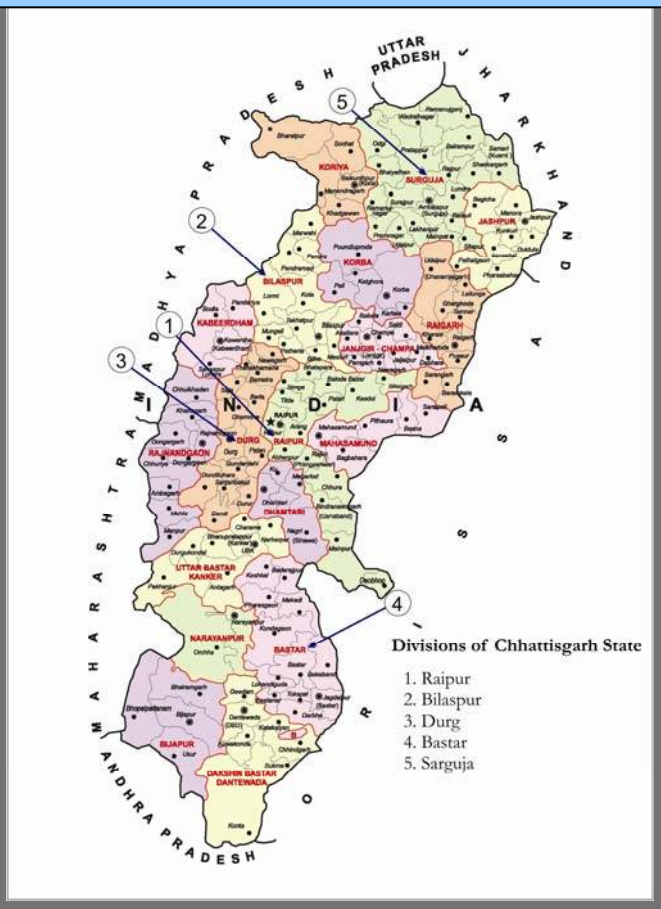
2016

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.

Producers: 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, 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.

Consumers: 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.

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. 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.

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.

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. 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 E-waste 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 E-waste 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 E-waste 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, Bastar and Sarguja. The overall aim of this initiative is to assess the generators, quantity and present practices for handling of E-waste 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**.

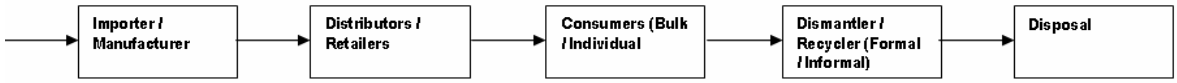


Figure 1.1: Conceptual WEEE business chain

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 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.

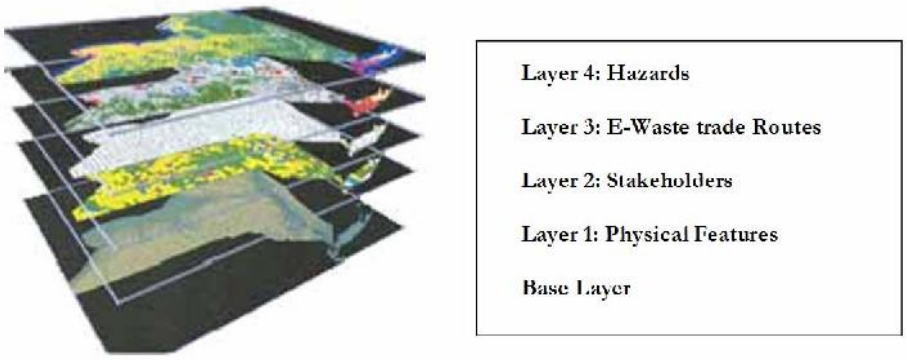


Figure 1.2: Geographical mapping of different attributes

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.

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**.

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, 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

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

Regulations / Guidelines	E-waste Management		Export & Import of E-waste	
	Pre 1st May 2012	Post 1st May 2012	Pre 1st May 2012	Post 1st May 2012
E-waste (Management & Handling) Rules 2011		√		
Hazardous Waste (Management, Handling & Transboundary) Rules 2008	√		√	√
Guidelines for Environmentally Sound Management of E-waste 2008	√	√		
Guidelines for Implementation of E-waste Regulations 2012	√	√		

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.

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
Collection	**Manufacturing**	√					
	End of Life	√					
Take-back	**Individual**	√					
	Collectively	√					
Transportation to	**Producer**		√	√			
	Collection Centre	√	√	√			
	Dismantlers/ Recyclers	√	√	√	√	√	
	TSDF* Facility	√				√	√
Storage					√	√	√
Financing		√					
Registration		√			√	√	
Filing of Annual Returns		√			√	√	√
Return of Annual Inventory Handled		√		√	√	√	√

Note: √ 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, poly-brominated 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 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.

<u>Scope of EPR for the Producer:</u>

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**.

