling operations shall not be permitted for chemical leaching or heating process or melting the material. Dismantlers shall not shred segregated LCDs.
- Dismantler shall have adequate facilities for disposal of bag filter residue and floor cleaning dust in secure manner or shall obtain membership with TSDF for safe disposal.
- Dismantlers can be permitted shredding or cutting of printed circuit boards not below the size of 20mm which have to be handled by employing minimal manual handling and with adequate air pollution control systems.

5. Clarification regarding E-waste Recyclers

As per these rules any person who is engaged in recycling or reprocessing of used electrical and electronic equipment or assemblies or their component is a recycler. Recyclers may also set up their own authorized collection centres and may establish linkages with producers/bulk generators/other collection agencies. They may also establish a scheme for household collection of e-waste or may establish tie–ups with other agencies involved in collection of E-waste from individual consumers.

The functions of the recycling facilities are similar to the dismantlers but implements high degree technologies for recycling or recovery operations. There shall be no restriction on degree of operations that can be permitted for recyclers. The following processes can be employed by recyclers;

- 1. Manual / semi-manual / automatic dismantling operations
- 2. Shredding / crushing / grinding / enrichment operations
- 3. Pyro-metallurgical operations Smelting furnace
- 4. Hydro metallurgical operations

- 5. Electro-weaning
- 6. CRT cutting
- 7. Toner cartridge recycling
- 8. Melting, casting, molding operations (for metals and plastics)
- A recycling facility can be permitted to receive any kind of E-waste covered under E-waste Rules.
- The recycling facilities shall comply with the requirements as specified for dismantlers in the above section for the operations specified therein.
- A recycling facility shall install adequate waste water treatment facilities for process wastewater and air pollution control equipment depending on type of operations undertaken.
- Suitable space de dusting equipment shall be installed where manual dismantling, shredding operations are carried out.
- Suitable fume hoods connected with bag dust collectors followed by wet (chemical) scrubbers shall be installed for control of fugitive emissions from furnaces or chemical reactor fumes.
- In additions to dismantling operations, recyclers may adopt suitable technologies for shredding, wet grinding, gravity / magnetic/density/eddy current / electromagnetic separators with adequate air pollution control equipment. It shall be ensured that dust control equipment comprises of mechanical dust collectors followed by fabric filters or two stage fabric filters or fabric filter followed by wet (chemical) scrubbers.
- Adequate facilities for onsite collection and storage of bag filter residues, floor cleaning dust and other hazardous material shall be provided and sent to secure land fill facility by obtaining membership with TSDF operator.
- The degree of refining and % recovery of resource or precious material present in the E-waste shall be given due importance.

6. Clarification regarding Recycling of CRT Monitor and TVs

- Large volumes of CRTs are expected to be generated in coming years. Care should be taken for recycling of CRTs as it contains harmful substances.
- CRT monitors and TVs can be manually removed from plastic/ wooden casing. The CRT is split into leaded funnel and unleaded panel glass using different splitting technology in a closed chamber under low vacuum environment and the funnel section is then lifted off from the panel glass section and the internal metal gasket is removed for facilitating the removal of internal phosphor coating.
- The CRT can be split manually adopting Ni-Chrome hot wire cutting, Diamond wire method or Diamond saw separation
- Manual shredding, cutting, and segregation operations for CRTs should be carried out in vacuum chambers where the dust is extracted through cyclones, bag filters, ID fan and a suitable chimney. The operators should use gloves fixed to the walls of the vacuum chamber while handling CRTs as shown in the figure below.





- The internal phosphor coating from the inner side of panel glass is removed by using an abrasive wire brush and collected separately. The extracted air is cleaned through high efficiency bag-filter system to collect the phosphor dust. The phosphor dust so collected in the filter bags should be sent to TSDF.
- Segregated CRTs can also be shredded in automatic shredding machines connected with dust

control systems. The mixed shredded glass is separated into leaded glass and glass cullet using electro-magnetic field or by density separation.

7. Clarification Regarding Bulk Consumers

- As per these rules a bulk consumer has to ensure that the e-waste generated by them have to be channelized to authorized collection centres or registered dismantler or recycler or is returned to the producer through its pick up or take back services or through its collection points.
- The bulk consumer has to maintain records of e-waste generated by them in Form 2 and make such records available for scrutiny to SPCBs / PCCs whenever demanded.

8. Clarification regarding reduction in the use of Hazardous Substances (RoHS) in the manufacture of electrical and electronic equipments:

The e-waste rules specifies limit for hazardous substance in the components of electrical and electronic equipments. The limits are detailed below

- i. Every producer of electrical and electronic equipments as per Schedule I shall ensure that new electrical and electronic equipments should not have concentration value more than 0.1% by weight in homogenous materials for Lead, Mercury, Cadmium, Hexavalent Chromium, Polybrominated biphenyls or polybrominated diphenyl ethers and for Cadmium more than 0.01% by weight in homogenous materials. The above maximum concentration limit should be achieved before 01-05-2014. The above limits will not apply to components of electrical and electronic equipment manufactured or placed in the market six years before the date of commencement of these rules. The above limits will also not apply to applications listed in Schedule II of the e-waste rules and electronic equipments used for defense purpose.
- ii. Import or placement in the market for new electrical and electronic equipment shall be permitted only for those equipment which are RoHS compliant.
- iii. Components of electrical and electronic equipment manufactured or placed in the market before the date of 01-05-2014 are exempted from above provisions.
- iv. The reductions have to be achieved before 1 May 2014 i.e. within two years from the dates of commencement of these rules. Certain applications listed in Schedule II are exempted from the above requirement and there is also an exemption for components of electrical and electronic equipment manufactured or placed in the market six years before the date of commencement of the reduction.

9. Clarification regarding interstate transportation or E-waste

- Transportation of e-waste, being sent for dismantling or recycling to a facility in a State other than the State, where it is generated or collected, does not require 'No objection certificate' from the SPCBs/PCCs concerned.
- However, Transporter of the E-waste is required to give prior intimation to the SPCBs/PCCs concerned i.e. the States in which the E-waste is generated, transited and being sent for the purpose of recycling or dismantling.

10. Clarification Over-all Compliance Mechanism

A compliance mechanism has been set out in E-waste Rules for producers, collection centers, consumer, bulk consumers, dismantler, recyclers and the regulatory authorities (SPCB's, PCCs, CPCB and MoEF). It also sets out the responsibilities for producers to finance and organize the take back and recycling system. However, while ensuring that the given compliance mechanism is followed the same be can be visualized in the following schematic flow sheet given in **Figure 2.2**.



Figure 2.2: Implementation of E-Waste Rules 2011

Source: E-waste Regulation Guidelines 2012

2.2 **Institutional Structure**

The Ministry of Environment and Forests, Government of India, is the nodal agency at the central level for policy, planning, promoting and coordinating the environmental programs. A number of enforcement agencies assist the Ministry of Environment and Forests at the state level in executing the assigned responsibilities. The Central Pollution Control Board (CPCB) advises on the policy and enforcement. State Pollution Control Boards (SPCB) carries out the enforcement at the state level. The roles & responsibilities of different agencies under E-waste rules are provided in Table 2.3.

Sr. No.	Authority/(ies)	Duties
1.	Central Pollution Control Board, Delhi	 i. Coordination with State Pollution Control Boards/ Committees of UT ii. Preparation of Guidelines for Environmentally Sound Management of e-waste iii. Conduct assessment of e-waste generation and processing iv. Recommend standards and specifications for processing and recycling e-waste v. Documentation, compilation of data on e-waste and uploading on websites of CPCB vi. Conducting training & awareness programmes. vii. Submit Annual Report to the Ministry. viii. Any other function delegated by the Ministry under these rules. ix. Enforcement of provisions regarding reduction in use of hazardous substances (RoHS) in manufacture of electrical & electronic equipment. x. Initiatives for IT industry for reducing hazardous substances. xi. Set targets for RoHS compliance in manufacture of electrical & electronic equipment. xii. Incentives and certification for green design/products
2.	State Pollution Control Boards/ Committees of Union Territories	 i. Inventorization of e-waste. ii. Grant & renewal of Authorization iii. Registration of recyclers of e-waste iv. Monitoring compliance of authorization and registration conditions v. Maintain information on the conditions imposed for authorization etc. vi. Implementation of programmes to encourage environmentally sound recycling vii. Action against violations of these rules

Table 2.3: List of Authorities and Corresponding Duties as per E-waste (Management and Handling) Rules, 2011

Sr. No.	Authority/(ies)	Duties
		viii. Any other function delegated by the Ministry under these rules
3.	Urban Local Bodies (Municipal Committee/Council/C orporation)	(i) To ensure that e-waste if found to be mixed with Municipal Solid Waste is properly segregated, collected and is channelized to either authorized collection centre or dismantler or recycler.(ii) To ensure that e-waste pertaining to orphan products is collected and channelized to either authorized collection centre or dismantler or recycler.

Source: E-waste Rules 2012

The roles and responsibilities of different agencies related to hazardous waste and its export and import is given below in Table 2.4.

Sr. No.	Authority/(ies)	Duties and Corresponding Rule
1.	Ministry of Environment and forests, under the Environment (protection) Act, 1986	 i. Identification of hazardous wastes ii. Permission to exporters of hazardous wastes iii. Permission to importers of hazardous wastes. iv. Permission for transit of hazardous wastes through India. v. Sponsoring of training and awareness program on Hazardous Waste and Management related activities.
2.	Central Pollution Control Board constituted under the Water (Prevention and Control of Pollution) Act, 1974	 i. Coordination of activities of the State Pollution Control Boards/ committees. ii. Conduct training courses for authorities dealing with management of hazardous substances. iii. Recommend standards for treatment, disposal of waste and leachates. Recommend procedures for characterisation of hazardous wastes. iv. Sector specific documentation to identify waste for inclusion in Hazardous Wastes (Management, Handling and transboundary Movement) Rules 2008. v. Prepare guidelines to prevent/ reduce/ minimize the generation and handling of hazardous wastes. vi
3.	State Government/ Union Territory Government and Administration	 VI. Any other function under rules delegated by MoEF. i. Identification of site (s) for common hazardous waste treatment, storage and disposal facility (TSDF). ii. Assess EIA reports and convey the decision of approval of site or otherwise. iii. Acquire the site or inform operator of facility or occupier or association of occupiers to acquire site. iv. Notification of sites v. Publish periodically an inventory of all disposal sites in the state/union territory
4.	State Pollution Control Boards constituted under the Water (Prevention and Control of Pollution) Act, 1974	 i. Inventorization of hazardous waste ii. Grant and renew authorization iii. Monitor the compliance of the various provisions and conditions of authorization including conditions of permission for issued by MoEF exports and imports. iv. Examining the applications for imports submitted by the importers and forwarding the same to MoEF. v. Implementation of programs to prevent/ reduce/ minimize the generation of hazardous wastes. vi. Registration and renewal of registration of Recyclers/ Re-Processors. vii. Action against violations of Hazardous Wastes (Management, Handling and Transboundary Movement) Rules 2008. viii. Any other function under these rules assigned by MoEF from time to time.
4.	Directorate General of Foreign Trade constituted under the Foreign Trade (Development & regulation) Act 1992	 Grant licence for import of hazardous wastes Refuse licence for hazardous wastes prohibited for imports and exports.

Table 2.4: The authority, duties and corresponding rule as per Schedule VII of the HW Rules, 2008

Sr. No.	Authority/(ies)	Duties and Corresponding Rule
5.	Port Authorities under	i. Verify the documents
	Indian Port Act 1908 and	ii. Inform the ministry of Environment and Forests, Govt. of India of
	Customs Authorities under	any illegal traffic
	the customs Act, 1962	iii. Analyze wastes permitted for imports and exports.
		iv. Train officials on the provisions of the Hazardous Wastes Rules and
		in analysis of hazardous wastes.
		v. Take action against export/import Acts, 1908/ Customs Act 1962.

Source: Hazardous Waste (Management, Handling & Transboundary) Rules 2008

Applicability of E-waste Rules is given in Table 2.5.

Table 2.5: E-Waste	(M&H)	Rules - 2011	applicability
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Sr. No.	Type of Applicant	To Maintain Records	To Maintain Record in Form -2	Filling Annual Return in Form - 3	Authorization Form-I	Registration Form-IV	RoHS Compliance
1. (Consumer	Х	X	Х	Х	Х	Х
2. I	Bulk Consumer			Х	Х	X	Х
3. U	Jrban Local Bodies		X	X	X	Х	Х
4. (Collection Centre					X	X
I	Producer –offer to			\checkmark		X	
5. s	ell						
6. I	Producer - importer	V				Х	
7. I I	Producer - Manufacturing EEE	; √				X	\checkmark
8. I	Dismantler						X
9. F	Recycler			\checkmark			Х
S	ource: E-waste Rules	guideline	s .				
	X = Not applicable	ole	$\sqrt{=}$	= Applicable			

Clarification of the role of State Pollution Control Boards as per E-waste Guideline 2012.

- SPCB/PCC shall also ensure that Producer having manufacturing facility or corporate head office in their State shall obtain authorization. SPCB/PCC shall also ensure that a Producer having their port of landing of imported equipments in their State obtains authorization.
- Shall ensure that manufacturer has set-up adequate collection mechanism to cater the collection needs from entire State.
- The number of collection centres or take-back systems may depend on quantum of sales, number of urban centres in that State.
- The authorization granted to each producer shall be evaluated on case to case basis depending on their proposed EPR implementation scheme. The details of EPR with respect to authorized collection centres, collection points, take-back systems, authorized recyclers, authorized dismantlers and details of agreement between producers, authorized collection centre, dismantler and recycler are required for evaluation.
- Shall ensure that the collection centres, who have applied for authorization, should have adequate space for storing the quantity of e-waste for which application has been made.
- Shall ensure that adequate numbers of containers proportionate to the applied capacity are available for storing e-waste.
- Shall ensure that collection centre should not store e-waste for a period exceeding one hundred and eighty days. The storage period may be extended to one year in those States which do not have any registered dismantling and recycling facility or in such cases where the e-waste needs to be stored for development of a process for its recycling or reuse.
- Shall ensure that collection centre should have arrangement in place for transferring the e-waste to the registered dismantler or recycler.
- Shall ensure that dismantlers and recyclers, who have applied for authorization and registration, possess appropriate facilities, technical capabilities and equipment to handle e-waste safely. The land may be owned by the dismantlers/recyclers or could be on lease.

- SPCBs/PCCs shall ensure that no one starts dismantling or recycling of e-waste without having prior permission (registration and authorization) to do so from SPCBs/PCCs.
- Shall ensure that dismantler and recyclers should have appropriate equipments for dismantling and recycling of e-waste.
- Grant of registration for dismantling and or recycling has to be evaluated on case to case basis depending on their capacity and level of operation. The SPCBs/PCCs should ensure that dismantler should not exceed their mandate for processing any e-waste for recovery or refining of materials.
- SPCBs/PCCs shall ensure that dismantlers have well set mechanism for providing dismantled material to recyclers. Action Plan for channelizing the disposal of dismantled component in an environmentally sound manner has to be provided by dismantler.
- SPCBs/PCCs shall ensure that dismantlers/recyclers should be members of TSDF.
- SPCBs/PCCs shall ensure that dismantlers/recyclers should file their annual returns within the stipulated time period.
- SPCBs/PCCs shall place on their web site the conditions imposed on the collection centre, dismantler and recycler while granting authorization and registration and ensure that these conditions are strictly met with by the facility concerned.
- SPCBs/PCCs should regularly monitor the compliance of authorization and registration.

Role of Municipal Authorities

- There is possibility of mixing of e-waste with municipal solid waste. In such cases, the Urban Local bodies (Municipal Committees/ Councils/ Corporations) are required to ensure that E-waste if found to be mixed with MSW is properly segregated, collected and is channelized to either authorized collection centre or dismantler or recycler.
- The Urban Local bodies (Municipal Committees/Councils/ Corporations) are also required to ensure that e-waste generated from non branded or assembled electrical and electronic equipment as specified in Schedule I is collected and channelized to either authorized collection centre or dismantler or recycler. The ULBs are also required to collect E-waste generated from those EEEs which are covered under the rules and produced by a company, which has closed its operation or has stopped product support.
- ULBs may also set up their own collection points at MSW disposal site, public places; residential locality etc to collect the E-waste and such collection points shall be connected to authorized collection centres/dismantlers/recyclers.

2.3 Overall Assessment with respect to Emerging Regulatory Scenario

Major conclusions drawn from regulatory assessment having implications an E-waste management in the state are given below.

National Environment Policy 2006

National Environment Policy 2006 provided overall guidelines on waste management including E-waste. These provided road map for preparation of guidelines and regulation policy. At first guidelines came into effect in 2008, which provided a minimum practice required for environmentally sound management of E-waste.

Guidelines Environment sound Management of E waste

These guidelines also provided the basis for amendment of Hazardous Waste (Management, Handling & Transboundary Movement) Rules 2008 & E-waste was included as part of Schedule IV. This development brought E-waste recycling into the ambit of hazardous waste regulations and facilitated control of export & import of E-waste. A number of E-waste recyclers got registered under these rules indicating the part formalization of the E-waste trade value chain but diversion less than 5% of the E-waste generation to these recyclers paved the way for separate E-waste regulation based on EPR.

E-waste (Management & Handling) Rule 2011

In 2011, new E-waste (Management & Handling) Rules were notified, which came into effect in 2012. These rules were formulated in close consultation with producers & their associations and other stakeholder. Some of the major features of this regulation having implication on E-waste inventory assessment are given below.

- No target has been fixed to collect E-waste from the time of enforcement. Producer is not bound by any collection target.
- There are no mandatory provisions for producers in the rules to declare quantity of EEE placed in the market since 2012.
- No mechanism for tracking purchase of EEE by bulk consumers exists.

Draft E-waste (Management & Handling) Rules 2016

Draft E-waste (Management & Handling) Rules have been disclosed and are expected to be notified any day. These rules have been formulated in close consultation with major stakeholders in E-waste trade value chain. Some of the major features of this regulation having implication on E-waste inventory assessment are given below.

- All the above three points (1, 2 & 3) have been addressed in the draft rules.
- Draft rules recommend financial mechanism to address financial implications for E-waste management.
- Responsibilities of Consumers especially bulk consumers have been increased.

2.4 Conclusions

None of the major brands manufacturing / importing items mentioned in Schedule 1 of the E-waste rules have manufacturing facilities or corporate head offices located in Chhattisgarh Therefore, monitoring of E-waste inventory through evaluation of Form 2 or Form 3 in accordance with Rule 4(9) of E-waste Rule by CECB in the state is possible only through the producers data obtained from centralized agency e.g. CPCB or the state where these producers are registered after 2012.

CPCB data shows that as of September 2013, Chhattisgarh has two E-waste dismantler / recycler M/s Navrachna Recycling Pvt. Ltd. & M/s ADV Metal Combine Private Limited. Therefore, CECB can track & monitor E-waste inventory in the state through the dismantler's / recycler's data obtained from centralized agency e.g. CPCB or the state where dismantler's / recycler's are registered. This also indicates that E-waste is either dismantled or recycled in both formal & informal sector in the state.

Table 2.2 indicates that producers are majorly responsible for all the activities including financing of E-waste management. Since, the state has two registered dismantler & recycler, it indicates that producers may be fulfilling their responsibility through collection system catering to dismantlers & recycler both inside & outside the state.

Assessment on the upstream side of the E-waste chain especially of both types of consumers (bulk & individual consumer), also indicate that only bulk consumer offer opportunity of E-waste inventory tracking & monitoring. Though, bulk consumers are required to maintain records of E-waste, they are not required to file the returns.

Since no mechanism exist for tracking purchase of EEE by bulk consumers and also producers are not required to declare quantity of EEE placed in the market since 2012, E-waste inventory assessment has to rely on available historical market research data.

Therefore, there is a need to identify different producers, profile of consumers & bulk consumers, collection centre, dismantlers & recyclers who are catering to E-waste in the five districts in the study area.

Chapter 3: Assessment of E-waste Market

3.0 Introduction

The increasing market penetration of the consumer electronics will lead to reduced life of electronics items and greater generation of E-waste in Chhattisgarh. Therefore, an assessment of E-waste market structure requires an understanding of E-waste as a "tradable commodity" and its "mechanism of trading". In Chhattisgarh E-waste as a "tradable commodity" can be described in terms of its composition and its potential for material recovery. "Mechanism of Trading" can be described in terms of E-waste trade value chain. This chain will identify different stakeholders consisting of producers, consumer or bulk consumers, collection centers, dismantlers and recyclers, while mechanism of trading will determine E-waste generation, present handling practices, storage and channelization for its recycling or disposal. The following sections describe each of these items to facilitate an understanding of E-waste market in five divisions of Chhattisgarh.

3.1 E-Waste Composition

E-waste Composition has been described in terms of components, which contain items of economic value. At first E-waste has been classified into 19 components forming "building blocks", which are easily "identifiable" and "removable", followed by their respective hazardousness.

3.1.1 E-waste Components

A number of components, which are assembled to produce "Electrical and Electronic Equipment" are metal, motor / compressor, cooling, plastic, insulation, glass, LCD, rubber, wiring / electrical, concrete, transformer, circuit board, fluorescent lamp, incandescent lamp, heating element, thermostat, FR / BFR – containing plastic, batteries, CFC / HCFC / HFC / HC & external electric cables. Specific component, which are found in Air Conditioners, refrigerator, washing machine, personal computers, cellular telephones, TVs and other items as per schedule 1 are described in **Table 3.1**.

Large household appliance like Air Conditioners / refrigerator may consist of electric motor, a circuit board, a transformer, capacitor, thermal insulation, switches, wiring, plastic casing (containing flame retardants) etc. A typical washing machine may consist of the metal casing, inner and outer drums, a motor, a pump, washing cycle controller unit, switches and other components. IT and telecom equipments sector is observing a trend of "micro miniaturization", while CRTs in monitor are being replaced by LCD screens. Further, there is an increasing trend of reduction in weights of these items.

Table 3.1 indicates that the range of different items found in E-waste is diverse classifying it a waste of complex nature. However, it shows that E-waste can be dismantled or disassembled into relatively small number of common components for further treatment. This disassembly results in segregation and treatment of E-waste.

3.1.2 E-waste Composition, Recyclability and Hazardousness

During market survey of major stakeholders in Surguja division, it was revealed that broadly E-waste consists of ferrous and non-ferrous metals, plastics, glass, wood, printed circuit boards, rubber and other items. Iron and steel constitutes about 50% of the E-waste followed by plastics, non - ferrous metals and other constituents. Non-ferrous metals consist of metals like copper, aluminum and precious metals ex. silver, gold, platinum, palladium etc. Therefore, these items are dismantled in informal sector. However, the presence of elements like lead, mercury, arsenic, cadmium, selenium, hexavalent chromium and flame retardants in E-waste and their components beyond threshold quantities render them hazardous in nature.

					1														-		-
Sr. No.	Items of Electrical & Electronic Equipment's	Metal	Motor / Cooling	Plastic	Insulation	Glass	CRT	LCD	Rubber	Wirring / Electrical	Transformer	Magnetron	Circuit Board	Fluorescent lamp (in ballast)	Incandescent lamp	Heating element	Thermostat	FR / BFR – containing plastic	Batteries	CFC, HCFC, HFC, HC	External electric cables
I.	Information Technology and Telecommunication Equipment																				
1.	Centralized Data Processing	\checkmark			\checkmark	\checkmark				\checkmark	\checkmark		\checkmark								
2.	Mainframes					\checkmark				\checkmark								\checkmark			\checkmark
3.	Mini Computers		\checkmark			\checkmark	\checkmark		\checkmark	\checkmark	\checkmark		\checkmark								
4.	Personal Computing	\checkmark	\checkmark	\checkmark	\checkmark		\checkmark	\checkmark	\checkmark	\checkmark	\checkmark		\checkmark								
5.	Personal Computers (Central processing unit with input and output devices)	V	V	V	V		V	V	V	V	\checkmark	\checkmark	V						\checkmark		\checkmark
6.	Laptop Computers (Central processing unit with input and output devices)			V	\checkmark	\checkmark		\checkmark	V	\checkmark			\checkmark	\checkmark				\checkmark	\checkmark		\checkmark
7.	Notebook Computers									\checkmark			\checkmark	\checkmark							\checkmark
8.	Notepad Computers	\checkmark	\checkmark					\checkmark	\checkmark				\checkmark	\checkmark				\checkmark	\checkmark		
9.	Printers including cartridges			\checkmark		\checkmark				\checkmark											
10.	Copying Equipment	\checkmark	\checkmark		\checkmark	\checkmark			\checkmark	\checkmark	\checkmark		\checkmark								
11.	User Terminals and Systems	\checkmark		\checkmark	\checkmark	\checkmark	\checkmark		\checkmark	\checkmark	\checkmark		\checkmark					\checkmark			\checkmark
12.	Facsimile	\checkmark	\checkmark		\checkmark				\checkmark	\checkmark			\checkmark					\checkmark			\checkmark
13.	Telephones	\checkmark		\checkmark	\checkmark				\checkmark	\checkmark	\checkmark		\checkmark								\checkmark
14.	Pay Telephones				\checkmark					\checkmark	\checkmark		\checkmark						\checkmark		
15.	Cordless Telephones	\checkmark		\checkmark	\checkmark			\checkmark	\checkmark	\checkmark			\checkmark					\checkmark			\checkmark
16.	Cellular Telephones	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark			\checkmark	\checkmark			\checkmark					\checkmark	\checkmark		\checkmark
17.	Answering Systems	\checkmark	\checkmark	\checkmark	\checkmark			\checkmark		\checkmark			\checkmark						\checkmark		\checkmark
II.	Consumer Electrical and Electro	nics																	-		
18.	Cathode Ray Tube (CRT) TV												\checkmark								
19.	Liquid Crystal Display (LCD) TV									\checkmark			\checkmark					\checkmark			
20.	Light Emitting Diode (LED) TV					\checkmark				\checkmark				\checkmark				\checkmark			
21.	Refrigerator					\checkmark									\checkmark			\checkmark		\checkmark	
22.	Washing Machine					\checkmark												,			
23.	Air Conditioners excluding centralized air conditioning plants	\checkmark	V	\checkmark	\checkmark				\checkmark	V			\checkmark				V	V		\checkmark	\checkmark
24.	Compact Fluorescent Lamp CFL																				

Table 3.1: Components in E-waste

 $\sqrt{\text{Present as a component}}$

• Possible presence as a component Source: Prepared from WEEE & Hazardous Waste, A report produced for DEFRA, UK Government, March 2004, AEA Technology

The possible substances of concern, which may be released during recovery of secondary raw material from E-waste, are given in **Table 3.2**.

Component	Possible Hazardous Content				
Metal					
Motor \setminus Compressor					
Cooling	ODS				
Plastic	Phthalate plasticize, BFR				
Insulation	Insulation ODS in foam, asbestos, refractory ceramic fiber				
Glass					
CRT	Lead, Antimony, Mercury, Phosphors				
LCD	Mercury				
Rubber	Phthalate plasticizer, BFR				
Wiring / Electrical	Phthalate plasticizer, Lead, BFR				
Concrete	-				
Transformer					
Circuit Board	Lead, Beryllium, Antimony, BFR				
Fluorescent Lamp	Mercury, Phosphorus, Flame Retardants				
Incandescent Lamp					
Heating Element					
Thermostat	Mercury				
BFR – containing plastic	BFRs				
Batteries	Lead, Lithium, Cadmium, Mercury				
CFC, HCFC, HFC, HC	Ozone depleting substances				
External electric cables	BFRs, plasticizers				

Table 3.2: Possible Hazardous Substances in E-waste Components Possible Hazardous Content

Source: Compiled from WEEE & Hazardous Waste, A report produced for DEFRA, March 2004, AEA Technology

Major components, which cause most concern, include lead, mercury, cadmium and chromium (VI), halogenated substances (e.g. CFCs), polychlorinated biphenyls, plastics and circuit boards that contain brominated flame retardants (BFRs). BFR can give rise to dioxins and furans during incineration and open burning of E-waste fractions at dump site can lead to other toxic release. Other materials and substances that can be present in E-waste are arsenic, asbestos, nickel and copper. These substances may act as a catalyst to increase the formation of dioxins during incineration.

3.2 Mechanism of E-Waste Trade

"Material Flow" along the "Life Cycle" of electrical and electronic equipment within a "Geographical Boundary" of Surguja division of Chhattisgarh forms the basis of E- waste generation. The following sections describe a conceptual understanding of material flow, along the life of electrical and electronic equipment, its conversion into an "obsolete" item followed by its transformation into new material. A conceptual E-waste trade value chain showing material flow along the E-waste trade value chain is shown in **Figure 3.1**. This is followed by customization of the conceptual E-waste trade value chain for Surguja division.

Raw Material Input





Source: UNEP Manual Vol. I; Inventory Assessment Manual

The establishment of material flow within a geographical boundary assists in identifying, networks / chain connecting different phases of life cycle of electrical and electronic equipment and associated stakeholders. The material flow, when applied to "life cycle" of electrical and electronic equipment leads to evolution of the 'Four-Phase-Model', where each phase describes respective unit operations and different stakeholders. Each of these phases and associated stakeholders is described in **Table 3.3** and depicted in **Figure 3.2**. The dotted vertical line in the **Figure 3.2** indicates the stage of "obsolescence" in between the second and third phase of life cycle.

Table 3.3: Phases of material flow model

S.No.	Phase	Stakeholders
1.	<u>Phase I:</u> Unit Operations / Processes / Activities: Production and sales of electrical and electronic equipment including import, export, and input of equipment for re-use from repair of WEEE / E-waste.	Stakeholders: Manufacturers, importers, exporters, and retailers (brand new / second hand)
2.	<u>Phase II:</u> Unit Operations / Processes / Activities: Consumption of electrical and electronic equipment, use of electrical and electronic equipment in households, offices and industry.	Stakeholders: Consumers like households, commercial places like offices and industry
3.	<u>Phase III:</u> Unit Operations / Processes / Activities: Consumption of electrical and electronic equipment, use of electrical and electronic equipment in households, offices and industry.	Stakeholders: Consumers, importers, exporters, collectors, traders, dismantlers, waste treatment operators
4.	<u>Phase IV:</u> Unit Operations / Processes / Activities: Treatment / disposal alternatives for WEEE/E-waste ex. repair, decontaminating, dismantling, shredding, landfill and incineration.	Stakeholders: Dismantlers, Recycling, Hazards landfill site operators.
Courses De	at and from Waste from electrical and electronic equitment (WEEE)	an antition damagements substances and

Source: Prepared from Waste from electrical and electronic equipment (WEEE) – quantities, dangerous substances and treatment methods, EEA Copenhagen, 2003

In developed countries, where E-waste management system is in operation, the entire trade value chain occurs in organized / formal sector. The blue line indicates the starting point of informal sector involvement in E-waste management in a developing country. An example of generic E-waste trade value chain in a developing country is shown in **Figure 3.3**. In majority of developing countries, the informal sector engagement starts from the point of collection and continues till the last stage in some capacity. However, other steps / unit operations like E-waste processing, production / end products may be present or absent in a country. Therefore, this chain can be further modified or customized with inter or intra linkages depending on the E-waste processing or end production in Surguja division.



Figure 3.2: Generic E-waste trade value chain in a developing country Source: UNEP Manual Vol. II; Inventory Assessment Manual


Figure 3.3: The 'Four-Phase-Model'

Source: Prepared from Waste from electrical and electronic equipment (WEEE) – quantities, dangerous substances and treatment methods, EEA Copenhagen, 2003

3.3 E-waste trade value chain in Surguja Division (5 districts)

A tentative E-waste trade value chain for study area which has emerged out of field work is shown in **Figure 3.4**. Tracer technique, which was pilot tested in Surguja division has been used in major five districts in the division to fix E-waste trade value chain. A brief description of the identified stakeholders is given below.



Figure 3.4: Tentative E-waste trade value chain in Study Area

<u>Producers</u>

Figure 3.4 indicates that EEE producers / manufacturers do not exist in the study area. However, their products are being sold in the division. Secondary data confirms that EEE producers do not have manufacturing facilities in the division and therefore they are not registered with Chhattisgarh Pollution Control Board. Since these producers are responsible for their products under EPR, their detailed **inventory** as per schedule 1 of E-waste (Management & Handling) rules are given in Annexure 1.

Distributors / Traders / Retailers

EEE from these producers are sold in the study area through Distributor / Trader / Retail network as well as directly through the company. Items like Centralized Data Processing, Mainframes, Mini computers of Schedule 1 are used by large corporate, State and Central Government agencies falling under the category of bulk consumers whose profile is given below. **Inventory** of Distributors / Traders / Retailers selling items other than mentioned above in the study area is given in Annexure 2. However, retailers / dealers do not fall under the purview of E-waste (Management & Handling) Rules 2011, unless they serve as collection centre or drop off point.

<u>Consumers</u>

There are two types of consumers, which are found in the five districts of study area; Individual Consumers & Bulk Consumers. **Inventory** of bulk consumers in the five districts are given in Annexure 3.

Collection Centres / Channel

Tracer analysis indicates that EEE, which becomes E-waste in the study area partly gets collected & transported in the informal sector and partly in formal sector. Primary survey carried out through Tracer technique indicates that bulk of E-waste generated in the study area goes to informal sector. Majority of the producer / manufacturer have established collection channel in the study area. These collection channels work through following mechanism.

- 1. Single point call centre
- 2. Distributors / Retailers

- 3. Service Centres
- 4. Physically established collection centre / drop off point

The producers use a combination of these mechanisms as given in Table 3.4.

Brands	Collection through Call Centre	Collection through Dealers / Retailer	Collection through Service Centre	Collection through Collection Centre / establishment	Remarks
LG				\checkmark	
Panasonic					
Samsung	\checkmark			\checkmark	Technician come to the site of E- waste discarded item, check the item and collect. (No compensate) provides certificate. (All the E-waste discarded item go to Haridwar, Rorkee) Attero Recycling Company.
Toshiba	\checkmark				Collection is carried out by a logistic service provider "M/s Kintetsu World Express Pvt. Ltd.", earlier "Gati"
Haier					
Kelvinator	\checkmark	\checkmark			Exchange your electronic item to your nearest dealer or where you buy the product
Electrolux	\checkmark				Exchange your electronic item to your nearest dealer or where you buy the product
Godrej					
Hitachi	\checkmark				Exchange offer contact to your dealer no collection center
BPL	\checkmark	\checkmark			Contact to your dealer where you buy the product
Akai					To the dealer he gives the cost of the product.
Sansui	V	\checkmark			E-waste Regarding no information Contact to nearest dealer
Philips	\checkmark			\checkmark	Call on customer care door to door collection of E-waste / discarded items of Philips
Whirlpool	\checkmark				To dealer he exchange your electronic item
			Printe	rs	
НР					Drop your items as dealer's drop off locations.
Canon					
Brother					
TVSE					

 Table 3.4: Manufacturer's E-waste Collection Centre System in Surguja

Inventory of Service centres in the study area is given in Annexure 4. Inventory of Physically established collection centres is given in Annexure5 Table 3.4 indicates that majority of producers

use call centre as well as dealer's network for collection of E-waste. There are two possibilities of onward transportation & disposal of E-waste. The first possibility is the disposal through informal sector & the second is through registered recycler. Since dealers are not covered under E-waste Rules, they are not legally bound to report.

<u>Informal Sector</u>

Tracer technique has been used in the Surguja division to fix E-waste trade value chain in the informal sector.

E-waste is collected & dismantled in informal sector in the study area. Further, its major fractions are transported outside the state mainly to Ghaziabad, Gwalior, Etawah & Delhi through informal sector traders. An inventory location of major scrap vendor / dismantler, temporary stockpile site / informal collection centre & landfill site is given in Annexure 6.

It has been found that Chando Road, Mission Road, Shanti para, Jail road, Wardaf nagar in Balrampur District, Jyoti Niwas Road, Pathargaon Road, Abikapur Road in Jashpur District, Jabri para, Rai baba tiraha, Rai Mahal, Arab baba Sahdol road area in Koriya District, Old Bustand, Kharsia road, Nawa garh, Chandni Cowk area in Surguja District and Sunday market area, Bisharpur, Mahgawa, Bhaiyathan road and government hospital area in Surajpur Area has a strong metal and electronic scrap market. These waste and scrap items are then transported to Ghaziabad, Gwalior, Etawah & Delhi. They used to come twice/thrice in a year. The motherboards and floppy drives are removed from the machines by scrap vendors and sold by weight and mobile phone sold as individual pieces to scrap dealers. None of these scrap vendors have the ability to identify the condition of these components. They are then typically sold - TV Circuit Rs. 20-50/kg & TV 250-300/Pcs.; Compressor Rs. 400-450/Pcs.; Copper Rs. 350-450/kg; Refrigerator Rs. 500-1200/Pcs.; Washing Machine Rs. 700-800/Pcs; CFL Rs. 300/kg and Mobile kit Rs. 30-50/Pcs.

- An electronic item goes to mechanic shops from households for repairing, and mechanic replaces damaged / defunct parts / components from it and then they sell it to scrap dealers.
- Mechanics sell E-waste to scrap dealer by weight / Pcs. mainly of ICT items (IT as per Schedule 1); TV circuit Rs. 15-45/kg; Compressor Rs. 300-400/Pcs.; Washing Machine Motor Rs. 200/Pcs.; Copper Rs. 200-350/kg; DVD Circuit Rs. 20-25/kg; Mobile kit Rs. 1000-2000/kg; SMPS Rs. 50/Pcs, Mother Board Rs. 90/Pcs.; Hard disk Rs. 120/Pcs.; CD Writer Rs. 35-40/Pcs.
- Small scrap vendors sell E-waste to big scrap dealer by weight / Pcs. TV Circuit Rs. 20-50/kg & TV 250-300/Pcs.; Compressor Rs. 400-450/Pcs.; Copper Rs. 350-450/kg; Refrigerator Rs. 500-1200/Pcs.; Washing Machine Rs. 700-800/Pcs; CFL Rs. 300/kg and Mobile kit Rs. 30-50/Pcs.
- Scrap dealers comes from Ghaziabad, Gwalior, Etawah & Delhi yearly twice / thrice for collection of E-waste.
- There is no organized mechanism for collection, transportation and disposal of E-Waste in Surguja division.
- No mechanism exists in the state to monitor and track its inventory, collection, transportation and disposal.

<u>Market Features</u>

E-waste Market concentration is mainly in Surguja district. This is due to higher penetration of EEE because of population concentration in this area. The EEE markets have been found to be small and price sensitive. Major brands, which have been observed, are Nokia, LG, Sony, Samsung, Panasonic,

Philips, Videocon, Godrej, Onida, Whirlpool, Kelvinator, Haier, Hitachi, Voltas, Blue Star, Dell, HP, HCL and Lenovo. The new items after active life gets repaired and reused by the owner of the item. In case it becomes useless, it is left at repair centre, where it is cannibalized & finally its fractions are thrown in the dust bin.

Majority of material/ E-waste is transported to Ghaziabad, Gwalior, Etawah & Delhi with scattered temporary storage at different places of different towns.

Dump Sites (E-waste tracers)

Only Plastic and Glass parts of E-waste were found in Dump Site. Mixed waste was found in all dump sites. A summary of the process observed is shown in **Figure 3.5**.



Figure 3.5: Processes observed at dumpsite

Collection, Transportation & Processing (scrap dealers)

Small scrap dealer purchase waste from Household / Commercial Area / Institution, etc. At first stage, they segregate the waste than break the item and collect valuable items like Aluminum, Copper, Iron & Steel, Compressor, motor, etc. from E-waste. They sell their collected item to the large scrap dealer. They visit nearby area on daily/weekly basis and purchase the waste. These scrap dealers are not licensed by the municipalities but are part of the networks of large scrap dealers. Dismantling and segregation of E-waste occurs in a major way at large scrap dealers. A summary of the process observed is illustrated in **Figure 3.6**.



Figure 3.6: Processes observed at scrap dealers / junkyards

Repair Shops (AC/WM/REF)

One person repairs one of these items every day. E-waste fractions/ waste Parts, like plastic body of these items, etc. is dumped into community bin and valuable item sold to nearby scrap dealer. Some of the respondent informed that Item which is not in repairable condition is returned to the owner of the product who in turn sells to the scrap dealer. Majority of the product are in repairable condition. A summary of the process observed is shown in **Figure 3.7**



Figure 3.7: Processes observed at AC, Washing Machine, and Refrigerator Repair Shop

Repair Shops (TV / PC / Mobile Phone)

Majority of mobile phones, TV & computers repair shop owners are local citizens. Waste Parts, like plastic body of these items, etc. are dumped into community bin and valuable item sold to nearby scrap dealer. They also store valuable item and use it to repair other EEE. Majority of the product are in repairable condition. A summary of the process observed is illustrated in **Figure 3.8**.



Figure 3.8: Processes observed at TV, Computer, and Mobile Phone Repair Shop

Summary E-Waste Process Study

There are various processes involved for recycling / reusing of electronic waste. The major process for different types of electronic items in Surajpur, Surguja, Jashpur, Balrampur and Koriya are mentioned in **Table 3.5**.

Sr.			P	rocess Star	tus	
No.	Process name	Surajpur	Surguja	Jashpur	Balrampur	Koriya
1	IC's Extraction from PCB	No	No	No	No	No
2	Surface Heating of PCB and Extraction of	No	No	No	No	No
	components					
3	Dissembling of Monitor & TV and	Yes	Yes	Yes	Yes	Yes
	extraction of components					
4	Yoke core and Copper	No	No	No	No	No
5	Metallic Core of Transformer and Copper	Yes	Yes	Yes	Yes	Yes
6	Rare Earth Core of Transformer and	No	No	No	No	No
	Copper					
7	Rare Earth Core of Static Transformer	No	No	No	No	No
8	Wire PVC and Copper	Yes	Yes	Yes	Yes	Yes
9	Plastic Shredder	No	No	No	No	No
10	Dismantling of Refrigerator and	Yes	Yes	Yes	Yes	Yes
	Compressor					
11	Gold Extractions from Pins and Comb	No	No	No	No	No
12	Acid Bath for PCB	No	No	No	No	No
13	Regunning CRT's	No	No	No	No	No
14	Glass Recovery from CRT	No	No	No	No	No
15	Gold Recovery	No	No	No	No	No

Table 3.5: Processes involved for E-waste recycling in different towns

The process details of fifteen processes are given in **Table 3.6**. The analysis of this table shows that there is dismantling activity occurring in Surajpur, Surguja, Jashpur, Balrampur and Koriya. The entire amount of E-waste from these towns is transported to Ghaziabad, Gwalior, Etawah and Delhi for dismantling and further supply to Delhi market. Photo documentation captured in different towns of Surguja division is given in Annexure 8.

3.4 Conclusions

Major conclusions, which can be derived, include growing market of EEE in Surguja division. This growth may lead to increasing E-waste generation, which may further lead to higher pollution loads, health impacts and loss of recoverable items.

Chapter 4: Methodology for E-waste Inventory

4.0 Introduction

E-waste inventory forms the backbone of its E-waste management in a geographical area. There are, five methods, which have been used to determine E-waste inventory in both developed and developing countries. Each of these methods use "Material Flow" model. Therefore, the selection of E-waste inventory assessment methodology in five districts of Chhattisgarh in Surguja division is based on the availability, reliability and analysis of data along the material flow chain within their geographical boundary. The following sections describe each of these methods, their application, constraints, advantages, data requirements and sources of data in the context of Chhattisgarh.

4.1 Methods for Inventory Assessment

Different methods of E-waste inventory assessment as per UNEP's Manual 1 on E-waste Inventory Assessment are given below.

- 1. The Time Step Method.
- 2. The Market Supply Method.
- 3. The Carnegie Mellon Method.
- 4. Approximation Method 1.
- 5. Approximation Method 2.

The data requirement for each methodology based on mathematical expressions is given in Annexure 9. The extent of data required depends on the extent of geographical boundary, which could be national, regional or city boundary. Conceptually, the source of data can be identified by understanding the "material flow chain" within the given geographical boundary.

The E-waste material flow chain in Chhattisgarh as described in **Figure 3.4** of Chapter 3 is again shown in **Figure 4.1** in the context of inventory assessment. **Figure 4.1** shows that in all the five districts of the study area, the material flows from an organized / formal sector starting from production / manufacture till consumption phase, where major percentage of material enters into unorganized / informal sector. Therefore, the major constraints are related to availability, reliability, amount and range and completeness of the data along the chain.

Analysis of transfer of E-waste flow chain from formal to informal sector shows that the data for EEE in Chhattisgarh needs to be collected from secondary sources & primary survey. Therefore, E-waste inventory assessment in Chhattisgarh requires collection of available secondary data from the formal sector & its strengthening by primary survey in the informal sector followed by trend analysis.

4.2 Material Flow Chain, Data Sources and Data Gaps in Study Area

Figure 4.1 indicates that stakeholders existing in the study area are EEE retailers, consumers, service centres, E-waste collectors (to a limited extent) and two dismantlers in formal sector & other E-waste collectors (majority), & dismantlers in the informal sector in the study area. Therefore, secondary data related to stakeholders in the flow chain in the formal sector at temporal level was identified, collected and collated for quantification, while primary survey was carried out covering stakeholders in the informal sector in the study area. The detailed findings of the primary survey are given in Chapter 3.



Figure 4.1: E-waste material flow chain in Study Area

Major observations related to data availability are given below.

- Saturation Level National census data was obtained from office of the Registrar General & Census Operation, Govt. of India, National Sample Survey Organization (NSSO), Department of Statistics, Government of India, State Statistics from Department of Statistics, Government of Chhattisgarh, Telecom Regulatory Authority of India (TRAI), Ministry of Communications & Information Technology (MOCIT), Government of India, Industry Association like Manufacturers Association for Information Technology (MAIT), Electronic Industries Association of India (ELCINA), Telecom Equipment Manufacturers Association of India (TEMA) & Research Institutions e.g. National Council for Applied Economic Research (NCAER).
- 2. Number of Households Available with national census data (1991, 2001 & 2011).
- 3. Stock Data Stock levels at private/households, industry, commercial & sectors with Industry Association.
- 4. Data related to average life time, storage data, reuse, recycling & disposal at landfill site is not available from secondary sources & so primary survey was carried out in the study area.

Data Source/ Item	National/ Local Government Agencies	Industry/ Trade/ Recyclers/ Waste Disposal Operator's Association (Reports/ Published Data/ Field Work)	Market Research Agencies (Reports/ Published Data)
Saturation Level (Household & Industry)	National Census Data, (1991, 2001 & 2011)	Major Trading Agencies, (Retailers)	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
Number of Household	National Census Data, (1991, 2001 & 2011)		
Export Data	Not required		

Table 4.1: Tentative sources of data in Study Area

Data Source/ Item	National/ Local Government Agencies	Industry/ Trade/ Recyclers/ Waste Disposal Operator's Association (Reports/ Published Data/ Field Work)	Market Research Agencies (Reports/ Published Data)
Import Data	Not required	,	
Stock Data Private (Rural & Urban)	NSSO (1994 – 2010)	Industry Association, Scrap Dealers, Recyclers, EEE Retailers	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
Stock Data Industry	TRAI, MOCIT, Govt of India.	Industry Association, Scrap Dealers, Recyclers, EEE Retailers	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
Average Life Time, Technology Change	TRAI, MOCIT, Govt of India.	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications, Annual Reports of Major Brands
Storage Data		Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications, Newspapers
Reuse		Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications
Recycle		Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	
Disposal in Landfill	City Municipalities	Scrap Dealers, Recyclers, EEE Retailers	

A matrix describing inventory methodology versus data availability has been prepared after assessing the data obtained as per **Table 4.1** (based on data requirement methodology) and summarized in **Table 4.2**. The major inferences, which can be drawn from **Table 4.2**, are given below.

Method ology/ Data Require ment	Satu La House hold	ration evel Industr y	Numbe r of Househ old	Cal Export Data	lculated S Import Data	ales Manufac turing / Product ion	Stoc Priv ate	k Data Indus try	Avera ge Lifeti me	Stora ge data	Reu se	Recycl e / disma ntling	Land fill
Time Step Method	Х		\checkmark	Х	Х		Х	Х					
Market Supply				Х	Х	\checkmark			\checkmark				

Table 4.2: Data Matrix Vs Methodology

Method	Saturation Level		Numbe	Calculated Sales			Stock Data		Avera	Store		Recycl	
Data Require ment	House hold	Industr y	r of Househ old	Export Data	Import Data	Manufac turing / Product ion	Priv ate	Indus try	ge Lifeti me	ge data	Reu se	e / disma ntling	Land fill
Method													
Carnegie Mellon Method				Х	Х				\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
Approxim ation 1	Х	Х	\checkmark				Х	Х					
Approxim ation 2				Х	Х								

Note: √ means 'Available'/"Can be derived"; X means 'Not Available'; NV means 'No value'

Since E-waste market in Chhattisgarh is a continuously growing market, which has not reached saturation levels, therefore Time Step Method, Approximation 1 & Approximation 2 Method have not been used. Further, market supply method can be applied since it requires at least one set of data related to EEE penetration & one set of data after E-waste generation. Carnegie Mellon method appears to give better estimates than Market Supply Method since data related to reuse and storage can be estimated while assessing, average life time based on primary & secondary data analysis. Further, only E-waste fractions of no economic value have been found in landfill sites in the study area.

Some of the findings of the secondary & primary data survey, which have been observed, are given below. These findings have been used for carrying out inventory assessment of E-waste from items mentioned in Schedule 1 of E-waste rules 2011.

- 1. The office automation industry has undergone radical shift around 2006-07. The differentiation or gap between "Copier" and "Printer" segment of the Office Automation Industry had been bridged around the year 2006-07. The multi Functions Products (MFPs), which is Printer / Scanner / Fax / Copier, (including color MFPs) are the key drivers of this industry. Therefore, for E-waste inventory assessment, items Printers including cartridges, Copying Equipment, & Facsimile mentioned in Schedule 1 of E-waste rules, have been clubbed under one head of **"Printers including Cartridges"** for inventory assessment.
- 2. It is pertinent to state that Bharat Sanchar Nigam Limited is the only Telecom. Service Provider providing Telegraph Services to the citizens of the country across the length and breadth of the nation. As per BSNL there has been steep decline in the usage of Telegraph Services due to large scale penetration of Fixed Line Telephony, Mobile Services and Internet Services. SMS and E-mails have gained greater importance in Message Transmission over the years. Realizing the declining usage of Telegraph Services, the Establishment branch of BSNL Corporate Office defined Telegraph Services as diminishing services vide circular No. 19 1/2009/TE-II dated 19-02-2010. BSNL in order to keep pace with technological developments introduced Web Based Telegraph Messaging System in all circles by 31-03-2010. Further no Telex machines had been encountered at any of the scrap dealer in the study area.
- 3. Typewriter production stopped in India in 2010. Godrej & Boyce was the only typewriter producing company in the world. Although primary survey in the five districts of the study area, indicated presence of mechanical typewriters in courts premises & few government offices. Further, primary survey at the scrap dealer also did not indicate any presence of electric or electronic typewriter coming into the dismantling or recycling chain.
- 4. NSSO data, Census data & data from research institution indicate temporal data compilation at national, state & district level for all types of TV (CRT, LCD & LED) clubbed together.

Therefore, all the three items under consumer Electrical & Electronics under schedule 1 of E-waste rules have been clubbed under the head TV for E-waste inventory assessment.

- 5. Temporal data from Census, NSSO, MOCIT, TRAI, TEMA market research institutions & telecom operators is classified under fixed line and cellular subscribers at national, state & district level. Further, cellular subscribers consist of GSM & WLL categories. Therefore, Pay telephones, Cordless telephones and Answering systems have been considered as subsegments under fixed line subscriber segment since the consumers choice of instrument cannot be accomplished without subscription to a telephone connection. Therefore, E-waste inventory assessment has been carried out based on temporal fixed line and cellular telephone subscription at district level consisting of both rural & urban consumers.
- 6. Temporal data from Census, NSSO, MOCIT, MAIT market research institutions & telecom operators is classified under Desktop, PC, Notebooks & servers at national, state & district level. Further, Notebook consumers consist of netbooks & notepad computers, servers have also been considered consisting of mainframes & minicomputers subscribers consist of GSM & WLL categories. Therefore, E-waste inventory assessment has been carried out under the head of "computers".
- 7. Among the white goods both households and commercial segments drive the air conditioner market, while households drive the refrigerator, washing machine and TV market.

4.3 Methodology / Approach & Instruments Used

Carnegie Mellon method has been identified for E-waste inventory assessment in study area. Major data requirements in order to use this method are given below.

- 1. Information about stakeholders i.e. recycler / dismantler, scrap dealer, consumer etc.
- 2. Stock and generation of E-waste
- 3. Origin of new electrical and electronic equipment i.e. mode of procurement
- 4. Life time of electrical and electronic equipment
- 5. End of life management of electrical and electronic equipment
- 6. Process involved during dismantling
- 7. Final destination of E-waste fractions

In order to get the required data, two approaches have been adopted. These approaches are depicted in **Figure 4.2** and cover all the identified stakeholders in study area. Salient features of these approaches are given below.

Approach 1: Combination of primary and secondary data collection

Different types of data required has been identified collected, Collated & analyzed from the sources given in **Table 4.1**.

Approach 2: E-waste tracer tracking

In this approach, E-waste tracers are identified at dumpsites, which lead to identification of stakeholders further up on the upstream side of the material flow chain as given in **Figure 4.2**. These stakeholders include dismantlers, junkyard owners, repair shops and retail shops. Different processes carried out by stakeholders are identified, photo-documented and quantified. A list of dismantlers / recyclers, scrap dealers, trading agents, landfill sites and other agencies surveyed is given in chapter 3 and related annexure.



4.4 Conclusion

Data matrix versus methodology used for E-waste inventory assessment indicates "Market Supply" method and "Carnegie Mellon" method can be applied for E-waste inventory assessment in five districts of Chhattisgarh in Surguja division. However, a combination of Carnegie Mellon method & tracer tracking has been selected for inventory assessment since it covers all the aspects of material flow chain. Assessment of data from these stakeholders through tracer tracking has resulted in assessment of obsolescence rate or average life of equipment described in chapter 5.

Chapter 5: E-Waste Inventory Assessment

5.1 Introduction

This chapter describes the E-waste inventory and market scenario for the E-waste management system in Surguja division. Since E-waste inventory forms the basis of planning for E-waste management system, an effort has been made to assess the E- waste inventory and market potential in the country. Following sections describe each of these items followed by pollution potential and risk profiling.

5.2 Market Size Assessment of Electrical and Electronic Equipment (EEE) in Surguja Division

The time series data related to market size of each of the EEE items has been computed from data obtained from different agencies as well as from trend analysis. This data was compiled from data sources described in chapter 4. The EEE market size for Air Conditioners, refrigerator, washing machine, personal computers, cellular telephones, TVs and other items as per schedule 1 is shown in **Table 5.1** to **Table 5.8**.

			1		,
Year	Surajpur	Surguja	Jashpur	Balrampur	Koriya
2006	2404	2569	2616	2183	2054
2007	14602	15565	15776	13259	12367
2008	21880	23251	23468	19862	18358
2009	28907	30615	30776	26232	24017
2010	34562	36468	36520	31350	28420
2011	37108	39521	40053	34354	30988
2012	41012	43540	43992	38013	33916
2013	44675	47262	47621	41460	36568
2014	48184	50775	51033	44774	39015
2015	51598	54138	54294	48015	41305
2016	54964	57396	57454	51226	43473
2017	58317	60581	60551	54446	45544
2018	61689	63718	63613	57706	47537
2019	65106	66827	66668	61037	49466
2020	68592	69925	69737	64467	51344

Table 5.1: Installed base for Cellular Telephone in Study Area (in numbers)

Source: Census 1991, 2001 & 2011, Telecom Regulatory Authority of India (TRAI), Department of Telecommunications (DOT)

Table 5.2. Instance base for Line Leichtone in Study filea (in numbers	Table	5.2:	Installed	base fo	r Fixed	Line	Telep	hone in	Study	Area ((in number	s)
--	-------	------	-----------	---------	---------	------	-------	---------	-------	--------	------------	----

				1		/
J	Year	Surajpur	Surguja	Jashpur	Balrampur	Koriya
2	2006	10278	10986	11184	9334	8782
2	2007	8621	9189	9314	7828	7301
2	2008	9953	10577	10676	9036	8351
2	2009	9073	9609	9659	8233	7538
2	2010	8312	8770	8783	7539	6835
2	2011	7987	8506	8621	7394	6670
2	2012	7696	8170	8255	7133	6364
2	2013	7419	7849	7908	6885	6073
2	2014	7156	7541	7579	6650	5795

Year	Surajpur	Surguja	Jashpur	Balrampur	Koriya
2015	6907	7247	7268	6427	5529
2016	6671	6966	6973	6217	5276
2017	6447	6697	6694	6019	5035
2018	6235	6440	6429	5832	4804
2019	6034	6194	6179	5657	4585
2020	5845	5958	5942	5493	4375

Source: Census 1991, 2001 & 2011, Telecom Regulatory Authority of India (TRAI), Department of Telecommunications (DOT)

Table 5.3: Installed base for Computers in Study Area (in numbers)

			• •		
Year	Surajpur	Surguja	Jashpur	Balrampur	Koriya
2006	1082	1372	975	762	1289
2007	1742	2209	1570	1227	2076
2008	2927	3712	2638	2062	3488
2009	5005	6347	4511	3526	5964
2010	8084	10251	7285	5695	9632
2011	12772	16196	11510	8998	15218
2012	20307	25752	18301	14307	24197
2013	33101	41975	29830	23320	39440
2014	52345	66378	47172	36878	62369
2015	84142	106699	75827	59279	100255
2016	135255	171513	121888	95289	161156
2017	217416	275700	195930	153172	259051
2018	349486	443174	314948	246218	416411
2019	561782	712382	506264	395783	669362
2020	903038	1145120	813795	636203	1075967

Source: Census 1991, 2001 & 2011, MAIT, NSSO

Table 5.4: Installed base for Printers in Study Area (in numbers)

Year	Surajpur	Surguja	Jashpur	Balrampur	Koriya
2006	162	206	146	114	193
2007	261	331	236	184	311
2008	381	483	343	268	453
2009	951	1206	857	670	1133
2010	1940	2460	1748	1367	2312
2011	2299	2915	2072	1620	2739
2012	3046	3863	2745	2146	3629
2013	4634	5877	4176	3265	5522
2014	5190	6582	4677	3657	6184
2015	5813	7372	5239	4095	6926
2016	6511	8256	5867	4587	7758
2017	7292	9247	6571	5137	8688
2018	8167	10356	7360	5754	9731
2019	9147	11599	8243	6444	10899
2020	10245	12991	9232	7217	12207
Source Consus 1	001 2001 de 2011	MAIT NISSO			

Source: Census 1991, 2001 & 2011, MAIT, NSSO

	Table 5.5: Installed base for TV in Study Area (in numbers)								
Year	Surajpur	Surguja	Jashpur	Balrampur	Koriya				

Year	Surajpur	Surguja	Jashpur	Balrampur	Koriya
2006	30018	36866	32845	26075	37923
2007	32674	39546	35816	29117	39724
2008	35476	42324	38977	32552	41556
2009	38433	45205	42345	36467	43420
2010	41284	47993	45827	40602	44906
2011	44567	51076	49672	45803	46823
2012	48040	54273	53798	51902	48773
2013	51719	57588	58238	59114	50760
2014	55619	61025	63024	67711	52783
2015	59757	64590	68198	78036	54843
2016	64152	68286	73802	90519	56942
2017	68826	72119	79887	105702	59079
2018	71999	74355	84646	122475	60160
2019	79100	80219	93730	147064	63475
2020	84752	84497	101623	175177	65735

Source: Census 1991, 2001 & 2011, ELCINA, NSSO

Table 5.6: Installed base for AC in Study Area (in numbers)

Year	Surajpur	Surguja	Jashpur	Balrampur	Koriya
2006	115	211	125	70	324
2007	132	232	146	92	345
2008	151	254	170	119	366
2009	172	278	197	155	388
2010	157	281	167	75	405
2011	178	306	193	98	428
2012	201	333	222	126	451
2013	227	362	256	163	475
2014	256	392	295	211	499
2015	288	425	338	272	524
2016	324	459	389	350	549
2017	364	496	446	451	576
2018	408	536	511	580	602
2019	457	577	585	745	630
2020	512	622	670	956	658

Source: Census 1991, 2001 & 2011, ELCINA, NSSO

Table 5.7: Installed base for Washing Machine in Study Area (in numbers)

Year	Surajpur	Surguja	Jashpur	Balrampur	Koriya
2006	197	282	215	62	352
2007	219	309	241	82	378
2008	243	337	270	108	403
2009	268	365	301	141	429
2010	259	373	278	68	449
2011	284	401	307	89	473
2012	310	431	339	115	498
2013	339	461	374	149	522
2014	369	493	413	192	545
2015	403	525	456	246	569
2016	438	559	505	316	592
2017	477	594	558	404	614

Year	Surajpur	Surguja	Jashpur	Balrampur	Koriya
2018	519	630	617	515	637
2019	564	666	683	656	659
2020	613	704	756	834	680
S	2001 2 2011 ELCI	NT 4 NICCO			

Source: Census 1991, 2001 & 2011, ELCINA, NSSO

Table 5.8: Installed base for Refrigerator in Study Area (in numbers)

Year	Surajpur	Surguja	Jashpur	Balrampur	Koriya
2006	292	465	317	119	642
2007	337	527	371	163	713
2008	389	595	434	222	788
2009	447	668	508	300	866
2010	429	698	459	151	937
2011	490	779	531	203	1022
2012	559	866	615	272	1112
2013	637	962	714	364	1205
2014	726	1066	828	485	1303
2015	827	1178	962	645	1406
2016	942	1301	1118	855	1513
2017	1072	1434	1301	1132	1625
2018	1221	1579	1513	1496	1743
2019	1390	1736	1762	1973	1865
2020	1582	1906	2051	2598	1994

Source: Census 1991, 2001 & 2011, ELCINA, NSSO

Analysis of **Table 5.1** to **Table 5.8** shows that Computers have the highest installed base followed by TV, cell phone, printers, fixed line telephone, refrigerators, washing machines and Air Conditioners. In Surguja Computers, TV, cellular phone, fixed line phone, Air condition, washing machine and refrigerator has the highest installed base followed by Koriya, Jashpur, Surajpur and Balrampur of Surguja division.

5.3 Obsolescence Rate / Average Life

Obsolescence rate / Average life for electrical and electronic equipment (EEE) has been calculated based on results of the sampling carried out for consumers, dismantlers, retailers and dumpsites along the E-waste "trade value chain" described in chapter 3 & chapter 4 and summarized in **Table 5.9**. The storage time takes into account storage at owner's premises, collection agency (scrap dealer) & dismantler's premises.

Table 5.9: Average Life and Storage of E-waste									
EEE Item	Average Life & Reuse (Years)	Storage (Years)							
Cellular Phone	3	0.5 - 1							
Computer	7	0.5 - 1							
Printer	5	0.5 - 1.0							
Washing Machine	12	0.5 - 12							
TV	10	1							
Refrigerator	12	0.5 - 1							
Air Conditioners	12	1 - 2							
Fixed Line Telephone	5	0.5 - 1							

A conservative estimate of the average life of each EEE item has been prepared by considering highest values of average life and storage time considering the consumer behavior in five districts. This estimate has been summarized in **Table 5.10**.

Table 5.10. Obsolescence Rate of Tracer EEE							
Sr. No.	EEE	Average Life (Years)					
1	Cellular Phone	3					
2	Computer	7					
3	Printer	5					
4	Washing Machine	12					
5	TV	10					
6	Refrigerator	12					
7	Air Conditioner	12					
8	Fixed Line Telephone	5					

Table 5.10: Obsolescence Rate of Tracer EEE

The average weights of each of the six items considered for computing E-waste inventory is given in **Table 5.11**.

Table 5.11: Average weight of EEE								

5.4 Weee/E-Waste Inventory

The projected district wise E-waste inventory estimates both in numbers and weights for Surguja division starting from 2011 till 2020 have been described in **Table 5.12** to **Table 5.21** and presented in **Figure 5.1** to **Figure 5.7**.

	Cellul							
	ar	Fixed						
	Phon	Line			Washing		Refrigerato	Air
Year	e	Telephone	Computer	Printer	Machine	TV	r	Conditioner
2011	21880	10278	511	162	27	18618	40	46
2012	28907	8621	726	261	88	20672	106	50
2013	34562	9953	1082	381	104	22832	130	59
2014	37108	9073	1742	951	121	25105	156	69
2015	41012	8312	2927	1940	138	27498	184	80
2016	44675	7987	5005	2299	157	30018	216	87
2017	48184	7696	8084	3046	176	32674	252	100
2018	51598	7419	12772	4634	197	35476	292	115
2019	54964	7156	20307	5190	219	38433	337	132
2020	58317	6907	33101	5813	243	41284	389	151

Table 5.12: E-waste Inventory of Surajpur District (in numbers)

Table 5.13: E-waste Inventory of Surajpur District (in Tons)

		Fixed						
	Cellular	Line			Washing			Air
Year	Phone	Telephone	Computer	Printer	Machine	TV	Refrigerator	Conditioner

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
2011	3.28	10.28	10.71	1.14	1.49	575.59	1.42	2.53
2012	4.34	8.62	15.21	1.83	4.82	639.08	3.72	2.74
2013	5.18	9.95	22.66	2.66	5.72	705.85	4.54	3.22
2014	5.57	9.07	36.48	6.66	6.64	776.12	5.44	3.77
2015	6.15	8.31	61.29	13.58	7.61	850.09	6.44	4.39
2016	6.70	7.99	104.80	16.09	8.63	928.01	7.56	4.79
2017	7.23	7.70	169.25	21.32	9.70	1010.13	8.81	5.52
2018	7.74	7.42	267.41	32.44	10.84	1096.74	10.21	6.34
2019	8.24	7.16	425.19	36.33	12.06	1188.14	11.80	7.26
2020	8.75	6.91	693.06	40.69	13.37	1276.29	13.61	8.29



Figure 5.1: Item wise E-waste Projection of Surajpur District

					8.).			
Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
2011	23251	10986	649	206	66	24826	99	108
2012	30615	9189	921	331	136	27064	183	118
2013	36468	10577	1372	483	159	29383	221	133
2014	39521	9609	2209	1206	183	31788	262	149
2015	43540	8770	3712	2460	206	34281	307	166
2016	47262	8506	6347	2915	231	36866	355	173
2017	50775	8170	10251	3863	256	39546	408	191
2018	54138	7849	16196	5877	282	42324	465	211
2019	57396	7541	25752	6582	309	45205	527	232
2020	60581	7247	41975	7372	337	46476	595	254

Table 5.14: E-waste Inventory of Surguja District (in numbers)

Table 5.15: E-waste Inventory of Surguja District (in Tons)

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
2011	3.49	10.99	13.58	1.44	3.64	767.51	3.46	5.91
2012	4.59	9.19	19.28	2.32	7.49	836.67	6.39	6.48
2013	5.47	10.58	28.73	3.38	8.75	908.38	7.74	7.30
2014	5.93	9.61	46.26	8.44	10.04	982.72	9.18	8.18
2015	6.53	8.77	77.72	17.22	11.36	1059.80	10.74	9.11
2016	7.09	8.51	132.89	20.41	12.70	1139.71	12.43	9.52
2017	7.62	8.17	214.62	27.04	14.09	1222.56	14.27	10.53
2018	8.12	7.85	339.10	41.14	15.52	1308.45	16.27	11.61
2019	8.61	7.54	539.17	46.07	16.99	1397.50	18.44	12.76
2020	9.09	7.25	878.86	51.60	18.51	1436.79	20.81	13.99



Figure 5.2: Item wise E-waste Projection of Surguja District

	-		waste miter	nory or j	aonpar Di	iner (m	mannoeroj	
	Cellular	Fixed Line			Washing			Air
Year	Phone	Telephone	Computer	Printer	Machine	TV	Refrigerator	Conditioner
2011	23468	11184	461	146	26	20286	39	45
2012	30776	9314	655	236	93	22533	111	48
2013	36520	10676	975	343	111	24902	136	57
2014	40053	9659	1570	857	129	27402	163	68
2015	43992	8783	2638	1748	148	30045	194	81
2016	47621	8621	4511	2072	169	32845	230	91
2017	51033	8255	7285	2745	191	35816	270	107
2018	54294	7908	11510	4176	215	38977	317	125
2019	57454	7579	18301	4677	241	42345	371	146
2020	60551	7268	29830	5239	270	45827	434	170

Table 5.16: E-waste Inventory of Jashpur District (in numbers)

		Fixed			Washing			Air
Year	Phone	Telephone	Computer	Printer	Machine	TV	Refrigerator	Conditioner
2011	3.52	11.18	9.65	1.02	1.42	627.13	1.35	2.46
2012	4.62	9.31	13.70	1.65	5.13	696.61	3.87	2.62
2013	5.48	10.68	20.42	2.40	6.09	769.84	4.75	3.15
2014	6.01	9.66	32.87	6.00	7.10	847.12	5.71	3.76
2015	6.60	8.78	55.23	12.24	8.16	928.84	6.80	4.47
2016	7.14	8.62	94.44	14.50	9.29	1015.39	8.04	4.98
2017	7.65	8.25	152.53	19.22	10.50	1107.26	9.46	5.86
2018	8.14	7.91	240.99	29.23	11.82	1204.96	11.10	6.86
2019	8.62	7.58	383.18	32.74	13.25	1309.09	12.99	8.01
2020	9.08	7.27	624.58	36.67	14.82	1416.73	15.20	9.33

Table 5.17: E-waste Inventory of Jashpur District (in Tons)



Figure 5.3: Item wise E-waste Projection of Jashpur District

	10	DIC 5.10 L-w	aste mvente	ory or Da	nampui D	isuici (i	ii iiuiiibeisj	
		Fixed						
	Cellular	Line			Washing			Air
Year	Phone	Telephone	Computer	Printer	Machine	TV	Refrigerator	Conditioner
2011	19862	9334	360	114	8	14763	11	13
2012	26232	7828	512	184	10	16640	15	14
2013	31350	9036	762	268	14	18677	22	18
2014	34354	8233	1227	670	19	20904	31	25
2015	38013	7539	2062	1367	26	23356	44	33
2016	41460	7394	3526	1620	35	26075	62	41
2017	44774	7133	5695	2146	47	29117	86	53
2018	48015	6885	8998	3265	62	32552	119	70
2019	51226	6650	14307	3657	82	36467	163	92
2020	54446	6427	23320	4095	108	40602	222	119

Table 5.18 E-waste Inventory of Balrampur District (in numbers)

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
2011	2.98	9.33	7.54	0.80	0.41	456.41	0.39	0.73
2012	3.93	7.83	10.71	1.29	0.53	514.42	0.52	0.76
2013	4.70	9.04	15.96	1.88	0.75	577.41	0.76	1.02
2014	5.15	8.23	25.70	4.69	1.04	646.26	1.09	1.35
2015	5.70	7.54	43.18	9.57	1.41	722.04	1.54	1.79
2016	6.22	7.39	73.83	11.34	1.91	806.10	2.17	2.23
2017	6.72	7.13	119.24	15.02	2.56	900.16	3.01	2.94
2018	7.20	6.88	188.40	22.85	3.40	1006.36	4.15	3.85
2019	7.68	6.65	299.55	25.60	4.50	1127.37	5.69	5.03
2020	8.17	6.43	488.26	28.67	5.92	1255.20	7.75	6.57





Figure 5.3: Item wise E-waste Projection of Balrampur District

				2	2	· ·		
Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
2011	18358	8782	609	193	136	29327	203	216
2012	24017	7301	865	311	192	30997	282	221
2013	28420	8351	1289	453	220	32690	335	240
2014	30988	7538	2076	1133	247	34407	390	261
2015	33916	6835	3488	2312	273	36151	449	281
2016	36568	6670	5964	2739	300	37923	510	283
2017	39015	6364	9632	3629	326	39724	574	303
2018	41305	6073	15218	5522	352	41556	642	324
2019	43473	5795	24197	6184	378	43420	713	345
2020	45544	5529	39440	6926	403	44906	788	366

Table 5.20 E-waste Inventory of Koriya District (in numbers)

	Cellular	Fixed			Washing			Air
Year	Phone	Telephone	Computer	Printer	Machine	TV	Refrigerator	Conditioner
2011	2.75	8.78	12.76	1.35	7.49	906.66	7.12	11.90
2012	3.60	7.30	18.12	2.18	10.58	958.29	9.86	12.14
2013	4.26	8.35	27.00	3.17	12.08	1010.61	11.72	13.23
2014	4.65	7.54	43.47	7.93	13.56	1063.71	13.66	14.33
2015	5.09	6.83	73.02	16.18	15.03	1117.61	15.70	15.45
2016	5.49	6.67	124.87	19.17	16.48	1172.39	17.85	15.58
2017	5.85	6.36	201.66	25.41	17.92	1228.07	20.10	16.68
2018	6.20	6.07	318.63	38.65	19.35	1284.70	22.47	17.80
2019	6.52	5.79	506.62	43.29	20.77	1342.31	24.96	18.95
2020	6.83	5.53	825.79	48.48	22.18	1388.28	27.57	20.13





Figure 5.3: Item wise E-waste Projection of Koriya District

	Table 5.22: All E-waste Items Inventory of Surguja Division (in Tons)										
Year	Surajpur	Surguja	Jashpur	Balrampur	Koriya	Total					
2011	606.43	810.01	657.74	478.60	958.81	3511.59					
2012	680.34	892.42	737.52	539.99	1022.07	3872.35					
2013	759.79	980.33	822.80	611.52	1090.42	4264.86					
2014	849.75	1080.36	918.24	693.51	1168.84	4710.70					
2015	957.86	1201.25	1031.12	792.77	1264.92	5247.92					
2016	1084.56	1343.26	1162.41	911.19	1378.50	5879.93					
2017	1239.65	1518.89	1320.73	1056.78	1522.06	6658.12					
2018	1439.15	1748.05	1521.01	1243.10	1713.88	7665.19					
2019	1696.19	2047.09	1775.47	1482.08	1969.22	8970.05					
2020	2060.96	2436.89	2133.69	1806.97	2344.79	10783.29					



Figure 5.6: District wise Total E-waste Inventory Projection



Figure 5.7: Total E-waste Inventory Projection in Surguja Division from 2011 to 2020

The results of E-waste inventory estimates in (Tons) for Raigarh division is given in **Table 5.22**. Major inferences, which can be drawn from E-waste inventory results, are given below.

- 1. Inventory estimates in Surguja division indicate that E-waste generation ranges from **3511.59** tons in 2011 to **10783.29** tons in 2020.
- In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 89% of the total inventory followed by Computers (6%), Printer (1%), Washing machine (1%), Refrigerator (1%), Fixed Line Phone (1%), AC (1%) & Cellular Phone)%.
- 3. In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (61%), computer will constitute about 34% of the total inventory followed by Printer (2%), Refrigerator (1%), Washing machine (1%), Air conditioner (1%), Cellular phone (0%), & Fixed Line Phone (0%).



Figure 5.8: Item-wise E-waste in Percent for Surguja Division in 2015



Figure 5.9: Item-wise E-waste in Percent for Surguja Division in 2020

5.5 E-waste Processing in Surguja Division

There are various processes involved for dismantling, recycling / reuse of E-waste in Surguja division. These processes for different types of electronic items are given in **Table 5.23**. The photo-

documentation of some of these processes observed. An analysis of the different processes observed to recover metals indicates that no chemical process is occurring in study area. Only physical processes, which prepare raw material for recycling industry is observed in the study area. Iron recovered from E-waste is recycled through induction arc furnace route in the study area.

Sr.				Process Statu	. S	
No.	Process name	Surajpur	Surguja	Jashpur	Balrampur	Koriya
1	IC's Extraction from PCB	No	No	No	No	No
2	Surface Heating of PCB and Extraction of components	No	No	No	No	No
3	Dissembling of Monitor & TV and extraction of components	Yes	Yes	Yes	Yes	Yes
4	Yoke core and Copper	No	No	No	No	No
5	Metallic Core of Transformer and Copper	Yes	Yes	Yes	Yes	Yes
6	Rare Earth Core of Transformer and Copper	No	No	No	No	No
7	Rare Earth Core of Static Transformer	No	No	No	No	No
8	Wire PVC and Copper	Yes	Yes	Yes	Yes	Yes
9	Plastic Shredder	No	No	No	No	No
10	Dismantling of Refrigerator and Compressor	Yes	Yes	Yes	Yes	Yes
11	Gold Extractions from Pins and Comb	No	No	No	No	No
12	Acid Bath for PCB	No	No	No	No	No
13	Regunning CRT's	No	No	No	No	No
14	Glass Recovery from CRT	No	No	No	No	No
15	Gold Recovery	No	No	No	No	No

Table 5.23: E-waste dismantling process occurring in the study area

Trade Economics

Trade economics has been studied in terms of various processes, which occur along the trade value chain. Each stakeholder in the processes studied is linked to the other and the trade between the two

takes place based on value added. The fundamental parameters governing this trade are same as that of any other trade. These parameters are described below.

- 1. Input cost
- 2. Operating Margin
- 3. Selling price

Input costs have been classified into the following costs.

- 1. Raw material cost
- 2. Labour cost

Selling price is the price at which the products are sold. The difference between the selling price and the input costs gives the operating margin. Operating margin is an indicator of the profit and has been computed in terms of operating margin per kg of raw material.

The entire trade economics of each of the processes is summarized in **Table 5.24**. **Table 5.24** does not include capital, depreciation, taxation and transportation cost. Labour refers to workers involved in e-waste extraction industry only and only 300 working days in a year.

Item	Rate / piece	Input Cost per Kg.	Labour Cost per Kg.	Output Price per Kg.	Profitability	%
TV	600	20.00	0.39	20.83	0.44	2.18
Ref	1000	22.22	0.39	34.07	11.46	50.69
WM	750	18.75	0.39	32.17	13.03	68.06
AC	3000	54.55	0.39	73.33	18.40	33.49
PC	1100	35.48	0.39	42.85	6.98	19.45
Mobile	38	38.00	0.39	62.59	24.20	63.04

Table 5.24: Trade economics of Surguja Division E-waste market

Some major observations from **Table 5.24** are as follows:

- 1. Operating margin for Television waste per kilogram is Rs. 0.44
- 2. Operating margin for waste refrigerator is Rs. 11.46 per kilogram
- 3. For that of Washing Machine is Rs. 13.03 per kilogram
- 4. For that of Air Conditioners is Rs. 18.40 per kilogram
- 5. For scrap old Personal Computer is Rs. 6.98 per kg and
- 6. For waste cellular phones is Rs. 24.20 per kg
- 7. The operating margin ranges from Rs. 0.44 to Rs. 24.20 per kilogram. Scrap of Mobile / cellular phones gives the maximum operating margin of Rs. 24.20 while scrap from television gives the minimum profit of Rs. 0.44 per kilogram. This indicates that informal sector if brought into formal sector considering taxation involved will only dismantle / recycle cellular phones followed by ACs and WMs to some extent. Therefore, there is a need to formulate financial instrument for making dismantling / recycling of white goods viable.

5.6 Market Risks

Market risks based on the assessment of demand, supply, collection and transportation primarily address availability (quantity) of raw material as E-waste. These risks have been assessed and described below based on duration (short term, long term) along with their intensities.

1. Risks of availability of raw material (E-waste)

- 2. Risk associated with collection
- 3. Risk associated with transportation

Risk profiling giving the intensities as part of market assessment has been highlighted in Table 5.25 given below.

	Table 5.25. Market Kis	SK Matilx		
Risks/ intensities		High	Medium	Low
Risks of availability	Short term			
of raw material	Long term			
Risk associated with	Short term			
collection	Long term			
Risk associated with	Short term			
transportation	Long term			
-	Long term			

Table	5.25:	Market	Risk	Matrix
-------	-------	--------	------	--------

The intensities have been fixed as per following analysis.

- 1. Risks of availability of raw material has been assessed as medium since enough Ewaste potential exists in Surguja division to be processed both in the short term and long term especially after 2014. This will depend on the implementation of regulatory regime, which will enable the E-waste generators to send the waste to dismantling / recycling facility.
- 2. Risk associated with collection is expected to be high in the short term as there is no formal collection mechanism in place in the study area. In this situation, the recycling facility will face the risk of collecting E-waste from the source, which could be geographically dispersed. In the long term this risks expected to be medium as collection and transportation mechanism is expected to be institutionalized. In the short term, the recycling facility is expected to be making their own arrangements for collection from vendors.
- 3 Risk associated with transportation is expected to be low in both short and long term as there is transportation mechanism in place both at the local and national level to carry hazardous waste. Since some E-waste is already being transported outside study area, therefore transportation risk is expected to be of low intensity

5.7 Conclusions

Market risks matrix highlight the availability of raw material, its collection and transportation as risks of high & medium intensities. Collection mechanism directly impacts the availability of raw material. Therefore, there is a need for both strict implementations of regulations as well as financial instrument for diverting E-waste inventory in to the formal sector.

Chapter 6: Conclusions & Recommendations

Major conclusions & recommendations, which have been arrived after assessment of E-waste regulations, E-waste material flow chain and inventory estimates are given below.

- Implementation of E-waste regulation is a major challenge
- There is no organized mechanism for collection, transportation and disposal of E-Waste in Surguja division.
- No mechanism exists in the state to monitor and track its inventory, collection, transportation and disposal.
- Currently, a majority of producers use call centre as well as dealer's network for collection of E-waste.
- Electronic items go to mechanic shops from households for repairing, and mechanic replace damaged / defunct parts/components from it and then they sold it to scrap dealers.
- Major conclusions, which can be derived, include growing market of EEE in Surguja division. This growth may lead to increasing E-waste generation, which may further lead to higher pollution loads, health impacts and loss of recoverable items.
- Mechanics sell E-waste to scrap dealer by weight / Pcs. mainly of ICT items (IT as per Schedule 1); TV circuit Rs. 15-45/kg; Compressor Rs. 300-400/Pcs.; Washing Machine Motor Rs. 200/Pcs.; Copper Rs. 200-350/kg; DVD Circuit Rs. 20-25/kg; Mobile kit Rs. 1000-2000/kg; SMPS Rs. 50/Pcs, Mother Board Rs. 90/Pcs.; Hard disk Rs. 120/Pcs.; CD Writer Rs. 35-40/Pcs.
- Scrap vendors sold E-waste to scrap dealer by weight at Rs. 150-250 per kg
- Scrap vendors sold damage mobile phone to scrap dealer as individual piece at Rs. 30-50 per piece
- Scrap dealer comes from Delhi yearly twice/thrice for collecting of E-waste.
- Since no mechanism exist for tracking purchase of EEE by bulk consumers and producers are not required to declare quantity of EEE placed in the market since 2012, E-waste inventory assessment has to rely on available historical market research data as well as data from collectors, dismantlers / recyclers.
- Data matrix versus methodology used for E-waste inventory assessment indicates "Market Supply" method and "Carnegie Mellon" method can be applied for E-waste inventory assessment in five districts of Surguja Division in Chhattisgarh. However, a combination of Carnegie Mellon method & tracer tracking has been selected for inventory assessment since it covers all the aspects of material flow chain.
- Analysis shows that Computers have the highest installed base followed by TV, Cellphones, printers, fixed line telephone, refrigerators, washing machines and Air Conditioners. In Surguja Computers, cellular phone, TV, fixed line phone washing machine and refrigerator has the highest installed base followed by Koriya, Jashpur, Surajpur and Balrampur of Surguja division.
- Inventory estimates in Surguja division indicate that E-waste generation ranges from **3511.59** tons in 2011 to **10783.29** tons in 2020.
- In 2015, E-waste in metric tons from TV (CRT/LCD/LED) constitutes 89% of the total inventory followed by Computers (6%), Printer (1%), Washing machine (1%), Refrigerator (1%), Fixed Line Phone (1%), AC (1%) & Cellular Phone)%.
- In 2020, it is expected that E-waste from TV (CRT/LCD/LED) (63%), computer will constitute about 33% of the total inventory followed by Printer (2%), Refrigerator (1%),

Washing machine (1%), Air conditioner (1%), Cellular phone (0%), & Fixed Line Phone (0%).

- An analysis of the different processes observed to recover metals indicates that no chemical process is occurring in study area. Only physical processes, which prepare raw material for recycling industry is observed in the study area. Iron recovered from E-waste is recycled through induction arc furnace route in the study area.
- Some major observations are that Operating margin for Television waste per kilogram is Rs. 0.44. Operating margin for waste refrigerator is Rs. 11.46 per kilogram. For that of Washing Machine is Rs. 13.03 per kilogram. For that of Air Conditioners is Rs. 18.40 per kilogram. For scrap old Personal Computer is Rs. 6.98 per kg and For waste cellular phones is Rs. 24.20 per kg. The operating margin ranges from Rs. 0.44 to Rs. 24.20 per kilogram. Scrap of Mobile / cellular phones gives the maximum operating margin of Rs. 24.20 while scrap from television gives the minimum profit of Rs. 0.44 per kilogram. This indicates that informal sector if brought into formal sector considering taxation involved will only dismantle / recycle cellular phones followed by ACs and WMs to some extent. Therefore, there is a need to formulate financial instrument for making dismantling / recycling of white goods viable.
- Market risks matrix highlight the availability of raw material, its collection and transportation as risks of high & medium intensities. Collection mechanism directly impacts the availability of raw material. Therefore, there is a need for both strict implementations of regulations as well as financial instrument for diverting E-waste inventory in to the formal sector.

Sr.		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
	Television	LCD	BPL	Address Not Available Customer Care Number 1800 – 425 – 1800, 1800 – 425 – 2355
			Daenyx	A-30 & 31, Hosiery Complex, Phase II Extn. Noida - 201305 Uttar Pradesh (INDIA) Ph. No. +91-120- 3042721
			Haier	B-1/A-14, Mohan Co-operative Industrial Estate, Mathura Road, New Delhi-110044 Ph. No. 011-39496000/30674000 Toll Free No. 1800-200-9999 (24X7)
		Branch Offices	Hitachi	Hitachi India Pvt. Ltd. Units 802A and 802B, Tower 2, 8th Floor, Konnectus Building, Bhavbhuti Marg, Near Minto Bridge, Connaught Place, New Delhi – 110001 Ph. No. +91 (11) 30605252
				Hitachi India Pvt. Ltd Bangalore Branch Office Unit 103, 1st Floor, Shah Sultan Complex, No 17, Cunningham Road, Bangalore 560 052, India Ph. No. +91 (80) 2238 6986 / 987 / 984
				Hitachi India Pvt. Ltd. Mumbai Branch Office 508, Ascot Center, Next to Hilton hotel, Sahar Road, Andheri East, Mumbai 400099, India Ph. No. +91-22-28215625
				Hitachi India Pvt. Ltd. Chennai Branch Office 206, Apeejay House, No.12, Haddows Road, Nungambakkam, Chennai 600 006, India Ph. No. +91 (44) 2821 3108 / 3109
				Hitachi Ltd. Infrastructure Systems Company Mumbai Branch Office 707, Trade Centre, Opp. to MTNL Bldg Bandra-Kurla Complex,

Detailed Inventory of Producers- Annexure 1

Sr		Product		Address / Contact Details
No.	Product Name	Sub	Brand	
		Category		
				Bandra (East) Mumbai $400\ 098$
				Ph. No. +91+22-2650-0031
				Amed JB Friction Private
		Crearb		A 12 Site IV Industrial Area
		Companias		Sabibabad 201010 Dist
		Companies		Ghaziabad (UP) India
				Ph. No. 0120 $4539600 - 700$
				Aloka Trivitron Medical
				Technologies Pvt. Ltd.
				Plot # A5, Sipcot Industrial Park,
				Irrungattukottai Sri Perambudur
				Taluk, Kanchipuram – 602117,
				TAMIL NADU
				Ph. No. 044-37183750
				Flyjac Logistics Pvt. Ltd.
				B – 1, 205, 2nd Fl, Boomerang,
				Chandivali Farm Road, Near
				Powai Andheri East, Mumbai 400
				0/2 DL NJ 022 2250 5000
				Hitachi Chemical India
				Private Limited
				708 7th Floor Time Tower M G
				Road. Gurgaon $-122\ 002\ Ph.$
				No. 0124 - 4246498
				Hitachi Consulting Software
				Services India Private Limited
				Plot No 9, Gachibowli,
				Hyderabad – 500032, IndiaPh.
				No. 040 - 4034 3000
				Hitachi Consulting India
				Private Limited
				Incubation Space A2, Magarpatta
				City SEZ, Hadapsar Road, Pune
				411013 Dh No 020 (511 1001/2
				$\begin{array}{c} \text{Ph. No. } 020 = 0311 \ 1001/2 \\ \text{Hitachi Data Systems India} \end{array}$
				Pyt I td
				#278/23 Trident Towers 3rd
				floor, 10th Main, T. Mariappa
				Road, Javnagar 2nd Block,
				Bangalore 560 011, India
				Ph. No. +91 (80) 2657 6295
				Hitachi Hi-Rel Power
				Electronics Pvt. Ltd.B-52, 5th
				Floor, "Corporate House", Near
				Judges Bungalow, Bodakdev,

Sr		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
		81		Ahmedabad – 380 054 Gujarat –
				India
				Ph. No. +91 79 – 4900 2300
				Hitachi High Technologies
				(Singapore) Pte. Ltd.
				#602, 6th floor,
				Eros Corporate Towers, Nehru
				Place,
				New Delhi 110 019, India
				Ph. No. +91 (11) 4651 8450
				Hitachi Home and Life
				Solutions (India) Ltd.
				10th floor, Abhijeet,
				Mithakhali Six Road,
				Ahmedabad 380 006 Gujarat,
-				Ph. No. +91 (79) 3041 4800
				Hitachi Koki India Ltd.
				Plot No. 9A, 1st Phase, Peenya
				1600 Industrial Area, Dangalore 560
				Db No ± 01 (80) 4117 0777
				Hitachi Lift India But Ltd
				Upits 304-306 3rd Floor ABW
				Elegance Tower Jasola District
				Centre New Delbi 110 025 India
				Ph No ± 91 (11) 4060 5290
				Hitachi Maxell, Ltd. Chennai
				Liaison Office
				DBS Office Business Center
				Room No. 103, 31A Cathedral
				Garden Road, Near Palmgrove
				Hotel, Nungambakkam, Chennai,
				India
				Ph. No. +91 (44) 4264 9495
				Hitachi Maxell, Ltd. Mumbai
				Liaison Office
				No.401, 4th Floor "BANARASI
				HERITAGE" Mind Space, Link
				Road, Malad (West), Mumbai,
				India
-				Ph. No. +91 (22) 3212 8193
				Hitachi Metals (India) Pvt.
				Ltd.
				Plot No. 94 & 95, Sector 8, IMT
				Manesar, Gurgaon - 122050 (HR)
				Ph. No. +91 (124) 4124800 /
				4812300 / 4812400
1	1	1		Finachi Metgias (India) Pvt.

S.		Product		Address / Contact Details
Sr. No	Product Name	Sub	Brand	
110.		Category		
				Ltd.
				Plot No. 94 & 95, Sector 8, IMT
				Manesar, Gurgaon - 122050 (HR)
				Ph. No. +91 (124) 4124800 /
				4812300 / 4812400
				Hitachi NeST Control Systems
				Pvt. Ltd.
				No.103, First Floor, Shah Sultan
				Complex No.17, Cunningnam
				Koad, Bangalore -560 052
				Narnataka. India \mathbf{Dh} No. 020, 6720,8700
				Ph. No. 080 - 6789 8700
				Hitachi Plant Technologies
				DDC 101 102 and 102 Einst
				Eleor Block No. 44, DI E
				Corporate Park MC Road Phase
				III DI E City Curgoon Harvana
				$Ph N_0 + 91 + 12 - 4455 - 2344$
				Hitachi Transport System
				India Pvt Ltd
				116 & 117 1st floor Rectangle -
				1. D-4. District Centre, Saket
				New Delhi 110 017. India
				Ph. No. +91 (11) 4052 5200
				Tata Hitachi Construction
				Machinery Co. Ltd.
				Jubilee Building, 44 Museum
				Road, Bangalore – 560 025
				Ph. No. 080 – 6695 3301 ~ 03
				Toyo Machinery & Metal Co.,
				Ltd. (India Liason Office)
				Units 304-306, 3rd Floor, ABW
				Elegance Tower, Jasola District
				Centre, New Delhi-110025
				Ph. No. 011 – 4060 5252
				LG Electronics India Pvt. Ltd,
				Plot No. 51, Udyog Vihar,
			LG	Surajpur Kasna Road,
				Greater Noida: 201306
				Uttar Pradesh
				SGV Industries
				Plot No.41 & 42,
		Manufacturing		Sector-6A, Sidcul Indl Area,
		Facilities	Markson	Haridwar (Uttrakhand)
				$Pin \ Code - 249401$
				FII. 01334-239002/03/04
				Fax INO. 01334- 239061

Sr		Product		Address / Contact Details
No	Product Name	Sub	Brand	
140.		Category		
				Email Id -
				store@sgvindustries.com
				Contact - Mr. Sunil Jain (Vice
				President) Mob. 9212669498
				Mr. Rajender Sharma (Facility
				Incharge) Mob. 9212669503
				SNR Industries
				Plot No.6A & 6B,
				Gabriel Road, Sector-2,
				Parwanoo, (H.P.)
				Pin Code - 173220
				Ph. 01792- 232711
				Contact- Mr. Alok Kumar
				(Facility Incharge) Mob.
				9212669513
				SNR Electronics Ltd.
				Plot No.2, HPISDC Indl. Area,
				Baddi, Tehsil Nalagarh,
				Dist. Solan,(H.P.).
				Pin Code - 173205
				Ph.01795- 244703
				Fax - 01795- 244703
				Contact - Mr. Alok Kumar
				(Facility Incharge) Mob.
				9212669513
				PLOT No. 378, F.I.E,
				PATPARGANJ, DEHLI -
		Head Office		110092
				Ph. No. +91-11-43086501-502,
				22157662-63
				43B, Okhla Industrial Estate,
		Corporate 🛷		New Delhi - 110020. India.
		Head Office	Moser Baer	Tel +91 11 40594444, 91 11
				26911570 - 74
				Fax +91 11 41635211, 26911860
				Chennai
				Moser Baer India Ltd.
		D. LOC		81, IInd Floor
		Branch Offices		Valluvarkottam High Road
				Nungambakkam,
				Chennai - 600 034
				1el: Ph.+91-44-42664358-59
				M & ES Office
				Moser Baer India Ltd.
				16/-169, 11nd Floor, Anna Salai,
				Saidapet, Chennai - 600 015
				1ei: +91-44-45050041-42-43
1		1	1	
Sr		Product		Address / Contact Details
-----	--------------	-----------------	-------	---
No.	Product Name	Sub Category	Brand	
				Chennai Project Office
				Moser Baer Solar Limited
				OZ-2,OZ-3,OZ-4
				Hi-TECH-SEZ, Sipcot Industrial
				Part-3
				Oragadam, Sriperampudur Taluk
				Kancheepuram District
				Tamil Nadu - 602105
				Mumbai
				Moser Baer Entertainment Ltd
				Musti Foundation Building
				A Wing 1st Floor
				141 A Model Town Willage
				Ambivali
				Allibivali, Debind Kebilehen Dhimebhei
				Archani Unarital
				Ambani Hospital,
				Four Bungalows, Andheri-West,
				Mumbai - 400053
				Domestic Marketing & CE
				Moser Baer India Ltd.
				510- Maker Chambers V
				5th Floor, Nariman Point
				Mumba1-400 021
				Telefax: +91-22-66157930-31
				Bangalore
				Moser Baer India Ltd.
				Raheja Plaza, Unit No.103
				17 Commissariat Road
				Bangalore - 560025
				Telefax : 080-41649712
				Kolkata
				Moserbaer Entertainment
				Limited
				1st Floor, 13 FLT. LT.
				Tapan Chowdhury Avenue,
				Mudiali,
				Kolkata - 700026
				Tel: +91-33-65419945-54
				Delhi
				235, Okhla Industrial Estate
				Phase III
				New Delhi -110 020
				Tel: +91-11-47624100
				Pune
				Moser Baer Photo Voltaic Ltd
				311. IIIrd Floor
				Connaught Place
				28 Bund Garden Road
				Pune - 411 001

S.		Product		Address / Contact Details
No	Product Name	Sub	Brand	
110.		Category		
				USA Distributor
				Media Masters LLC
				#440, 2601 S. Minnesota
		Representative		Ave., Ste 105 Sloux Falls,
		& Distributor		SD 5/105-4/50 USA
				Phone: +1-(888)-243-4465
				Fax: +1-(87/) 835-2834
				E-mail: sales@mediamastersdisc
				.com
				BOM & M& ES
		Manufacturing		66, Udyog Vihar,
		Facilities		Greater Noida (U.P.) - 201 306
				Tel: 0120-4386000
				Solid State Media
				A-164, Sector - 80,
				Phase - II, Noida (UP)
				Tel: 0120-430/000
				MBPV & MB Solar
				66B, SEZ Udyog Vihar,
				Greater Noida $(U.P.) - 201306$
				1el: 0120-4658000
				BOM & SSM
				A-104, Sector - 80 , Discrete H. Nickler (HD) - 201 205
				Tal. 0120 4307000
				DV Tashnalasias India Ltd
				r v recimologies mula Ltd.
				Hi Techsez Sipcot Industrial
				Park 3 Oragodom Sriporamoudur
				Taluk
				Kancheepuram District
				Tamilnadu 602105
				MIRC Electropics Ltd
				Opida House G-1 MIDC
				Mahakali Caves Road Andheri
				(F) Mumbai - 400 093
		Corporate	Onida	Tel: $022 = 28200435 / 66975777$
		Address	Omda	Email: response@onida.com
				For Institutional Sales:
				corporate sales@onida.com
				For Service: service@onida.com
				Ph. No. 1800 108 1333 / 1860
			Panasonic	425 1860 / 1800 103 1333
				Samsung India Electronics
				6th. 7th & 8th Floors, Ifci Tower
			Samsung	61. Nehru Place.
				New Delhi.
				Tel: 011 3030 8282

Sr.		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
				Samsung Corporation
				Room No 355, Hotel Taj Palace,
				Chanakyapuri
				New Delhi, DL
				011 2688 9817
				Philips Electronics India
				Limited
			51.11	9th Floor, DLF 9-B,
			Philips	DLF Cyber City,
				Sector 25, DLF Phase - 3,
				Gurgaon - 122002 , India
				1e1: +91 - 124 - 4606000
				Philips Electronics India
				/, Justice Chandra Madhab Koad,
				Kolkata - 700020 , India
				Dhiling Floatronics India
				Limited
				The Estate 4th floor (North
				Wing) (Next to Manipal Centre)
				121 Dickenson Road
				Bangalore - 560042 India
				Tel \cdot +91 - 80 - 66929898
				Philips Electronics India Limited
				MFAR Manyata Tech Park.
				Nagavara. Bangalore - 560045.
				India
				Tel : +91 - 80 - 41890000
				Philips Electronics India
				Limited
				Temple Towers, 5th Floor,
				Old No : 476, New No : 672,
				Anna Salai, Nandanam,
				Chennai - 600035, India
				Tel : +91 - 44 - 66501000
				Philips Electronics India
				Limited
				6-3-1109/1/P/103, 3rd Floor,
				Jewel Pawani Towers,
				Raj Bhavan Road, Somajiguda,
				Hyderabad - 500082, India
L				Tel: +91 - 40 - 66467676
				Philips Electronics India
				Limited
				Technopolis Knowledge Park,
				Mahakalı Caves Road,
1		1		Unakala, Andheri (E),

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
No.	I foduce i vanic	Category	Diand	
				Mumbai - 400093, India
				Tel: +91 - 22 - 66912000
				D-13/4, Okhla Industrial Area,
			Salora	Phase-II New Delhi $-$ 110 020,
				India Phone: $+91_{-}11_{-}49207100 / 101$
				Adheshwar Arcade Ist Floor
				Andheri Kurla Road.
			Sansui	Andheri East,
				Mumbai: 400 093
				No.62, 3rd floor, 1st main,
				3rd cross, 2nd stage,
				Yeshwantpur Industrial Area,
				Bangalore – 560022
				Plot No. 296,
				Udyog Vihar Phase -2,
				Gurgaon – 122015
				Sharp India Limited
				Gat No. 686/4,
			Sharp	Koregaon Bhima, Tal: Shirur,
			1	Dist: Pune Pin $= 412216$
				666520
				Sony India Registered Office
				A - 31, Mohan Co-operative
			Sam	Industrial Estate, Mathura Road
			Sony	New Delhi - 110044
				Ph No : 66006600
				Fax No : 26959141
				Sony India Branch Offices
				City Center, 3rd Floor,
				Plot A-5/1, Unit-IX,
				Sachivalaya Marg,
				Bhubaneswar
				PHI = / 51022
				Building Opposite Rom Service
				C S Road Cuwabati
				B = 0.0361 - 2462858 - 2462859
				White House 2nd Floor
				Block 2D 119 Park Street
				Kolkata - 700016
				Ph No : 033-40071751/52/53/
				54/55
				Fax No : 033 - 40071763
				4th Floor, Block-B,
				Sai Corporate Park,
				Rukanpura, Bailey Road,

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
10.		Category		
				Patna - 800 014
				Phone No : 0612-3269866
				3rd Floor, Adarsh Mall, Plot No
				50, Industrial and Business Park,
				Phase-2, Chandigarh - 160002
				Ph No : 0172-66 555 55,
				Fax No : 0172-66 555 66
				Unit # 405 - 407, 4th Floor,
				Copia Corporate Suites.
				Jasola District Centre.
				New Delhi $-$ 110010
				Contact : 1800-103-7799 (Toll
				Eree) Fax No : 011-42458844
				SCO 38-39 G 1st Floor
				BRS Nagar Ludhiana -141 012
				Ph No : 0161-463 2222
				24 Advocate Chambers
				2nd Floor RDC Rai Nagar
				Ghaziahad Uttar Pradesh
				Ph No : $0120 - 4940150$
				$F_{ax} N_0 : 0120 - 4940180$
				C 7 Sultan House 1st floor
				Sawai Jai Singh Highway Bani
				Park Jappur 302016
				$\frac{1}{2} \text{ ark, Japar - 302010} \\ \frac{1}{2} \text{ Dh No \cdot 0141 4041806 4041807} \\ \frac{1}{2} \text{ Characteristics} = 100000000000000000000000000000000000$
				FII 100.0141-4041890, 4041897 $Fax No : 0141 4041804$
				Ath Eleon Elders Corporate
				Chambers Wilhuti Khand
				Opposite Visan Mandi Bhawan
				Dhase 1 Comti Nagar
				Lucknow Dh No : 0522
				A041221/22/22/24/25
				4041231/32/33/34/33
				Diat No. 82 Sector 20
				Flot No. 65, Sector 29,
				Laguara 122002
				$\frac{11}{22002}$
				FII 100.0124 - 4090200, $F_{ave} 0124 - 4806220$
				Nax. 0124 - 4690220
				INO.700, 100 Feet Main Koad
				HAL, IIId Stage, 12th Main,
				Dh Ni - 080 (((05555
				Pn No : 080-66605555
				fax INO: 080-25294987
				$\frac{\#2-1-2}{0(2)}, \text{ First Floor,}$
				Hill Groove, Chilimbi Hills, 2nd
				Cross, Mangalore - 5/5006
				2nd Floor, Hameedia Centre,
1				No 14/43, Haddows Road,

Sr		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
				Nungambakkam,
				Chennai - 600006
				Ph No : 044 - 28242571
				Fax No : 044-28234853
				2nd Floor, Muscat Tower
				S.A.Road, Kadavanthara
				Cochin - 682 020
				Ph No : 0484-2318616, 2318618,
				2318619, Fax No : 0484-2318629
				III Floor, 1025/1 Skanda Square,
				Avinashi Road
				Coimbatore - 641018
				Ph No : 0422-4334455
				Fax No : 0422-4334456
				6-3-676/A/2/3/4,
				Punjagutta X Roads, Punjagutta
				Hyderabad - 500082
				Ph No : 040-66115000
				Fax No : 040-23400014
				Door No. 59-10-1/A,
				Matha Towers, 4th Floor,
				King Road, Patamatalanka,
				Vijayawada-520 010
				Mohans Arcade, 1st Floor, 4/-
				11-5, Dwarka Nagar
-				Vishakhapatnam - 530016
				101, Parth Complex, Ground
				HOOr, SWASTIK Cross Road
				Abmodahad 280000
				$\frac{1}{2} \frac{1}{2} \frac{1}$
				$\begin{array}{c} Pn \ N0: \ 079-20441040, \\ 26441041 \end{array}$
				$E_{0441041}$
				25/1 Ground Floor
				Vashwant Niwas Road
				Shirish Chamber
				Indore - 452003
				Ph No : 0731-4055762 4042013
				4042033
				2nd floor. Crimpage
				Corporation.
				Plot No. 57, Street No.17, MIDC
				Andheri East.
				Mumbai - 400093
				Ph No : 022-6128 8000
				Fax No : 28312935
				Office No.2, 3rd floor
				G.O.Square, Aundh-Hinjewadi

Sr		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
				Road, Near Mankar Square
				Wakad, Pune - 411057
				Ph No : 020-67917200
				Fax No : 020-6/91/299
				Office - 18 A, 04th Floor,
				Empress Mall, Rohind Roman Science Contro
				Sir Bezonii Mehta Marg
				Nacour $= 440018$
				Ph No : 0712-6471533-557
				TCL India Holding Pvt. Ltd.
			TO	Sco 254, 2nd Floor, Sector 44 C
			ICL	Chandigarh, CH
				Tel: 0172 464 6211
				TCL India Holding Pvt. Ltd.
				B-8/3, Uppal Industrial Area,
				Uppal, Hyderabad, AP
				Tel: 040 2344 9350
				ICL India Holding Pvt. Ltd.
				Boad Bace Course Boad
				Indore MP
				Tel: 0731 400 3365
				TCL India Holding Pvt. Ltd.
				82, Phase 3, Okhla Industrial
				Estate, New Delhi, DL
				011 3082 3011
				Laxbro Manufacturing Company
			T-Series	W-53, MIDC Area, Bhosari Indl.
				Estate, PMC – 411026,
				3rd Floor Building No. 10 Tower
				- B. Phase - II
			Toshiba	DLF Cyber City,
				Gurgaon - 122 002,
				Haryana, India
				Board No. + 91-124-4996600
				TOSHIBA INDIA PVT. LTD.
				C&B Square Building , 6th Floor,
				Plot No 601, 127, Andheri Kurla
				Road, Chakla Andheri, (East),
				Tab + 01 22 61011500
				TOSHIBA INDIA PVT I TD
				284 Hothur Square, 2nd Floor
				100 Feet Road Indiranagar.
				Bangalore - 560038.

S.		Product		Address / Contact Details
No.	Product Name	Sub	Brand	
		Category		
				Karnataka, India
				1 el: + 91-80-25190800
				I osniba India Pvt. Ltd.,
				Business Communication Centre
				Chiramel Chambers, Kurisupally
				Koad, Ravipuram, Kochi-682 015 T_{1} + 01 494 2257107
				Tel: + 91-484-235/10/
				I osniba India Pvt. Ltd.,
				Plot No 1-4, Vatika Business
				center, 3rd Floor, NSL Icon,
				Koad No 12, Banjara Hills,
				Hyderadad-500034 T_1 + 01 40 44241452
-				Tel: + 91-40-44311152
				Toshiba India Pvt. Ltd.,
				219, Regus Centre, 3rd Floor,
				Altius Olympia Technology
				Park, Sideo Industrial Estate,
				Guindy, Chennai - 600052 , India
				$\frac{1}{1} \frac{1}{1} \frac{1}$
				14 Kmg Stopp, Auroprobed
				Paithan Pood
			Videocon	Chitograp Ta Daithan
				Dist Auroporchad 421 105
				(India)
				Corporate Office
				Fort House 2nd Floor
				221 Dr. DN Road Fort Mumbri-
				400.001(INDIA)
-				Corporate Office (Marketing
				Service & Support):
				296 Udvog Vihar Phase-II
				Gurgaon, Harvana, Phone No.:
				0124-3273091
				Westway Electronics Limited
				B-102, Phase – II, Noida –
			Weston	201305 (U.P)
				Phone: 0120 4543114
				Fax: 0120 4543115
				Westway Electronics Limited
				C-189, Naraina Industrial Area
				Phase-I
				New Delhi 110028
				Phone: 011 45035222
				Fax: 011 41411110
		LED	LG	Given Above
			Samsung	Given Above
			Panasonic	Given Above

S.		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
			Toshiba	Given Above
			Onida	Given Above
				Corporate office
				Global Brands Enterprise
				Solutions Pvt. Ltd.
			Akai	Plot No. 97, Sector-44, Gurgaon -
				122 002, INDIA
				Phone No: 0124-4305000, Fax
				No.: 0124-4305020
				Global Brands Enterprise
				Solutions Pvt. Ltd.
				Flat No. 31, 3rd Floor,
				Harihar Apartment, Vishnu Dev
				Path, East Boring Canal Road,
				Patna - 800 001.
			** •	Tel No: 0612 2524302
			Haier	Given Above
			Hitachi	Given Above
			Philips	Given Above
			Sony	Given Above
			T-series	Given Above
			Salora	Given Above
			Videocon	Given Above
		Plasma and HDTV	Hitachi	Given Above
			LG	Given Above
			Panasonic	Given Above
			Samsung	Given Above
			Sansui	Given Above
		Flat	BPL	Given Above
			Daenyx	Given Above
			Haier	Given Above
			LG	Given Above
				Next Retail India Limited,
				3rd Floor, Aadeshwar Arcade
				Above Loop Gallary,
			Next	Opp. Sangam Cinema,
				Andheri Kurla Road,
				Mumbai 400 102
				Phone: +91-7498218860
			Onida	Given Above
			Panasonic	Given Above
			Samsung	Given Above
			Philips	Given Above
			Salora	Given Above
			Sansui	Given Above
			Sharp	Given Above
			Sanyo	SANYO India Pvt. Ltd.,

Sr.		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
		Suregory		'Jubilee Building', 2nd Floor,
				45, Museum Road,
				Bangalore 560025, India,
				Tel: +91-80-43418200,
				Fax: +91-80-43418222
			TCL	Given Above
			T-Series	Given Above
				TEXLA ELETROVISION
				A-72, OKHLA INDUSTRIAL
			Texla	AREA, PHASE-II, New Delhi -
				110020, India
-				91-11-26384589/26387153
			Videocon	Given Above
			Weston	Given Above
		CTV	Daenyx	Given Above
			Haier	Given Above
-			LG	Given Above
			Markson	Given Above
-			Moser Baer	Given Above
			Panasonic	Given Above
				Next Retail India Limited,
				3rd Floor, Aadeshwar Arcade
			DT .	Above Loop Gallary,
			Next	Opp. Sangam Cinema,
				Andheri Kurla Koad,
				Mumbai $400\ 102$
			Dhilios	Given Above
			Filips Salora	Given Above
			TCI	Given Above
			T CL	Given Above
-			Videocon	Given Above
			Weston	Given Above
		Semi	weston	Given Above
	Washing Machine	Automatic	BPL	
				BELTEK INDIA LTD.
			Beltek	B-89 SEC-5 201301
				NOIDA - UTTAR PRADESH
			5	Phone No.:- 0091 95 1202421676
			Daenyx	Given Above
				PE Electronics Ltd.
				Corporate Centre, 5th Floor,
			Electrolux	Andheri Kurla Koad, Andheri
				(East), Multipal $= 400059$ Dhope No. $\pm 01.22.61171000$
				$\mathbf{Com} \mathbf{Equipmente} \mathbf{D} \mathbf{t} \mathbf{I} \mathbf{t} \mathbf{I}$
			Gem	S E No 103 Avanashi Road
			Jem	Arasur
1	1		1	1114041

Sr.		Product		Address / Contact Details
No.	Product Name	Sub	Brand	
		Category		
				Combatore $- 64140/$
				Ph. No. +91 422 2363800
				Biroishanagar Eastern Express
				Hiofshanagar, Eastern Express
				Vikhroli Mumbri 400079
			Godrej	INDIA
				Tel: +91-22-2518 8010 / 2518
				8020 / 2518 8030
				Fax: +91-22-2518 8074
				Godrej & Boyce
				Manufacturing Company
				Limited.
				Pirojshanagar, Vikhroli,
				Mumbai - 400079, INDIA.
				Tel: +91-22-6796 5656 / 5959
			Haier	Given Above
			Kelvinator	
			Kenstar	
			LG	Given Above
			Onida	Given Above
			Samsung	Given Above
			TCL	Given Above
			T-Series	Given Above
			Videocon	Given Above
			Weston	Given Above
			Whirlpool	Given Above
		Fully Automatic	BPL	Given Above
			Daenyx	Given Above
			Electrolux	
			Godrej	Given Above
			Haier	Given Above
				Corporate Address: IFB
				Industries Limited
				Corporate Off.: Flat No.IND-5,
			IFB	Sector-1,East Kolkata Township,
				Kolkata – 700 107
				Ph: +91 33 39849524/39849475
				Fax: +91 33 39849676
				Kolkata Factory: IFB Industries
				Limited
				1NO:14, 1 aratolla Koad, Kolkata -
				700000. Db: ± 01.3330480200
				F_{00} = F_{01} =
				Bangalore Factory IER Industrias
				Limited

Sr.		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
		ounegory		16/17, Visveswaraiah Indl.
				Estate,
				Off.Whitefield road, Bangalore -
				560048.
				Ph: + 91 80 30589620
				GM: +91 80 30589604
				MK1G: +91.80.30589641 Eax:+91.80.30589611
			Kelvinator	
			LG	Given Above
			Kenstar	
			Onida	Given Above
			Panasonic	Given Above
			Samsung	Given Above
			Toshiba	Given Above
			Videocon	Given Above
			Whirlpool	Given Above
				Corporate Headquarters
				Kasturi Buildings,
		xx//· 1	DI	Mohan T Advani Chowk,
	Air Conditioner	Window	Blue star	Jamshedji Tata Road,
				Mumbai - $400\ 020$
				Fer: (91) (22) 66654000
				Divisional Headquarters
				Chennai
				9 Bazullah Road
				T Nagar
				Chennai - 600 017
				Tel: (91) (44) 4344 4000
				Fax: (91) (44) 28158015 / 4344
				4072
				Mumbai
				Bandbox House
				4th Flr, 254 D
				Dr Annie Besant Road
				World Mumbai 400.030
				Tel: (91) (22) 66544000
				Fax: (91) (22) 66544001
				Regional Headquarters
				Chennai
				No.104, Old No. 46,
				Garuda Buildings, Cathedral
				Road,
				Chennai - 600 086
				Tel: (91) (44) 42444000
				Fax: (91) (44) 42444190

Sr		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
				Mumbai
				Blue Star House
				9A, Ghatkopar
				Link Road
				Sakinaka
				Mumbai - 400 072
				Tel: (91) (22) 66684000
				Fax: (91) (22) 66684004
				Kolkata
				7, Hare Street
				Kolkata - 700 001
				Tel: (91) (33) 22134000
				Fax: (91) (33) 22134102
				New Delhi
				Block 2-A, DLF Corporate Park
				DLF Qutab Enclave
				Phase III
				Gurgaon - 122 002 (Haryana)
				Tel: (91) (124) 4094000
				Fax: (91) (124) 4094004
				Manufacturing Facilities
				Ahmedabad
				501/3, 503/2, Tejpur Road
				Sarkhej Baula Highway
				Changodar,
				Ahmedabad- 382213
				Tel : (91) (2717) 294490
				Bharuch
				Plot Nos. 4 and 5
				GIDC Industrial Estate
				Narmada Nagar post
				Bharuch - 392 015
				Tel: (91) (2642) 246116
				Fax: (91) (2642) 246026
				Dadra
				Survey No. 265/2
				Demni Road
				Dadra 396 191
				U.T. Of Dadra & Nagar Haveli
				Tel: (91) (0260) 2668617 /
				2668618
				Fax: (91) (0260) 2668503
				Kala Amb
				Nahan Road
				Ranpur Jattan
				Kala Amb
				District Sirmour
				Hımachal Pradesh 173030
1			1	Tel : (91) (01702) 238760

S.		Product		Address / Contact Details
No	Product Name	Sub	Brand	
140.		Category		
				Fax: (91) (01702) 238461
				Kala Amb
				Nahan Road
				Village Ogli
				Kala Amb
				District Sirmour
				Himachal Pradesh 173030
				Tel : (91) 98160 13443
				Fax : (91) (01702) 238761
				Thane
				Und Pokhran Road
				Majiwada
				Thana 400 601
				T_{a1} (01) (22) 67024000
				Tet: $(91)(22)(7924000)$
				Fax: (91) (22) 67924020
				Wada
				Village-Vasuri Khurd,
				Khanivali Road,
				PO - Khupari,
				Taluka - Wada,
				Dist - Thane, 421312
				India
				Sales and Service Offices
				Ahmedabad
				Abhishree Avenue,
				3rd Floor, Near Nehru
				Nagar Cross Roads,
				Ambawadi Road,
				Ahmedabad - 380 006
				Tel: (91) (79) 4022 4000
				Bengaluru
				Ozone Manay Technology Park
				Sv No 56/18 & 55/9
				Hongasandra Village
				Bogur Hobli
				Correbhavipalva
				Bargelono 560.069
				Daligatore - 500000
				Tel: (91) (80) 41854000
				Bhubaneswar
				3A, Satya Nagar
				2nd Floor,
				Bhubaneswar 751 007
				Tel: (91) (674) 2572403 /
				2573670 / 2570024
				Fax: (91) (674) 2570544
				Chandigarh
				Adarsh Mall,
				4th Floor, Plot No. 50.

Sr		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
				Industrial & Business Park,
				Phase - II,
				Chandigarh - 160 002
				Tel: (91) (172) 5024000
				Fax: (91) (172) 5004007
				Chennai
				Blue Star Limited
				620, Anna Salai,
				Modern School Road,
				Chennai - 600006
				1 el: (91) (44) 40444000
				Fax: (91) (44) 40444001
				Gnaziadad C 53 A Third Elecar
				Rai Nagar District Center
				(RDC) Rai Nagar
				Ghaziabad - 201001
				Uttar Pradesh
				Tel: (91) (120) 2821400
				Guwahati
				2nd Floor, New Star Freeze
				Bldg., Opp. Kunjalata Bibah
				Bhawan, G S Road,
				Guwahati - 781005
				Tel: (91) (361) 2340620
				Indore
				1st Floor, Shri Krishna
				Classic, 139,
				Fadnis Colony, A B Road,
				Indore - 452 010
				1el: (91) (731) 40012117
				A 10 First Floor
				Main Sabakar Path
				Nr. Sahakar Bhayan
				Laipur
				Tel: (91) (141) 4141100/
				2744033/35
				Kochi
				Millenium Plaza
				Alinchuvadu
				MKK Nair Road
				Near Palarivattom Junction
				Kochi - 682024
				Tel: (91) (484) 4499000
				Fax: (91) (484) 4499190

Sr		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
				Lucknow
				177/4,Faizabad Road
				Lucknow 226 007
				Tel: (91) (522) 4034000
				Fax: (91) (522) 4034004
				Mumbai
				59 Forbes Street
				Mumbai 400 001
				Tel: (91) (22) 22844660
				Mumbai
				Unit G-2
				Shalimar Ind. Estate
				Dharavi Road
				Matunga
				Mumbai - 400 019
				Tel: (91) (22) 24042098
				Mumbai
				Unit 1 Prabhadevi
				Industrial Estate
				Prabhadevi,
				Mumbai - 400025
				Tel: (91) (22) 24227305
				Fax: (91) (22) 24376041
				Nagpur
				219 Bajaj Nagar, 1st Floor, South
				Ambazari Road, Nagpur - 440010
				Tel: (91) (712) 6624000
				Fax: (91) (712) 6624002
				New Delhi
				E-44/12, Okhla Industrial
				Area, Phase II,
				New Delhi - 110 020
				Tel: (91) (11) 41494000
				Fax: (91) (11) 41494001
				Panjim (Goa)
				First Floor, Buddhaseth
				Apts, Tonca, Caranzalem,
				Goa - 403 002.
				Tel: (91) (832) 2462789
				Pune
				201/A, Nityanand Complex
				247/A Bund Garden Road
				Pune - 411011
				Tel: (91) (20) 4104 4000
				Fax:(91) (20) 4104 4001
				Raipur
				Alaska Corporates,
				3rd Floor, Opp VIP Road,

Sr		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
				Jivan Vihar Colony,
				G E Road, Raipur,
				Chattisgarh - 492 006
				Tel: (91) (771) 6544000
				Secunderabad
				207 Sikh Road
				Bantia Estate
				Secunderabad - 500 003
				Tel: (91) (40) 4400 4000
				Fax: (91) (40) 4400 4001 / 4190
				Thane
				IInd Pokhran Road
				Majiwada
				Thane - 400601
				Tel: (91) (22) 67154500
				Fax:(91) (22) 67924020
				Thiruvananthapuram
				TC IV/962, Chandrika,
				Sree Chitra Nagar,
				Pipe line Road, Kawdiar,
				Thiruvananthapuram - 695 003
				Tel: (91) (471) 2435025
				Fax: (91) (471) 2434065
				Vadodara
				Ramkrishna Chambers
				Productivity Road
				Alkapuri
				Vadodara
				Tel: (91) (265) 6614000
				Visakhapatnam
				D. No. 49-24-65/1,
				Resapuvani Palem Village,
				Madhura Nagar Mandal,
				Near Sankarmattam Road,
				Vishakapatnam 530 016
				Tel: (91) (891) 274 8405
				Fax: (91) (891) 270 1041
				INDIAN HEADQUARTERS :
				Carrier Airconditioning &
				Refrigeration Limited
			Carrier	Delhi - Jalpur Highway, Narsingpur,
				Gurgaon,
				$Haryana, 122 004, India Db. No. \pm 01.124.4825500$
				$\begin{array}{c} 1 \text{ II. INO. } \pm 91 \text{ - } 124 \text{ - } 4025300 \\ \end{array}$
				Carrier Airconditioning &
				Refrigeration Ltd
				U & I Building,Plot No-83.
				Sector-29,
				Near Bikaner Sweets

Sr		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
		Category		Gurgaon 122 002 (Harvana)
				Tel = 0.0124 - 4707333
				Fax:- 0124 - 2565050
				Carrier Airconditioning &
				Refrigeration Ltd
				Carrier Complex
				Vill. Narsinghpur, Kherki Daula
				Post,
				Gurgaon – 122 004
				Tel:- 0124 - 482 5500
				Fax:- 0124 - 237 2230
				Carrier Airconditioning &
				Refrigeration Ltd
				Shop No # 201 E, 2nd Floor,
				Mahagun Metro Mall,
				Near Ansal Plaza, Vaishali,
				Ghaziabad (Uttar Pradesh)
				Tel:- 0120-4183260
				Fax:- 0120 - 4183266
				Carrier Airconditioning &
				Refrigeration Ltd
				Unit No.402 B & 403,
				4th floor, Shalimar Square,
				126/3 B B.N.Road,Lalbagh,
				Lucknow - 226001 Tal. 0522 2202346 2220508
				$\begin{array}{c} \text{rel:-} 0522 - 2202340, 2230398 \\ \text{Fax:-} 0522 - 2230050 \end{array}$
				Carrier Airconditioning &
				Refrigeration Ltd
				SCO 301/302. 1st Floor
				Sector – 38 D. Chandigarh - 160 036
				Tel:- 0172 - 500 7548/ 50
				Fax:- 0172 - 5007160
				Carrier Airconditioning &
				Refrigeration Ltd
				1st Floor, S.S.Tower, New Colony
				Behind Jyanti Market,
				Jaipur - 302 001
				Tel Nos :- 0141 - 511 3444, 511 3999
				Carrier Airconditioning &
				Refrigeration Ltd
				C/o Bhairav Distributors,
				Shop No:- 5 & 6, Victor Bldg
				Cujira - St Cruz
				Panaji - Margao Highway,
				Panjim, Goa - $403\ 005$
				$1 \text{ et:} - 0832 - 244 / 028$ $E_{\text{av}} = 0832 - 244 / 7027$
				Tax 0032 - 244 /02/
				Refrigeration I td
				605A Lokmet Building
				Lokmat Square Vardha Road
				Ramdas Peth, Nagpur

Sr		Product		Address / Contact Details
No	Product Name	Sub	Brand	
110.		Category		
				Tel:- 0712 - 663 0214, 645 3790
				Fax:- 0712 - 645 3790
				Carrier Airconditioning &
				Retrigeration Ltd
				C/o Suman Enterprises
				Behind III, Sham Nagar
				$\begin{array}{cccc} \text{Kaipur} = 492\ 000 \\ \text{Tel:} \ 0771 \ 401\ 3245 \end{array}$
				Carrier Airconditioning &
				Refrigeration Ltd
				1st Floor Milestone Drive In Road
				Thaltei Ahmedabad – 380 052
				Tel:- 079 - 4026 7777
				Fax:- 079 - 4026 7799
				Carrier Airconditioning &
				Refrigeration Ltd
				Shreeprasad, Office No.4, 4th floor
				Plot No.74, Sheela vihar colony
				Opp. Planet ford, Paud Road
				Pune -411 038
				Tel:- 020 - 41051000/ 02025437741
				Fax:- 020-25437742
				Carrier Air-conditioning &
				Refrigeration Ltd.,
				Unit No.4, 3rd Floor
				Phoenix Market City,
				15 L.B.S. Marg, Kurla (West)
				MUMBAI – 400 070.
				Telephone: 022-61700700
				Carrier Airconditioning &
				Refrigeration Ltd
				315-316, Shagun tower,
				7 Commercial Sector PU 4, Scheme
				No 54,
				Vijay Nagar Square, A.B. Road,
				Indore – 452010
				Tel:- 0731-4070378
				Fax:- 0/31 - 252 6365
				Carrier Airconditioning &
				Retrigeration Ltd
				C/o Om Sai Enterprises,
				Second Elecer Lake Read
				Banahi 834.001
				$T_{el} = 0.651 = 6.45 2488$
				Fax:-0.051 - 2.46 + 1818
				Carrier Airconditioning &
				Refrigeration Ltd
				C/o, Candida Enterprises
				R.G. Baruha Raod, Sunderpur
				Guwahati - 781 005
				Tel:- 0361 - 259 5003
				Fax:- 0361 - 220 3508

Sr.	Product Name	Product	Brand	Address / Contact Details
No.	I foduce i vanic	Category	Diand	
				Carrier Airconditioning &
				Refrigeration Ltd
				204, Adarshila Complex
				South Gandhi Maidan
				Patna – 800 001
				Tel:- 0612 - 232 3517
				Telefax:- 0612 - 266 8591
				Carrier Airconditioning &
				Retrigeration Ltd
				P-339/1, C11 Road, Scheme VI-M,
				Phulbagan, Kolkatta $= 700.054$
				1e:-0.053 - 4020 - 1300
				Fax:- 033 - 2304 9700
				Carrier Airconditioning &
				Elat No: 201 Shapti Niwas Housing
				Plat No 201, Shahu Niwas Housing Diot No: 23/1747 Pagulooth
				Bhuvapashwar 751010
				Tal: 0.674 258 7178 / 258 5803
				$F_{23} = 0.674 - 258 7178$
				Carrier Airconditioning &
				Refrigeration Ltd
				6-2-976 Rai Bhawan Road
				Khairatabad
				Hyderabad $-$ 500 004
				Tel:- 040 - 4546 2888
				Fax:- 040 - 4011 8146
				Carrier Airconditioning &
				Refrigeration Limited
				3rd Floor, Block-III,
				Prestige Blue Chip, No.9, Hosur
				Road,
				Bangalore – 560 029
				Tel :- +91 80 43442000
				Fax:- +91 80 41321222
				Carrier Airconditioning &
				Refrigeration Ltd
				Shivas Complex
				263/5, Mettupalayam Road
				Combatore $- 641\ 043$.
				1e:-0422 - 438 4151, 438 5403
-				Fax:- 0422 - 2430485
				Carrier Airconditioning &
				20/6641 Doministration
				MC Read (Opp Cashin Shinyard)
				Cochine 682 015
				$\begin{array}{c} \text{Cochin} = 0.02 \ 0.03 \\ \text{Tab} 0.484 4.02 \ 0.001 \ / \ 0 \end{array}$
				Eas: $0.484 - 235 0.0214$
				Carrier Airconditioning &
				Refrigeration Ltd
				GRR Zone
				271/2. Maraimalai Adigal Salai

Sr.	Product Name	Product	Brand	Address / Contact Details
No.	Troduct Tyaine	Category	Dialid	
				Pondicherry – 605 001
				1 el:- 0413 - 222 5853, 2226 676 Fax:- 0413 - 234 4695
				Carrier Airconditioning &
				Refrigeration Ltd
				Old No. 248, New No.114
				Royapettah High Road,
				Royapettan, Chennai $-$ 600 014. Phone : 044 $-$ 42222888
			Daenvx	Given Above
				ETA General Pvt Ltd
				ETA House ,3rd Floor
			C = 1 (ETA)	#71/63,Opp.Loyola College
			General (ETA)	Sterling Road, Nungambakkam,
				Chennai.6000034 . Tamilnadu
				044- 43402345
				ETA General Pvt. Ltd.Flat no -
				642 D, Ram AppartmentsOpp.
				Laksmi MillsPapanaicken
				#:0422 - 2554732
				ETA General Pvt Ltd
				ETA House, Behind Green Park
				Hotel
				7-1-27/5, Plot No:9,
				HVDERABAD 500.016
				Tel $\#:040 = 66103530 / 31$
				ETA General Pvt. Ltd.
				D NO.40-1-119, Old BATA
				GodownOpp. Jyothi Mahal Benz
				Circle,
				VIJAYAWADA – 522 010
				Tel: 0866 - 6460278 / 3074029
				ETA General Pvt. Ltd.
				PLot No.153, 2nd Floor, 9th
				Main Road
				PANCALOPE 560.011
				$T_{el} \cdot 080_{-}40926531 / 40926538$
				ETA General Pyt 1 td
				Bldng #:30/2001-D. 'Atham'
				1st Floor, Opp.Gold Souk
				Grande
				Ponnurunni Road
				Ponnurunni, Vytilla P.O
				Cochin - 682 019
L				Telefax : 0484 - 4011623
				ETA General Pvt. Ltd.

Sr.		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
				101-102, 1st Floor, Grotto
				Heritage,
				Opp.Orlem Church, Marve Road,
				Malad – West,
				Mumbai - 400 064
				Tel: 022 - 42455300 / 02
				ETA General Pvt. Ltd.
				203, 2nd Floor, Sankalp Square
				Near Gurukul Temple
				Drive In Road
				AHMEDABAD - 380 054 T-1 - 070 27467001 40059001
				ETA C 1D + L+1
				ETA General Pvt. Ltd.
				SCO 24/5 - 70, Sector 22 C 2nd Electr
				CHANDICAPH 160 022
				T_{el} , 0172 5087288 4421121
				ETA General Pyt 1 td
				C = 19 Sector - I
				Alioani
				LUCKNOW - 226 020 (U.P)
				Tel : 0522 - 4006879
				ETA General Private Limited
				Sunrise Mall, 2nd Floor,
				Sector - 11, Vasundhara- 201 012
				Tel: 0120-4291121
				ETA General Pvt. Ltd.
				221, Ist floor,
				Okhla Indl. Area,
				New Delhi-110020
				# 011-43127777
				ETA General Pvt. Ltd.
				203, 2nd Floor
				Krishna Enclave, Plotno-SB-52
				Opp.SMS Stadium, Tonk Road,
				Dh. No: 0141 4012684
				ETA Coporal Put I td
				1st Eloor Unit 1 E
				"Sree Ganesh Centre"
				216. AIC Bose Road
				KOLKATA - 700 017
				Tel : 033 - 40602006
			Godrej	Given Above
			Haier	Given Above
			Hitachi	Given Above
			LG	Given Above
			Onida	Given Above

Sr		Product		Address / Contact Details
No.	Product Name	Sub	Brand	
		Category	Samana a	Cince Above
			Videogog	Given Above
			TCI	Given Above
			ICL	Given Above
				Voltas Limited
				Voltas House
	Corporate		37.1	
	Headquarters		Voltas	Dr. Babasaheb Ambedkar Koad
				March ai 400.022
				Mumbai $400\ 0.000$
				1el: 022-00050 000
	Factories			2nd, Poknran Koad,
				Thane - $400\ 601$
				Tel: 022-67920111
				Dadra Plant (EM&RBG)
				Shreenath Industrial Estate, C
				Building
				Survey NO.197, Nr. Dadra Check
				Post Pin $= 396230$
				Tel: 0260-6619999 / 2669648
				(EM® DBC)
				(EM&RDG)
				Plot No.1, Sector 8
				Dist U.S. Nagar Budropur
				Dist U.S. Nagar, Rudrapur
				$P_{11} = 203145$ T _{al} 05044 250006 / 8
				Litterellhand Plant (UPPC)
				Dist NO 2.5 Sector 8
				LLE Dept Nagar Industrial Area
				Dist U.S. Nagar Budropur
				Dist 0.3. Nagar, Rudrapur
				$T_{al} = 203133$ $T_{al} = 05944, 250000$
			Whinloool	Civen Above
		Split	Rhua atar	Given Above
		Spiit	Comion	Given Above
			Deepwy	Given Above
			Canoral (ETA)	Given Above
			General (ETA)	Given Above
			Goure	Given Above
			Hater	Given Above
			Hitachi	Given Above
			LG	Given Above
			Onida	Given Above
				Gurgaon Head Office
				2nd Floor, Tower A & B, DLF
			Mitsubishi	Cyber Greens, Dlt Cyber City,
				DLF Phase -III, Gurgaon-122002,
				Phone: +91 (124) 463-0300 +91

Sr		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
				(124) 673-9300 Fax: +91 (124)
				463-0399 / 398
				Delhi Registered Office
				M-38/1, Middle Circle,
				Connaught Place, New Delhi-
				11000, India
				Please contact Gurgaon head
				office for Delhi inquiries.
				Bangalore Sales Office
				Prestige Emerald, 6th Floor,
				Municipal No. 2, Madras Bank
				Road (Lavelle Road), Bangalore
				560001, India
				Phone: +91 (80) 4020-1600 Fax:
				+91 (80) 4020-1699
				Pune FAID Head Office
				Emerald House, EL-3, J block
				M.I.D.C Bhosari, Pune -411026,
				India
				Phone: +91 (20) 2710-2000 Fax:
				+91 (20) 2710-2100
				Pune Sales Office
				301-302, Lunkad sky Station, near
				HDFC Bank, Viman Nagar,
				Pune-411 014, India
				Phone: +91 (20) 4131-4868 Fax:
				+91 (20) 4131-4851
				Pune Sales Office
				F-2 , Gurutej Bahadur, Housing
				Society, Aundh Road, Khadki,
				Pune - 411003, India
				Phone: +91 (20) 2582-0447/ 448
				/ 449 Fax: +91 (20) 2582-0450
				Mumbai Sales Office
				305-306, 3rd Floor, "Windfall",
				Sahar Plaza Complex, Next to
				Kohinoor Hotel, Andheri Kurla
				Road, J. B. Nagar, Andheri (E.)
				Mumbai-400 059, India
				Phone: +91 (22) 6611-6200 Fax:
				+91 (22) 6611-6299
				Chennai Sales Office
				Utilights Corporate Centre No.1,
				Vivekananda Koad, Srinivasa
				Tamilandu India
				$\begin{array}{c} \text{Tanininadu, findia} \\ \text{Dhomes} + 01 (44) 4022 2222 E \end{array}$
				+91 (44) 4923-2222 Fax:

Sr.		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
				Hyderabad Sales Office
				4th Floor, Unit No.407, Ashok
				Bhopal Chamber S.P. Road,
				Secunderabad, A.P-500 003,
				Andhra Pradesh, India
				Phone: +91 (40) 4343-8888 Fax:
				+91 (40) 4343-8899
				Chandigarh Sales Office
				SCO 176, First Floor, Sector 38
				C, Chandigarh – 160036, India
				Phone: +91 (172) 460-1645
				Jaipur Sales Office
				111, Ground Floor, Apex Mall,
				Tonk Road, Jaipur, India
				Phone: +91 (141) 401-1109
				Ahmedabad Sales Office
				303 / A, 3rd Floor, Primate, Judges
				Abmedabad Gujarat - 380054 India
-				Coimbatore Sales Office
				No 551A West Lokmanya Street
				DB Road RS Puram Comptore
				- 641002 India
				Phone: $+91$ (422) 438-5600
				Vadodara Sales Office
				A - 1/2. 2nd Floor. Status Plaza.
				Opp Relish Resort Aksar Square.
				O.P Road, Vadodara -390020,
				India
				Phone: +91 (265) 231-4699/ 235-
				8137 Fax: +91 (265) 233-3307
				Kochi Sales Office
				Room No G9, Building Door No
				CC: 39/5102-A-6, Netage
				Arcade Church Landing Road
				Ernaculum, Kochi-682016, India
				Phone: +91-9846013451 / +91-
				8129445670
				Mitsubishi Elevator ETA India
				Pvt. Ltd.
				Chennai Citi Centre, 5th Floor,
				10 & 11, Dr.R.K. Salai, Mylapore,
				Chennai - 600004, India
				Phone: +91 (44) 2847-7370 Fax:
				+91 (44) 2847-7374
			Panasonic	Given Above
			Samsung	Given Above
			Sanyo	Given Above
			TCL	Given Above

Sr.		Product		Address / Contact Details
No.	Product Name	Sub	Brand	
		Category	T1.1-	Circo Ab and
			Toshiba Videogon	Given Above
			Videocon	Given Above
			Voltas Wilsinka sil	Given Above
	D - Cuita a ma da ma	$\mathbf{D}^{*} + \mathbf{C} = 1$	Whiripool	Given Above
	Refrigerators	Direct Cool	BPL 1	Given Above
			Electrolux	Given Above
			Gem	Given Above
			Godrej	Given Above
			Haier	Given Above
			Kelvinator	Circuit Alberta
			LG ·	Given Above
			Panasonic	Given Above
			Samsung	Given Above
			Videocon Willing 1	Given Above
		E (E	Whiripool	Given Above
		Frost Free	BPL Electrolism	Given Above
			Electrolux	
			Godrej	Given Above
			Hater	Given Above
			Hitachi	Given Above
			Kelvinator	
			LG ·	Given Above
			Panasonic	Given Above
			Samsung	Given Above
			Videocon	Given Above
			Whiripool	Given Above
			l oshiba	Given Above
			Sharp	Given Above
				Registered & Corporate Office
				150, Pandurang Budhkar Marg,
			Siemens	Worli, Manarashtra, Murehai 400 018
				$T_{\rm ol} \pm 01.22.3967.7000$
				F_{av} : +91 22 3967 7500
				Acer India Private Limited
				Ground Floor B- 28 Okhla
	Mobile Phones		Acer	Phase - I New Delhi -
	nicone i noneo			110020. Delhi. India
				Tel: $+(91)-(11)-40568000$
				India Office
				TCT Mobile International
				Limited,
			Alcatel	Elegance Tower, Regus Business
				Centre, 2nd Floor, Room
				No.252B Jasola, New Delhi-
				110025
				Distributors

Sr.	Product Name	Product Sub	Brand	Address / Contact Details
No.	I foduce i vanic	Category	Diand	
				Encon Impex Private Limited,
				Super Distributor
				Encon Impex Private Limited,
				No.45, 2nd Floor, Vinayaka
				Electronic Plaza, 1st Cross, S.P
				Road, Bangalore - 560 002
				Kochi, Kerala
				Distributor
				Talletime Telesustems 48/425B
				Main road Elamakkara Kochi
				682026.
				Tirunelveli.Tamil Nadu
				KM Enterprises, Super
				Distributor
				KM Enterprises, No 41 E/3,
				Vasanthapuram, South Bye-Pass
				road, Tirunelveli-627005
				Karimnagar,Andhra Pradesh
				SR Technologies,Micro
				Distributor
				SR Technologies, No 1-5-89,
				Aravindh Nagar, Jagtial,
				Karımnagar, Andhra Pradesh.
				Amazon Development Center
				O gity 2nd Floor Block A &
				Block B
				Survey Number-109 110 111/2
			Amazon	Nanakramguda Village
				Serlingamplayy Mandal, Ranga
				Reddy Dist.
				Hyderabad - 500032
				Ph: 040 39921111
				Divyashree Building, Ground
				Floor, Plot No: 6
				Hi-Tech City Layout, Survey No.
				64(Part), Madhapur Village
				Serilingampally Mandal
				Hyderabad - 500081
				Ph: 040 43451000
				9th & 10th Floor, Pulding #0, Pulsie Mind
				Madhapur
				Hyderabad 500081
				Ph: 040 40005111
				#40 3rd Floor SP Infocity
				M G R Salai, Perungudi

Sr		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
				Kandanchavady
				Chennai-600096
				Ph: 044 30883088
				2nd Floor, Safina Towers
				Opposite J.P. Techno park
				No.3, Ali Asker Road
				Bangalore - 560052
				Ph- 080 41970000
				Brigade Gateway 6th floor
				26/1, Dr. Rajkumar Road
				Malleshwaram(W)
				Bangalore-560055
				Ph: 080 332/3000
				Apple India Private Limited
				19 Floor, Concorde Tower C,
			Apple	UB City No 24 Vittal Mallya
				Road
-				Bangalore 560-001
				Presentec GmbH
			Danafan	Grobe Eldstrabe 117
			Benefon	DE-22/6/Hamburg
				Phone: $+49(0)4030060830$
				Pax: +49 (0)40 500 6085 29
				and Eleon OP Puilding
			BenQ	DI E Cuber City, DI E Phase 3
				Gurgaon 122002 Harvana
				Ningho Bird Co. Ltd
				No 999 Dacheng East Road
				Fenghua City Zheijang Province
				P R China
			Bird	Tel: $+8657488953465+86755$
			Dira	36878286
				Fax: +86 574 88951025, +86 755
				36878284
				Postcode: 315500
				US & Latin Americas
				Tel: +86 574 88953465
				Mobile: +86 13738470409
				Corporate Head Office
				BlackBerry B
				2200 University Ave. E
			BlackBerry	Waterloo, ON, Canada
				N2K 0A2
				Tel: (519) 888-7465
				Fax: (519) 888-7884
				BlackBerry United States
				BlackBerry
1				5000 Riverside Drive,

Sr.		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
				Irving,
				TX 75039
				Tel: (972) 373-1700
				Fax: (9/2) 650-2006
				BlackBerry Europe
				BlackBerry
				200 Bath Road
				Slough, Berksnire
				Tal: ± 44 (0)1753 667000
				Fax: ± 44 (0)1753 669970
				Manufacturing Eacility
				BlackBerry
				451 Phillip Street
				Waterloo Ontario
				Canada N2L 3X2
				Tel: (519) 888-7465
				Fax: (519) 888-0021
				Ottawa
				BlackBerry
				4000 Innovation Drive
				Kanata, Ontario
				Canada K2K 3K1
				Tel: (613) 599-7465
				Fax: (613) 599-1922
				Mississauga
				BlackBerry
				4701 Tahoe Boulevard
				Mississauga, Ontario
				Canada L4W 0B5
				Tel: (905) 629-4/46
				Fax: (905) 629-4869
				BLU Products
			BLU	10814 NW 33 rd St# 100
				(305) 715 - 7171
				Bosch Sicherheitssysteme GmbH
				Robert-Bosch-Bing 5
			Bosch	85630 Grasbrunn
			20000	GERMANY
				Tel: +49 (0) 89 6290-0
				Bosch Security Systems
				130 Perinton Parkway
				Fairport, New York, 14450
				USÂ
				Tel: +1 585 223 4060
				Bosch Security Systems Pte Ltd
				11 Bishan Street 21

Sr		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
				Singapore 573943
				SINGAPORE
				Tel: +65 6571 2808
				Bosch Security Systems B.V.
				Postfach 80002
				5600 JB Eindhoven
				THE NETHERLANDS
				Tel: +31 (0) 40 25 77 284
				Casio India Co. Private Ltd.
				210, 1st Floor, Okhla Industrial
			Casio	Estate, Phase-III,
				New Delhi-110020
				Tel: 011-66999200
				Fax: 011-41054550
				Tolly Culli Andhori(E)
				Mumbri 60
				$Ph \cdot 022 \ 60605005$
				No 7 Shah Complex 2nd Floor
				9th Main 5th Block Javanagar
				Bangalore- 41
				Ph.: 080-60605005
				3rd Floor, Heera Panna Complex.
				124/1, G.N.Chetty Road,
				T.Nagar, Chennai-17,
				Ph.: 044-60605005
				3rd Floor, 3-4-630,
				Padma Plaza, Opposite Ratna
				College,
				Narayanguds, Hydrabad-29,
				Ph.: 040-60605005
				4C, Lansdowne Place,
				2nd Floor, Kolkata-29,
				Ph.: 033-60605005
				CELKON IMPEX PVT LTD.
				3rd floor, 2nd block, MY HOME
			Celkon	HUB,
				Madhapur, Hyderabad - 500081,
				Andhra Pradesh, India.
				Contact : +91 90523 456/8
				Spectrum House, Dunstable
				AL 2 7DD
			Chea	AL2 /PK Tal: 01022 202020
				$\begin{array}{c} 1 \text{ cl. } 01923 \ 303020 \\ \text{International: } \pm 44 \ (0)1023 \\ \end{array}$
				383828
				Dell Computer Corporation
			Dell	One Dell Way

Sr		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
		Category		Round Rock, Texas 78682
				Tel: (888) 560-8324
				(800) 915-3355
				ERICSSON INDIA PRIVATE
				LIMITED
				Ericsson Forum DLF Cyberciti
			Ericsson	Sector-25A, Gurgaon Haryana
				Postal code: 122 002
				Phone: +91 124 4080808, +91
				124 2701001
				Shiodome City Center
				1-5-2 Higashi-Shimbashi, Minato-
			Fujitsu Siemens	ku
				Tokyo 105-7123, Japan
				Tel: +81-3-6252-2220
				Gigabyte Technology India
			Gigabyte	Private Limited
				+91-22-40633222
			Haier	Given Above
				Hewlett-Packard India Sales
				Pvt.Ltd
				24, Salarpuria Arena
			НР	Adugodi
				Hosur Road
				Bangalore - 560 030
				Phone: (080) 33824000 /
				33829000
				Hewlett-Packard India Sales Pvt.
				Lta 501 5th Elene Sether Conseler
				Bohind Swarath Building
				Off C C Road Neurangeura
				Abmedabad - 380.001
				Hewlett-Packard India Sales Pyt
				I td
				24 Salarpuria Arena Building
				Adugodi, Hosur Road
				Bangalore - 560 030
				HP GR Tech Park Facility
				10th & 11th floor, B wing, Akash
				Block,
				6-9 floor, B wing, Akash Block,
				0-3rd Floor, B wing, Akash
				Block,
				Salarpuria GR Tech Park,
				Sy No.69/3, Whitefield Road,
				Next to ITPL,
				Bangalore - 560 066. India.

Sr.		Product	D 1	Address / Contact Details
No.	Product Name	Sub Category	Brand	
				Hewlett-Packard GlobalSoft
				Limited
				HP Avenue
				39/40, Electronics City-I
				Hosur Road
				Bangalore - 560 100
				Global e-Business Operations
				Pvt. Ltd.
				Wind Tunnel Road
				Tower 1, GVH, Murugeshpalya
				Murugeshpalya
				Bangalore - 560 017
				Hewlett-Packard India Sales Pvt.
				Ltd.
				No. 66/2, Ward No. 83,
				Bagmane Tech-Park
				4th Floor, Wing A,
				Embassy Prime, CV Raman
				Nagar,
				Bangalore - 560 093
				Survey No. 192,
				Whitefield Road,
				Mahadevpura Road,
				Bangalore - 560 048
				III Floor, Khanija Bhavan,
				49, Race Course Road,
				Bangalore - 560 001
				Surya Park 2,
				No.100, Ring road,
				Bangalore - 560 100
				Surya Wave,Sy # 61(p),
				Electronic City, Hosur Road
				Bangalore - 560 100
				Prathik Tech Park,
				Survey No 93/1, Veerasandra
				village,
				Attibele Hobli, Anekal Taluk,
				Electronic City Extension
				Bangalore - 560 100
				Hewlett-Packard India Sales
				Pvt.Ltd
				No.2, KRM Plaza,
				Harrington Road,
				Chetpet,
				Chennai - 600 031
				Plot 1, Olympia Technology park,
				Citius block, SIDCO industrial
				estate,

Sr		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
				Guindy,
				Chennai - 600 032
				Block 1, 4F - 6F
				Block 1, G - 3F
				First Software Park,
				110 Mount Poonamalle Road,
				Porur Channei (00.11(
				Cheminal - 000 110
				Ground noor, Crowne Plaza,
				New Friends Colony,
				New Delni - 110065.
				Hewlett-Packard India Sales Pvt.
				Liu. No 18 John Contro
				Ath Eleor D. Block
				5th Floor, C. Block
				5th Floor, D - Block
				Madhapur
				Hyderabad - 500 081
				Hewlett Packard India Sales
				Private Limited
				Building No:-02. DLF
				Cybergreen.
				1st to 4th floors. Towers D & E.
				DLF Cyber City, Phase III,
				Gurgaon – 122 022, Harvana,
				India
				Phone:(0124) 3886000
				Fax: (0124) 3886941
				Hewlett-Packard India Sales Pvt
				Ltd.
				Plot No. 9-11A & 35-37A,
				Sector-V
				Integrated Industrial Estate,
				Pantnagar (SIDCUL),
				Rudrapur, US Nagar - 263 153.
				Uttaranchal State, India
				No 08, Major Arteral Road,
				Block -AF New Town 1st Floor,
				Rajarhat,
				Kolkata- 700 156,
				West Bengal.
				Unit No. 16N & 17, 16th & 17th
				Floor,
				Oberoi Commerz, International
				Business Park,
				Oberoi Garden City, Off.
				Western Express Highway,

Sr		Product		Address / Contact Details
No.	Product Name	Sub	Brand	
		Category		Carrage
				Goregoan, Mumbai 400.063
				Maharastra
				Hewlett-Packard India Sales
				Pvt.Ltd.
				Level 6, Pentagon P-2,
				Magarpatta City,
				Hadapsar
				Pune - 411 028
			HTC	1800 266 3566
				Huawei Telecommunication
				(INDIA) Co. Pvt Ltd.
				7 th Floor, Tower A,
			Huawei	Spaze I-Tech Park, Sohna Road,
			Tittawei	Sector-49
				Gurgaon, Haryana-122001 India
				Tel: +91-124-4774700
				Fax: +91-124-4774863
				Huawei
				9 th Floor, Tower 6, The Gateway,
				No. 9, Canton Koad, 1 sim Sha
				Tsu, Kowleen Hendkong
				Tal: 00852 21253888
				Fax: $0.0852-21253889$
				Karbonn Mobiles
				#39/13 off 7th main HAL 2nd
				stage
			Karbonn	Appareddy Palya, Indiranagar,
				Bangalore – 560038
				Tel: 080 40894888
				Karbonn Mobiles
				D-170, Okhla Industrial Area,
				Phase-1
				New Delhi – 110020
				011 46604660
				KYOCERA Corporation
				Cutting Tool Group
			17	6 Takeda, Tobadono-cho,
			Kyocera	Fushimi-ku, Kyoto 612-8501,
				Japan Dhanay 191 75 (04 2472
				Finone: $\pm \delta 1 - (5 - 004 - 54/5)$ Eas: $\pm \delta 1 - 75 - 604 - 3472$
				$\frac{1}{1} \text{ ax. } \pm 01 - 75 - 004 - 5472$
				Put I td
				1001A 1001B 1002 10th Elect
				IMD Recent Square M.G. Road
				Gurgaon-122 002 Harvana. India

Sr		Product		Address / Contact Details
No.	Product Name	Sub Category	Brand	
				Phone: +91-124-402-5000
				Fax: +91-124-402-5001
				Lenovo India Pvt.Ltd
				Ferns Icon, Level -2,
				Doddenakund Village,
			Lenovo	Marathhalli Outer King Road,
				Marathhalli Post, Kr Puram
				HODII, Bangaloro 560037
				Dangalore-500057 Dhona No. :080 30533000
				Lapova India Dut Ltd
				Vatlka Business Park 1st
				floor Badshah Dur Road
				Sec-49
				Sohna Road
				Gurgaon-122001
				Phone No. : 0124-4315600
				Lenovo India private ltd
				MLS Business Centres India Pvt.
				Ltd.
				6th Floor, Block A, 22, Camac
				Street
				Kolkata - 700 016.
				MPh no: 033 - 4019-2234 TO
				4019-2239
				FAX - 033 - 40192240
				#1011-12, Solitaire Corporate
				Park,
				Chatlanger Link David
				Chakala Andhori (East)
				Mumbai 400093
				Phone No $: 022 - 30847000/100$
				Lenovo India Pyt Ltd
				2nd Floor Kuppu Arcade, 4
				Venkatanarayana Road,
				T.Nagar, Chennai 600 017
				Phone No. : 044-39159273
			LG	Given Above
				Maxon CIC Europe Ltd
				Maxon House
				Cleveland Road
			Maxon	Hemei Hempstead Herts
				United Kingdom
				Tel: +44 (0) 1442 267777
				Future Technology Enterprise
			Meizu	Ltd.
				Unit 01-02, 19/F, Hollywood

S #		Product		Address / Contact Details					
Sr.	Product Name	Sub	Brand						
110.		Category							
				Plaza, 610 Nathan Road,					
				Mongkok, Kowloon, Hong Kong					
				Tel: (852) 2388 8022					
				Micromax House,					
				90B,Sector-18,Gurgaon					
			Micromax	Pin Code - 122015					
				Tel: +91-124-4811000					
				Fax: +91-124-4009603					
				Micromax House,					
				90B,Sector-18,Gurgaon					
				Pin Code - 122015					
				Tel: +91-124-4811000					
				Fax: +91-124-4009603					
				Micromax House,					
				90B,Sector-18,Gurgaon					
				Pin Code - 122015					
				Tel: 18605008286					
				Fax: +91-124-4009603					
				Micromax Informatics Ltd, Plot					
				No.234, HPSIDC Industrial Area,					
				Tehsil Nalagarh, Distt Solan					
				(HO)-173205					
				Microsoft Corporation					
			Microsoft	One Microsoft Way					
				Redmond, WA 98052-6399					
				MiTAC products or general					
			Mitac	company enquiries					
				Tel: 886-2-26525888					
			Mitsubishi	Given Above					
				Motorola Mobility, Inc.					
			Motorola	600 North U.S. Highway 45					
				Libertyville, Illinois 60048 USA					
SI No	Name	Address		Latitude	:	Longitude			
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			Deg.	Min.	Sec.	Deg.	Min.	Sec.	
		Balrampur							
1	Juganoo Electronics	Main Market, Balrampur	23	36	34.9	83	37	11.6	
2	Sandeep Electronics	Main Market, Balrampur	23	36	31.9	83	37	10.0	
3	Raja Electronics	Mission Road, Balrampur	23	36	28.2	83	37	12.0	
4	Rajesh Radio	Main Road, Balrampur	23	36	29.4	83	37	8.5	
5	R.K.Electronics	Main Road, Balrampur	23	36	30.3	83	37	8.6	
6	Vinay Radio	Main Road, Balrampur	23	36	28.9	83	37	9.1	
7	Yash Raj Enterprises	Near Police station, Balrampur	23	36	25.7	83	37	6.3	
8	Dinesh Enterprises	Main Road, Shankargarh, Balrampur	23	18	2.3	83	36	14.6	
9	Raquib Electronics	Main Road, Shankargarh, Balrampur	23	18	3.4	83	36	11.6	
10	Neeraj Electronics	Bachwar Road, Shankargarh, Balrampur	23	18	1.3	83	35	35.1	
11	Maha Maya Electroics	Main Road, Rajpur, Balrampur	23	20	6.8	83	24	22.8	
12	Balaji Electronics	Main Road, Rajpur, Balrampur	23	20	7.2	83	24	22.1	
13	Prakash Electronics	Main Road, Rajpur, Balrampur	23	20	10.5	83	24	11.0	
14	Furniture Mart & Electronics	Main Road, Near SBI, Rajpur, Balrampur	23	20	11.2	83	24	10.0	
15	Uphar Electronics	SBI Road, Ramanujganj, Balrampur	23	48	24.2	83	42	6.8	
16	Gupta Electronics	Main Market, Ramanujganj, Balrampur	23	48	15.3	83	42	4.9	
17	Yadav Electronics	Balangi, Wadraf Nagar, Balrampur	23	45	50.8	83	11	35.3	
		Jashpur		1		1	Į		
1	Gupta Watch & Electronics	Near Bus Stand, Jashpur	22	53	18.5	84	8	29.7	
2	Gupta Radio House	Gupta Line, Jashpur	22	53	18.1	84	8	23.9	
3	Sai Enterprises	Gupta Line, Jashpur	22	53	17.1	84	8	23.9	
4	Shiva Electronics & Steel	Sanna Road, Jashpur	22	53	23.5	84	8	17.2	
5	Prateek Enterprises (Samsung Plaza)	Sanna Road, Jashpur	22	53	9.6	84	8	15.3	
6	Ghar Sansar	Near SBI Bank, Madhuban Toli Road,	22	53	6.7	84	8	10.8	

Partial list of Distributor, Trader & Retailer in Surguja Division – Annexure 2

SI No	Name	Address Latitude Longitud						le
01. 140.	ivanic	Autros	Deg.	Min.	Sec.	Deg.	Min.	Sec.
		Jashpur						
7	Sao Electronics	Balaji Road, Jashpur	22	53	0.2	84	8	13.0
8	Saw Electronics	Gamhariya, Raipur Road, Jashpur	22	53	13.6	84	9	19.4
9	Gupta Electronics	Karbala Road, Jashpur	22	53	19.8	84	8	25.5
10	Rupesh Electronics	Karbala Road, Jashpur	22	53	19.7	84	8	25.5
11	Vishwa Bharti Enterprises	Purani Tola, Jashpur	22	53	6.4	84	8	20.5
12	New Samir Electronics	Near bus Stand, Kansabel, Jashpur	22	38	46.4	83	44	33.8
13	Sonu Mobile & Electronics	BJP Complex, Near bus Stand, Kansabel, Jashpur	22	38	46.2	83	44	33.9
14	Vashim Mobile & Electronics	Near bus Stand, Kansabel, Jashpur	22	38	46.2	83	44	34.0
15	Shekhar Mobile & Electronics	Bagicha Road, Kansabel, Jashpur	22	38	46.1	83	44	33.0
16	Payal Electronics	Pathargaon Road, Kansabel, Jashpur	22	38	48.3	83	44	32.3
17	Friends Mobile & Electronics	Main Road, Kansabel, Jashpur	22	38	45.6	83	44	32.1
18	National Electronics	Main Road, Kansabel, Jashpur	22	38	42.6	83	44	32.0
19	Shree Hanuman Electronics	Main Chowk, Kansabel, Jashpur	22	38	41.6	83	44	31.7
20	Sonu Mobile & Electronics	Main Chowk, Kansabel, Jashpur	22	38	40.1	83	44	31.6
21	Sri Ram Electronics	Church Road, Main Chowk, Kansabel, Jashpur	22	38	38.9	83	44	31.5
22	Golden watch & Electronics	Main Chowk, Kansabel, Jashpur	22	38	41.2	83	44	32.7
23	Amit Mobile & Electronics	Main Chowk, Kansabel, Jashpur	22	38	41.3	83	44	32.9
24	Seema Electronics	Near Bus Stand, Kansabel, Jashpur	22	38	45.9	83	44	34.9
25	Agarwal Electronics	Main Road, Kunkuri, Jashpur	22	44	30.6	83	57	4.9
26	Glaxy Electronics	Jashpur Road, Kunkuri, Jashpur	22	44	36.0	83	57	20.1
27	Arushi Electronics	Bazar Road, Kunkuri, Jashpur	22	44	30.2	83	56	58.6
28	Taj Electronics	Tapkara Road, Kunkuri, Jashpur	22	44	19.9	83	57	4.7
29	Sargam Electronics	Bus Stand Chowk, Kunkuri, Jashpur	22	44	28.6	83	57	1.4
30	Surabhi Electronics	Near Bus Stand, Kunkuri, Jashpur	22	44	27.6	83	57	1.3
31	Sai Electronics	Near Bus Stand, Kunkuri, Jashpur	22	44	24.7	83	56	59.8
32	Goyal Electronics	Main Road, Pathargaon, Jashpur	22	33	21.1	83	27	33.3

SI No	Name	Address	Latitude		ddress Latitude Longitude					
01.140.	, , , , , , , , , , , , , , , , , , ,	11111030	Deg.	Min.	Sec.	Deg.	Min.	Sec.		
33	Vijay Electronics	Abikapur Road, Pathargaon, Jashpur	22	33	26.5	83	27	33.5		
34	Harsh Electronics	Abikapur Road, Pathargaon, Jashpur	22	33	28.2	83	27	32.2		
35	Sri Jai Balaji Electronics	Abikapur Road, Pathargaon, Jashpur	22	33	29.5	83	27	32.3		
36	Ashok Electronics	Near Bus Stand, Pathargaon, Jashpur	22	33	22.5	83	27	36.2		
37	Shubham Electronics	Jashpur Road, Pathargaon, Jashpur	22	33	23.9	83	27	48.7		
38	Balaji Electronics	Jashpur Road, Pathargaon, Jashpur	22	33	27.2	83	27	55.4		
	<u> </u>	Koriya		I		I	I	Į		
1	Vijenddra Electroncs	Mazar Chowk, Sonhat, Koriya	23	28	41.5	82	31	2.6		
2	Aman Electroncs	Main Road, Sonhat, Koriya	23	28	43.4	82	31	2.8		
3	Vandana Telecom	Main Road, Baikunthpur, Koriya	23	28	53.0	82	31	4.1		
4	Kaish Electronics	Main Road, Baikunthpur, Koriya	23	15	40.6	82	33	40.3		
5	Upkar Electronics	Main Market, Baikunthpur, Koriya	23	15	41.0	82	33	40.4		
6	Sangeet Mahal	Ghadi Chowk, Baikunthpur, Koriya	23	15	43.7	82	33	40.3		
7	Shivam Music	Ghadi Chowk, Baikunthpur, Koriya	23	15	44.3	82	33	40.0		
8	Baijnath Prasad Ayodhya Prasad	Ghadi Chowk, Baikunthpur, Koriya	23	15	43.1	82	33	39.3		
9	Super Electronics	Main Road, Baikunthpur, Koriya	23	15	43.2	82	33	35.9		
10	Surya Electronics	Main Road, Baikunthpur, Koriya	23	15	43.5	82	33	35.8		
11	Vikas Electronics	Manendragarh Road, Baikunthpur, Koriya	23	15	46.4	82	33	31.1		
12	Sri Krishna Distributer (Whirlpool)	Nehru Ward No-14,Manendragarh, Koriya	23	12	44.3	82	11	2.8		
13	Balmik Electronics	Nehru Ward, Manendragarh, Koriya	23	12	47.0	82	12	3.0		
14	Vivek Electronics	Sai Baba Tiraha, Manendragarh, Koriya	23	12	47.9	82	12	2.9		
15	Leela Sales	Sai Baba Tiraha, Manendragarh, Koriya	23	12	49.4	82	12	4.8		
16	Nafis Watch & Electronics	Mohar Para, Manendragarh, Koriya	23	12	53.5	82	12	2.4		
17	Amar Agency	Old Nagar Palika Office, Manendragarh, Koriya	23	12	55.3	82	12	7.3		
18	Shyran Electronics	Guru Dwara Road, Manendragarh, Koriya	23	12	52.2	82	12	8.4		

SI No	Name	Address Latitude Longi						Address Latitude Longitude				le
01.110.	ivanc	Autress	Deg.	Min.	Sec.	Deg.	Min.	Sec.				
19	Agarwal Electronics	Station Road, Manendragarh, Koriya	23	12	58.4	82	12	2.9				
20	Rahul Agency	Ambikapur Road, Manendragarh, Koriya	23	13	6.2	82	12	40.4				
		Surguja		1	1	1	1	I				
1	Sri Ram Electronics Mobile & Eletronics	Hospiral Road, Ambikapur, Sarguja	2	23 6	46.4	83	11	41.0				
2	Amber Light & Electronics	School Road, Ambikapur, Sarguja	23	7	28.3	83	11	55.3				
3	Luxus Enterprises	New Market, Ambikapur, Sarguja	23	7	22.8	83	11	50.9				
4	Alankar Electronice	Maha Maya Chowk, Ambikapur, Sarguja	23	7	23.0	83	11	50.7				
5	Devsar Enterprises	Maha Maya Chowk, Ambikapur, Sarguja	23	7	22.8	83	11	51.2				
6	Satyam Electronics	Deviganj Road, Sangam Chowk Ambikapur, Sarguja	23	7	26.7	83	11	43.6				
7	Natioal Electronics	School Road, Ambikapur, Sarguja	23	7	43.4	83	12	4.0				
8	Sri Ram Electronics	Pratap Naka, Ambikapur, Sarguja	23	8	16.5	83	11	52.6				
9	Raj Electronics	Nawa Para, Ambikapur, Sarguja	23	8	3.4	83	11	7.3				
10	Ashok Electronics	Near Old Bus Stand, Ambikapur, Sarguja	23	7	49.5	83	11	20.1				
11	Manoj Electronics	Jai Stambh Chowk, Ambikapur, Sarguja	23	7	5.2	83	11	45.7				
12	Swagat Enterprises	Jai Stambh Chowk, Ambikapur, Sarguja	23	7	5.9	83	11	46.0				
13	Srikant Enterprises	Bramh Road, Ambikapur, Sarguja	23	7	22.6	83	11	40.4				
14	Deshraj Electronics	Bilaspur Road Road, Udaipur, Sarguja	22	54	37.2	82	56	34.9				
15	Ravi Electronics& Mobile	Main Market, Udaipur, Sarguja	22	54	37.4	82	56	40.0				
16	Gaurav Radio	Main Market, Udaipur, Sarguja	22	54	37.6	82	56	47.4				
17	Janta Electronics	Near Rest House, Lakhanpur, Sarguja	22	58	49.1	83	2	47.5				
18	Manohar Radio	Ambikapur Road, Lakhanpur, Sarguja	22	58	52.4	83	2	47.7				
19	Janta Watch & Electronics	Ambikapur Road, Lakhanpur, Sarguja	22	58	52.7	83	2	47.9				
20	Baba Musical & Mobile	Ambikapur Road, Lakhanpur, Sarguja	22	58	53.5	83	2	47.6				

SI No	Name	Address	Latitude		Latitude Longitude					le
01.140.			Deg.	Min.	Sec.	Deg.	Min.	Sec.		
21	Nazir Electronics	Main Road, Lakhanpur, Sarguja	22	59	11.1	83	2	50.9		
22	Trimurti Enterprises	Main Road, Lakhanpur, Sarguja	22	58	55.5	83	2	48.7		
23	Agarwal Radio & Mobile	Beldgi Road, Lakhanpur, Sarguja	22	58	47.7	83	2	47.4		
24	Shivam Photo Studio & Electronic	Main Road, Sitapur, Sarguja	22	46	48.4	83	29	38.4		
25	Santosh Electronics	Main Road, Sitapur, Sarguja	22	47	18.3	83	29	27.8		
26	Taj Electrical	Main Road, Sitapur, Sarguja	22	47	31.6	83	29	19.5		
27	Dipanshu Electronics	Bagich Chowk, Batauli, Sarguja	22	58	34.4	83	24	44.0		
28	Bishanu Electronics	Bagich Chowk, Batauli, Sarguja	22	58	35.4	83	24	45.5		
29	Pragya Electronics	Main Road, Sitapur, Sarguja	22	58	39.3	83	24	41.1		
30	Amit Radio &Electronics	Main Road, Sitapur, Sarguja	22	58	46.1	83	24	36.5		
31	Umesh Radio &Electronics	Main Road, Sitapur, Sarguja	22	58	38.4	83	24	41.8		
		Surajpur	1		1	I				
1	Uma Electonics	Main Maket, Bhaiyathan, Surajpur	23	23	24.9	82	50	56.5		
2	Garg Electronics	Main Road, Bhaiyathan, Surajpur	23	23	23.1	82	50	55.9		
3	Goyal Electronics	Main Road, Bhaiyathan, Surajpur	23	23	22.2	82	50	55.5		
4	Prayag Electronics	Main Road, Bhaiyathan, Surajpur	23	23	21.6	82	50	55.9		
5	Ashu Electronics	Main Market, Odgi, Surajpur	23	28	41.6	82	48	18.5		
6	Singhal Radio	Main Market, Bishrapur, Surajpur	23	11	5.3	82	58	26.6		
7	Jain Electronics	Main Road, Bishrapur, Surajpur	23	11	5.1	82	58	25.4		
8	Music Parlor	Main Market, Bishrapur, Surajpur	23	11	5.6	82	58	23.8		
9	Vikash Electronics	Main Market, Bishrapur, Surajpur	23	11	6.0	82	58	17.3		
10	G A Electronics	Main Market, Bishrapur, Surajpur	23	11	6.7	82	58	11.8		
11	Shringar Sadan Electronics	Main Market, Bishrapur, Surajpur	23	11	5.7	82	58	10.9		
12	Kheda Electronics	Main Market, Bishrapur, Surajpur	23	11	6.4	82	58	7.6		
13	Ashok Radio Center	Bhaiyathan Road, Surajpur	23	12	59.2	82	52	0.7		
14	Ekta Electronics	Bhaikunthpur Road, Surajpur	23	12	52.0	82	51	56.6		
15	R K Radio	Bhaikunthpur Road, Surajpur	23	12	52.5	82	51	56.2		
16	Suraj Electronics	Bhaikunthpur Road, Surajpur	23	12	53.3	82	51	54.8		

Sl. No.	Name	Address			Latitude			le
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
17	Payal Electronics	Manendragarh Road, Surajpur	23	12	53.1	82	51	54.9
18	Ayus Radio	Manendragarh Road, Surajpur	23	12	56.6	82	51	44.2
19	Amit Radio	Manendragarh Road, Surajpur	23	12	56.2	82	51	46.7
20	New Satya Electronics	Manendragarh Road, Surajpur	23	12	54.1	82	51	51.0
21	Singhal Radio	Near Bus Stand, Surajpur	23	12	51.2	82	52	9.3
22	Vicky Electronics	Main Chowk, Pratappur, Surajpur	23	29	8.7	83	12	25.3
23	Akash Electronics	Main Chowk, Pratappur, Surajpur	23	29	6.8	83	12	24.3
24	Maa Mahamaya Electronics	Kadapara, Pratappur, Surajpur	23	29	5.7	83	12	36.5
25	Gupta Electronics	Kadapara, Pratappur, Surajpur	23	29	4.1	83	12	36.6

SI No	Name	Address Latitude Lon					ongitu	de
01.110.	ivanc		Deg.	Min.	Sec.	Deg.	Min.	Sec.
		Balrampur	1			<u> </u>		<u> </u>
1	Tahsil office	Balrampur	23	36	8.2	83	36	32.5
2	Collectrate office	Balrampur	23	36	31.6	83	37	2.5
3	Zila Panchayat office	Balrampur	23	36	30.7	83	37	5.1
4	Tahsil office	Shankargarh	23	18	3.8	83	36	19.6
5	Nagar Nigam office	Rajpur	23	20	16.6	83	25	3.6
6	Tahsil office	Rajpur	25	20	28.6	83	25	15.5
		Jashpur	1	1		1	1	
1	Collectrate office	Jashpur	22	52	36.4	84	8	27.8
2	Lok sewa kendra	Jashpur	22	52	36.1	84	8	27.2
3	Tahsil office	Jashpur	22	52	36.8	84	8	28.0
4	Nagar Nigam office	Jashpur	22	53	23.1	84	8	27.9
5	Tahsil office	Kunkuri	22	45	5.9	83	57	41.6
6	Janpat Panchayat office	Pathargaon	22	33	23.0	83	27	38.3
		Koriya	1	I	<u> </u>		1	I
1	Tahsil office	Sonhat	23	28	56.8	82	31	11.7
2	Collectrate office	Baikunthpur	23	18	1.4	82	33	20.8
3	Tahsil office	Baikunthpur	23	15	57.3	82	33	51.0
4	Lok Sewa Kendra	Baikunthpur	23	15	57.3	82	33	492
5	Nagar Palika office	Manendragarh	23	12	47.2	82	12	8.3
6	Tahsil office	Manendragarh	23	12	54.5	82	12	25.9
7	Janpat Panchayat office	Manendragarh	23	12	53.9	82	12	26.7
8	PWD office	Manendragarh	23	12	53.6	82	12	27.5
		Surguja						
1	District Court	Ambikanur	23	7	41 5	83	11	16.6
			2.5	-	71.5	0.0	11	10.0
2	I absil office	Ambikapur	23	7	39.2	83	11	14.6

Sl. No.	Name	Address	Latitude		L	ongitu	de	
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
3	Collectrate office	Ambikapur	23	7	35.6	83	11	19.0
4	Nagar Palika office	Ambikapur	23	7	44.8	83	11	25.0
5	Tahsil office	Lakhanpur	22	59	42.3	83	3	3.9
6	Tahsil office	Sitapur	22	48	15.0	83	28	58.6
		Surajpur						
1	Tahsil office	Bhaiyathan	23	23	24.0	82	51	0.0
2	Janpat Panchayat office	Bhaiyathan	23	23	24.2	82	51	2.2
3	Tahsil office	Odgi	23	28	41.3	82	48	16.1
4	Tahsil office	Bishrapur	23	11	2.6	82	57	39.6
5	Civil Court	Surajpur	23	12	48.5	82	52	10.8
6	Collectrate office	Surajpur	23	12	45.4	82	52	17.9
7	Tahsil office	Surajpur	23	12	44.1	82	52	24.1
8	Janpat Panchayat office	Pratappur	23	29	5.0	83	12	11.4
9	Tahsil office	Pratappur	23	29	2.8	83	11	47.5

Partial list of Service centers in Surguja Division- Annexure-4

Sl. No.	Name of Shops	Address		Latitude	e	Longitud	le	
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
		Balrampur						
1	Smart Computer	Main Market, Balrampur	23	36	36.3	83	37	12.1
2			22	26	20.7	0.2	27	10.1
2	Par Electronics	Mission Koad, Bairampur	23	- 20	29.7	65	57	10.1
3	Khusi Electroics	Mission Road, Balrampur	23	36	29.5	83	37	10.5
4	R.K.Radio	Chando Road, Balrampur	23	36	19.7	83	37	2.9
5	Shabnam Electronics	Main Road, Shankargarh, Balrampur	23	18	3.8	83	36	19.6
6	Raquib Electronics	Main Road, Shankargarh, Balrampur	23	18	3.4	83	36	11.6
7	Shabnam Electronics (Mobile shop)	Main Market, Shankargarh, Balrampur	23	18	3.6	83	36	11.5
8	Sri Balaji Bartan & Electronics	Main Road, Shankargarh, Balrampur	23	18	2.4	83	36	11.1
9	Sandeep Electronics	Bachwar Road, Shankargarh, Balrampur	23	18	1.7	83	35	38.4
10	Ashok Electronics	Main Road, Rajpur, Balrampur	23	20	7.2	83	24	22.1
11	Sharma Mobile & Electronics	Main Road, Rajpur, Balrampur	23	20	11.3	83	24	7.2
12	Irfan Electronics	SBI Road, Ramanujganj, Balrampur	23	48	25.7	83	42	7.0
13	Mohit Electronics	Main Market, Ramanujganj, Balrampur	23	48	15.5	83	42	4.5
14	Raju Electronics	Main Market, Ramanujganj, Balrampur	23	48	14.9	83	42	3.2
15	Khusaboo Watch & Electronics	Chadani Chowk, Ramanujganj, Balrampur	23	48	23.6	83	41	50.7
16	Rajesh Electronics	Larang say Chowk, Ramanujganj, Balrampur	23	48	27.5	83	41	48
17	Ayub Ayush Electronics	Varanasi Road, Wadraf Nagar, Balrampur	23	45	52.8	83	11	40.1
18	Javed Electronics	Balangi, Wadraf Nagar, Balrampur	23	45	50.1	83	11	34.9
19	Vikash Electronics	Balangi, Wadraf Nagar, Balrampur	23	45	49.7	83	11	34.7
20	Sachan Electronics	Balangi, Wadraf Nagar, Balrampur	23	45	50.9	83	11	35.9
21	Nausad Electronics	Main Market, Wadraf Nagar, Balrampur						
22	Jay Electronics	Main Market, Wadraf Nagar,	23	43	49.1	83	11	39.9

SI, No.	Name of Shops	Address Latitude Longitude						le
01.140.	Funce of onopo	induices.	Deg.	Min.	Sec.	Deg.	Min.	Sec.
		Balrampur						
23	Suhail Electronics	Pratappur Road, Wadraf Nagar, Balrampur	23	45	46.5	83	11	43.2
	L	Jashpur		Į	<u> </u>	Į		I
1	Jashpur Radio	Near Bus Stand, Jashpur	22	53	18.4	84	8	29.9
2	Balaji Electronics	Near Bus Stand, Jashpur	22	53	18.2	84	8	30.3
3	Raja Electronics	College Road, Jashpur	22	53	18.7	84	8	30.9
4	Minz Electronics	Karbala Road, Jashpur	22	53	22.9	84	8	26.7
5	Vinod Electronics	Karbala Road, Jashpur	22	53	21.4	84	8	25.7
6	Vishwakarma Electronics	Near Shiv Mandir, Sanna Road, Jashpur	22	53	22.5	84	8	15.8
7	Anjali Electronics	Madhuban Toli Road, Jashpur	22	53	6.2	84	8	9.3
8	Maa Durga Electronics	Ganbaria, Raipur Road, Jashpur	22	52	14.7	84	9	18.7
9	Sakeel Electronics	Tapashya Complex, Kansabel, Jashpur	22	38	47.2	83	44	31.3
10	Friends Mobile & Electronics	Main Road, Kansabel, Jashpur	22	38	45.6	83	44	32.1
11	National Electronics	Main Road, Kansabel, Jashpur	22	38	42.6	83	44	32.0
12	National Electronics & Refrigeration	Main Road, Kansabel, Jashpur	22	38	42.4	83	44	32.0
13	Kuldeep Electronics	Church Road, Main Chowk, Kansabel, Jashpur	22	38	32.5	83	44	29.3
14	Dubey Repairing Shop	Church Road, Kansabel, Jashpur	22	38	32.1	83	44	29.5
15	JMD Refrigeration	Church Road, Kansabel, Jashpur	22	38	30.3	83	44	29.0
16	Anoop Electronics	Jashpur Road, Kunkuri, Jashpur	22	44	35.9	83	57	19.3
17	Kumar Electronics	Main Road, Kunkuri, Jashpur	22	44	27.9	83	56	57.9
18	Singh Radio Center	Pathargaon Road, Kunkuri, Jashpur	22	44	25.5	83	56	51.5
19	Ishwari Refrigeration	Main Road, Kunkuri, Jashpur	22	44	25.1	83	56	51.1
20	Aman Electronics & Refrigeration	Main Road, Kunkuri, Jashpur	22	44	25.7	83	56	50.1
21	Prakash Electronics	Bazar Road, Kunkuri, Jashpur	22	44	30.2	83	56	58.5
22	Diamond Electronics	Near Bus Stand, Kunkuri, Jashpur	22	44	26.2	83	56	59.7
23	Subham Electronics &	Tapkara Road, Kunkuri, Jashpur	22	44	21.7	83	57	2.9

SI No	Name of Shops	Address Latitude Longitude			Latitude		le	
011140.	Tunic of onopo		Deg.	Min.	Sec.	Deg.	Min.	Sec.
	Refrigeration							
24	Subhir Electronics	Raigarh Road, Pathargaon, Jashpur	22	33	14.3	83	27	29.2
25	Singh Electronics	Abikapur Road, Pathargaon, Jashpur	22	33	25.5	83	27	32.8
26	Rohila Electronics	Abikapur Road, Pathargaon, Jashpur	22	33	39.7	83	27	28.7
		Koriya	<u></u>	Į	<u></u>	Į	<u></u>	<u>.</u>
1	Vijenddra Electroncs	Mazar Chowk, Sonhat, Koriya	23	28	41.5	82	31	2.6
2	Uma Electronics	Main Road, Sonhat, Koriya	23	28	40.1	82	31	2.1
3	Maa Ambey Mobile Shop	Main Road, Sonhat, Koriya	23	28	46.7	82	31	2.8
4	Raza Mobile & Repairing	Main Road, Sonhat, Koriya	23	28	49.8	82	31	2.5
5	Vinod Electronics	Durga Mandir, Main Road, Sonhat, Koriya	23	28	53	82	31	4.1
6	Super Electronics	Main Road, Baikunthpur, Koriya	23	15	43.2	82	33	35.9
7	Surya Electronics	Main Road, Baikunthpur, Koriya	23	15	43.5	82	33	35.8
8	Guddu Electronics	School Para, Baikunthpur, Koriya	23	15	52.2	82	33	25.5
9	Wale Guru Electronics	Bhatti Para, Baikunthpur, Koriya	23	16	16.5	82	33	10.9
10	Indore Refrigeration	Bhatti Para, Baikunthpur, Koriya	23	16	18	82	33	9.9
11	Ajay Electronics	Talwa Para, Baikunthpur, Koriya	23	16	51.9	82	33	11.2
12	Meghani Electronics	Sai Baba Tiraha, Manendragarh, Koriya	23	12	48.8	82	12	3.9
13	Freez Services	Cendral Hospiral Road, Manendragarh, Koriya	23	12	42.8	82	12	33.6
14	S S Electronics	Mahar Para, Manendragarh, Koriya	23	12	53.7	82	11	57.7
15	Shree Watch & Radio	Near Bus Stand, Manendragarh, Koriya	23	12	13.4	82	12	13.4
		Surguja	<u> </u>	Į	<u> </u>	Į	L	L
1	Sunit Electronics	Manipur, Bilaspur Road, Abmikapur, Sarguja	23	6	24.9	83	11	31.2
2	Ama Electronics	Kharsia Naka, Ambikapur, Sarguja	23	6	44.2	83	12	6.5
3	Jai Maha Maya Electronics	Mayapur, Ambikapur, Sarguja	23	7	25.2	83	12	8.0
4	Rakesh Radio	Maha Maya Chowk, Ambikapur, Sarguja	23	7	25	83	11	47.7

SI, No.	Name of Shops Address Latitude				Latitude L			
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
5	Shiv Electronics	Sangam Chowk, Ambikapur, Sarguja	23	7	27.3	83	11	42.2
6	Shankar Electronics	Satti Para, Ambikapur, Sarguja	23	7	16.9	83	11	23.2
7	Soni Electronics	Bori Para, Ambikapur, Sarguja	23	7	42.9	83	12	5.5
8	Cooling Center	Nawa Para, Ambikapur, Sarguja	23	7	55.6	83	11	12.0
9	Sarguja Refrigeration	Chopda Para, Ambikapur, Sarguja	23	7	49.5	83	11	20.1
10	Manoj Radio Center	Near Old Bus Stand, Ambikapur, Sarguja	23	7	5.6	83	11	35.8
11	Dipak Radio	Jai Stambh Chowk, Ambikapur, Sarguja	23	7	3.3	83	11	44.4
12	Satya Cool World	Near Old Bus Stand, Ambikapur, Sarguja	23	7	3.3	83	11	35.6
13	TV Repairing Shop	Near Old Bus Stand, Ambikapur, Sarguja	23	7	3.5	83	11	35.6
14	Deshraj Electronics	Bilaspur Road Road, Udaipur, Sarguja	22	54	37.2	82	56	34.9
15	Singh Computer	Bilaspur Road, Udaipur, Sarguja	22	54	39.2	82	56	31.6
16	Pappu Electronics	Main Road, Udaipur, Sarguja	22	54	37.8	82	56	42.5
17	Rajwade Electronics	Main Market, Udaipur, Sarguja	22	54	37.8	82	56	46.2
18	Rajesh Radio	Main Market, Udaipur, Sarguja	22	54	38.2	82	56	46.9
19	Gaurav Radio	Main Market, Udaipur, Sarguja	22	54	37.6	82	56	47.4
20	Janta Electronics	Near Rest House, Lakhanpur, Sarguja	22	58	49.1	83	2	47.5
21	Laxmi Mobile & Electronics	Ambikapur Road, Lakhanpur, Sarguja	22	58	52.3	83	2	46.9
22	Rajwade Electronics	Main Road, Lakhanpur, Sarguja	22	58	54.5	83	2	47.8
23	Vijesh Electronics	Main Road, Lakhanpur, Sarguja	22	58	54.9	83	2	48.1
24	Gyan Deep Electronics	Beldgi Road, Lakhanpur, Sarguja	22	58	47.7	83	2	47.0
25	Dwivedi Mobile & Electronics	Main Road, Sitapur, Sarguja	22	46	58.9	83	29	38.7
26	Vikas Electronics	Main Road, Sitapur, Sarguja	22	47	5.5	83	29	35.2
27	Maha Maya Electronics	Main Road, Sitapur, Sarguja	22	47	17.6	83	29	28.2
28	Pankaj Watch & Electronics	Sitapur Road, Batauli, Sarguja	22	58	28.9	83	24	47.1
	L	Surajpur		I	I	1		1
1	Kamal Electronics	Near Poice Stn., Pratappur Road,	23	23	27.6	82	51	0.7
		•						

Sl. No.	Name of Shops	Address		Latitude	e	Longitude		
	- the second sec		Deg.	Min.	Sec.	Deg.	Min.	Sec.
		Bhaiyathan, Surajpur						
2	Geetanjali Electronics	Pratappur Road, Bhaiyathan, Surajpur	23	23	28.9	82	51	6.2
3	Prince Electronics	Main Market, Odgi, Surajpur	23	28	41.2	82	48	19.8
4	Sanju Electronics	Bilaspur Road, Odgi, Surajpur	23	28	41.7	82	48	22.3
5	Rajwade Electronics	Near Bus Stand, Odgi, Surajpur	23	28	39.4	82	48	16.9
6	Tanvir Refrigeration	Station Road, Bishrapur, Surajpur	23	10	47.5	82	58	49.4
7	Khan Electronics	Station Road, Bishrapur, Surajpur	23	10	49.0	82	58	47.8
8	G N Electronics	Main Market, Bishrapur, Surajpur	23	11	5.4	82	58	26.8
9	Santosh Electronics	Main Market, Bishrapur, Surajpur	23	11	5.5	82	58	26.8
10	Kajal Electronics	Main Market, Bishrapur, Surajpur	23	11	5.2	82	58	26.0
11	Vikash Electronics	Main Market, Bishrapur, Surajpur	23	11	6.0	82	58	17.3
12	Munna Electronics	Main Market, Bishrapur, Surajpur	23	11	5.9	82	58	15.8
13	Vinod Radio	Near Bus Stand, Bishrapur, Surajpur	23	11	7.1	82	58	0.1
14	Laxmi Electronics	Near Bus Stand, Bishrapur, Surajpur	23	11	6.0	82	57	54.4
15	Chanchal Electronics	Bhaiyathan Road, Surajpur	23	13	7.5	82	52	0.3
16	Bombay Electronics	Bhaiyathan Road, Surajpur	23	13	5.1	82	52	0.3
17	Manoj Radio	Main Road, Surajpur	23	12	52.4	82	51	57.0
18	S K Electronics	Bhaikunthpur Road, Surajpur	23	12	52.8	82	51	55.2
19	A K Electronics	Manendragarh Road, Surajpur	23	12	55.8	82	51	47.3
20	Aman Electronics	Near Bus Stand, Pratappur, Surajpur	23	29	15.8	83	12	31.7
21	Jai Bhawani TV Repairing	Main Road, Pratappur, Surajpur	23	29	7.2	83	12	27.6
22	Raj Electronics	Main Road, Pratappur, Surajpur	23	29	7.5	83	12	29.7
23	Sri Sai Electronics	Main Road, Pratappur, Surajpur	23	29	7.6	83	12	30.1
24	Ajay Electronics	Main Road, Pratappur, Surajpur	23	29	7.7	83	12	32.7

Inventory of Physically Established Collection Center- Annexure 5

Sl No.	Name	Address
1.	M/s Navrachna Recycling Pvt. Ltd.	Plot No 1B, Somni Industrial Area, Rajnandgaon
2.	M/S ADV Metal Combine Private Limited	Borai Industrial Growth Center, Durg

Sl. No. Name		Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
		Balrampur						
1	Javed	Chando Road, Balrampur	23	25	53.9	83	37	2.3
2	Tabrej	Mission Road, Balrampur	23	36	27.9	83	37	41.0
3	Dipu Gupta	Shanti para, Balrampur	23	36	47.7	83	37	15.8
4	Umesh	Dhanna Road, Shanti para, Balrampur	23	37	1.3	83	37	25.3
5	Ram Kumar	Jail Road, Ramanujganj, Balrampur	23	48	32.0	83	14	43.4
6	Sanjay Gupta	Ring Road, Ramanujganj, Balrampur	23	48	33.8	83	42	4.4
7	Uday Gupta	Gandhiji Road, Ramanujganj, Balrampur	23	48	10.1	83	42	5.8
8	Roshan lal	Balangi, Wadraf Nagar, Balrampur	23	45	54.3	83	11	35.0
		Jashpur				1		
1	Haseeb	Near Jain Mandir, Jashpur	22	53	22.4	84	8	36.1
2	Tipu Manihar	Jyoti Niwas Road, Jashpur	22	53	45.7	84	7	58.4
3	Mukhtar	Pathargaon Road, Kunkuri, Jashpur	22	44	24.8	83	56	54.4
4	Irfan	Abikapur Road, Pathargaon, Jashpur	22	33	31.6	83	27	32.9
		Koriya	<u> </u>	<u> </u>	<u> </u>	I	<u> </u>	<u> </u>
1	Saddam Quiraisi	Jabri Para, Baikunthpur, Koriya	23	15	33.7	82	33	26.1
2	Shyam Srivastava	Rai baba Tiraha, Manendragarh, Koriya	23	12	49.2	82	12	2.8
3	Chunmun	Rai Mahal Para, Manendragarh, Koriya	23	12	53.3	82	12	1.1
4	Raju	Arab Baba, Sahdol Road, Manendragarh, Koriya	23	12	41.1	82	11	45.3
5	Badru Jama	Arab Baba, Sahdol Road,	23	12	45.9	82	11	48.4

Sl. No.	Name	Name Address		Latitude			Longitude			
				Min.	Sec.	Deg.	Min.	Sec.		
		Manendragarh, Koriya								
6	Kahira Begam	Near College, Manendragarh, Koriya	23	12	27.9	82	11	56.8		
		Surguja		•		•	•			
1	Jasmudding	Near Old Bus Stand, Ambikapur, Sarguja	23	7	2.4	83	11	33.4		
2	Mohd Faiyaz	Bilaspur Road, Ambikapur, Sarguja	23	6	24.9	83	11	31.2		
3	Shyam Agarwal	Kharsia Road, Ambikapur, Sarguja	23	6	55.5	83	11	44.6		
4	Lal Ji	Kharsia Naka, Ambikapur, Sarguja	23	6	39.5	83	12	12.0		
5	Mohd Faiyaz	Nawagarh, Ambikapur, Sarguja	23	6	54.2	83	12	29.2		
6	Golu	Chadani Chowk, Ambikapur, Sarguja	23	7	23.2	83	12	20.4		
7	Munna	Near Bus Stand, Lakhanpur, Sarguja	22	58	49.7	83	2	50.1		
Surajpur										
1	Islam Bhai	Sunday Market, Bishrapur, Surajpur	23	11	9.9	82	58	19.6		
2	Gulam Ahmad	Sunday Market, Bishrapur, Surajpur	23	11	11.2	82	58	23.4		
3	Sonu	Mahgawa, Surajpur	23	13	50.7	82	52	5.1		
4	Buki	Bhaiyathan Road, Surajpur	23	13	44.5	82	51	54.1		
5	Sanjay Sahu	Back side of Bus Stand, Surajpur	23	12	54.4	82	52	8.4		
6	Gulshan	Near Govt. Hospital, Pratappur, Surajpur	23	29	6.8	83	12	16.2		

Annexure-7









Sample Photo Documentation Annexure-8







Annexure - 9

Methods for Inventory Assessment

The Time Step Method

The calculation of WEEE/E-waste is made on the basis of private and industrial stock and sales data. Mathematically, the time step method is given below.

WEEE generation (t) =Stock (t1) – Stock (t)] private + [Stock (t1) - Stock (t)] industry + • Sales (n) - • WEEE (n) n=t1+1 to t-1 n=t1+1 to t with t1 < t

Stock private = Number of households * (saturation level of households / 100)

= Population / average size of household * (saturation level of households / 100)

Stock industry = number of work places * (saturation level in the industry / 100)

= number of employees / number of users per appliance *saturation level in the industry/100

The Market Supply Method

The calculation of WEEE/ E-waste is made from sales data, together with typical lifespan. The waste potential during collection phase at time t is calculated from sales figures and information about consumption patterns. Mathematically, the market supply method is given below.

WEEE generation (t) = sales $(t - d_N)$ + reuse $(t - d_S)$ Where,

- $d_{\ensuremath{\mathbf{N}}}$ Average lifetime of new items
- dS Average lifetime of second-hand items

The Carnegie Mellon Method

This method is a variation of "market supply method", where the calculation of WEEE/E-waste is made from sales data, assumptions about typical lifetimes, recycling and storage. The model considers consumer behaviour when disposing of end-of-life EEE. This method defines the pathways of electrical and electronic equipment from purchase to end-of-life. At the point of obsolescence, there are four options of reuse, storage, recycling & landfill available to the owner.

Approximation 1

The calculation of WEEE is estimated on the basis of stock and average lifetime data. This method has also been referred to as the 'Consumption and Use' method. This method was used to calculate WEEE/ E-waste in the Netherlands. Mathematically, the method is represented by the following equation.

WEEE generation (t) = [Stock private (t) + Stock industry (t)] / average lifetime

Stock private = Number of households *saturation level of the households / 100

= Population / average size of household *saturation level of the households / 100

Stock industry = number of work places *saturation level in the industry / 100

= number of employees/number of users per appliance *saturation level in the industry /

100

Approximation 2

This method is based on the assumption, that with the sale of a new appliance, an old appliance has to be disposed of. Mathematically, it can be represented as given below.

WEEE generation (t) = sales (t)

Methodology/Features	Requirements	Constraints	Advantages
The Time Step Method	 Information about domestic sales. Appliance stock levels for household. Industrial stock levels. 	 Household saturation levels are based on predetermined stock levels Industrial stock levels are assumed in the calculations because they are difficult to obtain and require assumptions. Assumption that all the WEEE/E-waste generated is collected and transferred to treatment and disposal facility. 	 Calculations can be carried out very easily. Method gives good results in a saturated market.
The market Supply Method	 Information about domestic sales. Average life of new and second hand items. 	 The average life is to a large extent is subjective because in most of the developed countries electrical and electronic equipment is often replaced and disposed of before it reaches its technical end-of-life. WEEE/ E-waste are often stored for years. Assumed that all appliances produced in the same year will be in line for disposal after exactly the average life. Assumption that the average variance in life of items of EEE does not change very much, whereas, in reality, lifetimes may become shorter in the future. Therefore, this method is not especially useful in the 	 Necessary data need not be very wide-ranging Calculations can be carried out very easily using a simple formula Sales data is derived from official statistics from market research institutes or trade organisations and are of good quality and available for a large number of products.

Features of the five inventory assessment methods

Methodology/Features	Requirements	Constraints	Advantages
		calculation of WEEE for a dynamic market where technology and life are changing rapidly.	
The Carnegie Mellon Method	Sales data, date for typical life times, recycling & storage.	 Assumptions are made regarding the pathways or "material flow" during reuse, storage, recycling and landfilling. These assumptions are both product and country specific and therefore demand a good knowledge of consumer behaviour and the disposal position. This model also requires a full coverage of sales data as early as possible in the WEEE/E-waste trade value chain. 	 The model allows for an electrical and electronic equipment to be purchased, reused, stored and finally recycled or landfilled representing "material flow" more precisely. This method is ideal for more extensive examination of individual products.
			Because of the larger amount of input data, the calculation of WEEE is clearly more extensively structured.
Approximation 1	The required input data for application of this method is stock data and assumptions about average lifetime of appliance.	 A product's constant mean lifespan is assumed in this method. This method is suitable for estimating WEEE in widely saturated markets with no major deviations from the mean lifespan, which is a subjective variable. 	This method is particularly useful when reliable stock data for an appliance is available
Approximation 2	Sales statistics is used to calculate WEEE/E-waste	1. This method is only suitable in a fully saturated market where the purchase of a	1. This method is suitable for carrying

Methodology/Features	Requirements	Constraints	Advantages
	generation in a particular year assuming a saturated market.	 product leads to the same quantity of waste from the old product. Therefore, this method has limited application in dynamic and developing markets because in these markets a larger part of the sales serves to increase stock and does not initially contribute to waste. 2. This method is unsuitable if the temporary storage or second use of old appliances plays a significant role in consumer behaviour. 	 out an initial assessment. 2. Very limited range of input data required for application of this method. 3. No historical data is required, only sales figures for a particular period of time are required.

Methodology/	Satur	ration Level	Number of	Calculated Sales Stock Data		Average	Storage						
Data Requirement	Household	Industry	Household	Export Data	Import Data	Manufacturing /Production	Private	Industry	Lifetime	data	Reuse	Recycle	Landfill
Time Step Method	\checkmark	\checkmark		V	V		V	V					
Market Supply Method				V	\checkmark	\checkmark			V				
Carnegie Mellon Method				V	\checkmark	\checkmark			\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
Approximation 1	\checkmark		$\overline{\mathbf{v}}$						V				
Approximation 2					V	\checkmark							

Data Requirements for E-waste Inventory Assessment

Note: √ means 'Yes'



Generic E-waste material flow chain

Methodology

A two-prolonged approach was adopted for the collection of relevant data and arriving at the results. Firstly, a primary survey was undertaken for data collection from the end users side. The information was then projected to the all-India level using robust projection techniques. Secondly, All-India estimates were validated by the feedback obtained from the vendors and the trade channel members.



End User Survey

Two broad user segments were covered in this phase of data collection viz. business establishments (having at least a telephone connection) and households (SEC A, B, C and D/E households). The following paragraphs explain the method of arriving at the final estimates from the end users route.

Business Establishments

A representative sample of establishments was contacted personally by our trained field personnel and relevant information on the IT products installed in the establishment during April 2012 to March 2013 and the number of units of each installed etc. was obtained. This information was then projected to the universe of establishment stratified by the Principal activity carried out at the respective establishment and the number of employees working in the respective establishment.

The detailed sampling process is as explained below:

Stratification of the Universe of Establishment

The universe of establishment was stratified on the basis of "Principal Activity carried out at the respective establishment" Classified by "Employee size" (ACE), which has been ascertained through an extensive telephonic survey conducted as a part of ITOPS' 97 – the baseline study in the ITOPS series. During the survey, 32000 telephonic contacts ware made in the Top 22 cities to determine the distribution of telephone owning establishments among different (nature of) Activity X Employee size (ACE) cells. This provided the ACE grid distribution for each of the 22 cities.

The universe of establishment as well as the ACE grid obtained from ITOPS' 97 is continuously updated and used for this study.

On the basis of the ACE grid composition thus obtained for each of the 22 centres covered, sample quota were set for the number of establishments that had to be contacted for each cell formed by the intersection of the nature of activity and numbers of employees as in the ACE grid.

Random starting addresses were selected from the telephone directory and at each starting address, 5 interviews were conducted with telephone owning establishments.

The variables used in ACE grid are robust indicator, which explains consumption of IT and Office automation products.

The market size for establishments has been obtained by applying product acquisition rate in each employee band to the respective size of universe of establishments in each city.



Households

With the growing awareness of the benefits of using IT at home, this segment has grown well in the last 3-4 years and offers a huge potential for such products. A representative sample of affluent households (SEC A, B and C & D/E) was personally contacted and relevant information was obtained. The universe of households for projection purpose has been taken from National Readership Survey 2006.

The steps involved in the household sampling and the purpose of these steps have been explained in the following table:

Step	Purpose
Random Listing	 To identify the target group household (SEC A/B/C/D/E) To determine the penetration of PC and other IT products in the households To stratify the household universe into 2 broad categories Pure households Home offices
Detailed interview with the Target Group Household	 To determine the market size and profile of the owners and non-owners To determine the brand share To determine the usage of IT products among the owners

Step	Purpose
	 To determine the intention to own IT products among the non-owners And to obtain there relevant information as needed for the study.

For the market size estimation for home offices and households, the acquisition rate in each SEC class in home offices and households were applied to their respective universe strata.

Validation from Vendors and Trade Channel

Major IT manufacturers of each of these products were contacted and their views and facts & figures on the sales during April 2012 to March 2013 and their likely share of the market were collected. This information was used to validate the findings of the End User Survey.

List of Sources of Data in the Study Area- Annexure 10

Industry/ Trade/ Recyclers/ Waste		
National/ Local Government Agencies	Disposal Operator's Association (Reports/ Published Data/ Field Work)	Market Research Agencies (Reports/ Published Data)
National Census Data, (1991, 2001 & 2011)	Major Trading Agencies, (Retailers)	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
National Census Data, (1991, 2001 & 2011)		
NSSO (1994 – 2010)	Industry Association, Scrap Dealers, Recyclers, EEE Retailers	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
TRAI, MOCIT, Govt of India.	Industry Association, Scrap Dealers, Recyclers, EEE Retailers	Business Trade (Apex Publications), Research Agencies, UN publications (ITU), & local & International Journals. Annual Reports of Major Brands
TRAI, MOCIT, Govt of India.	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications, Annual Reports of Major Brands
	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications, Newspapers
	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	Research Publications
	Major Trading Agencies (Retailers), Retailers, Scrap Dealers, Recyclers, EEE Retailers	
City Municipalities	Scrap Dealers, Recyclers, EEE Retailers	