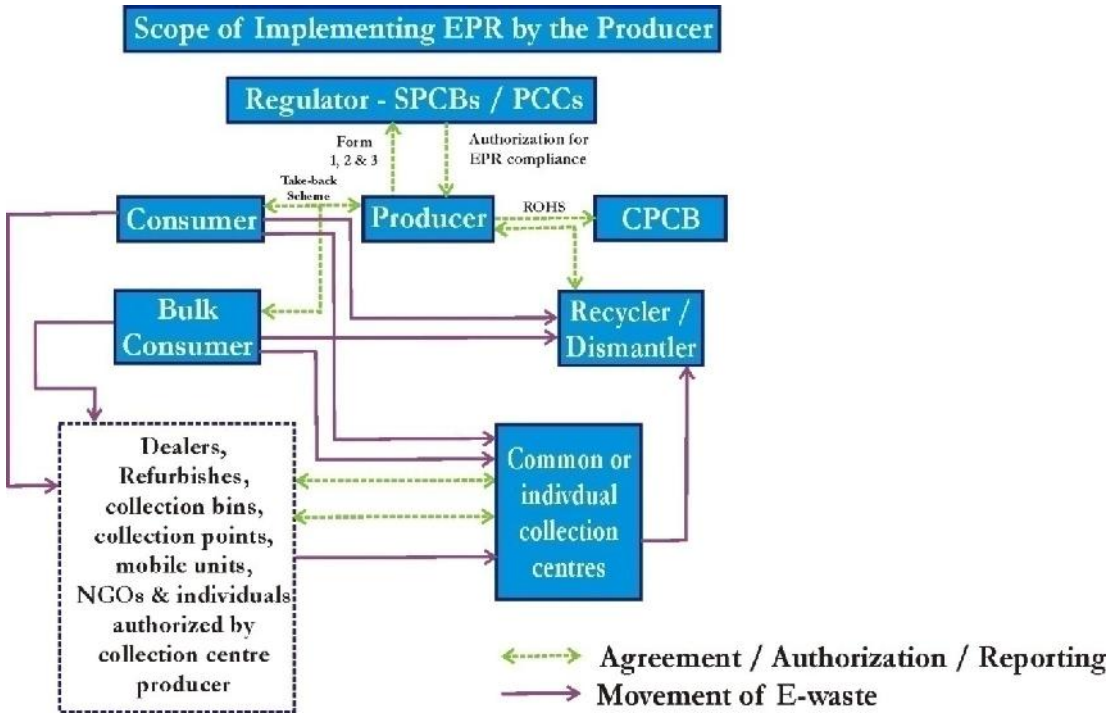


Figure 2.1: Scope of implementing EPR for Producers

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.

<u>The criteria for setting up collection centres are</u>

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.

    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**.

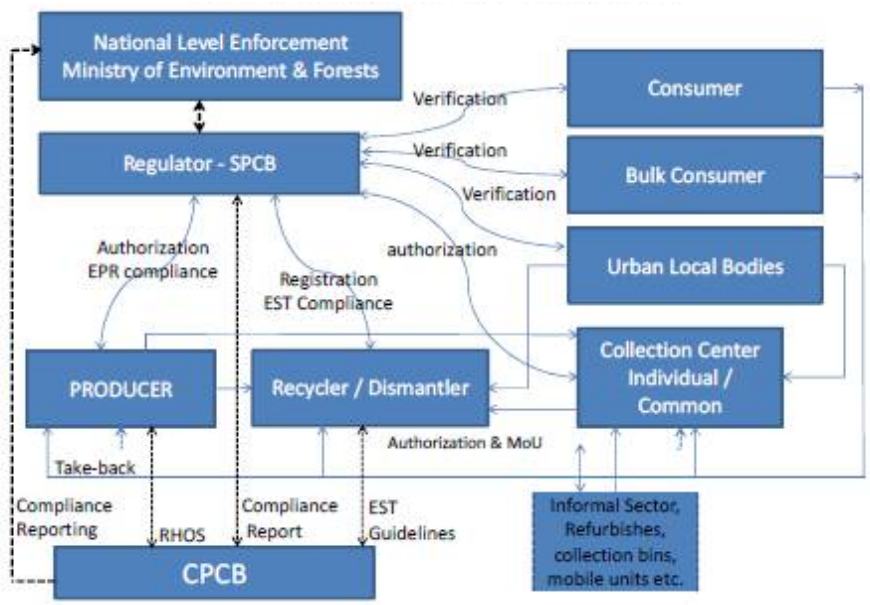


Figure 2.2: Implementation of E-Waste Rules 2011

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**.

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

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

Sr. No.	Authority/(ies)	Duties
		viii. Any other function delegated by the Ministry under these rules
3.	Urban Local Bodies (Municipal Committee/Council/Corporation)	(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**.

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
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 MoEF.
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.
5.	Directorate General of Foreign Trade constituted under the Foreign Trade (Development & regulation) Act 1992	i. Grant licence for import of hazardous wastes ii. Refuse licence for hazardous wastes prohibited for imports and exports.

Sr. No.	Authority/(ies)	Duties and Corresponding Rule
6.	Port Authorities under Indian Port Act 1908 and Customs Authorities under the customs Act, 1962	i. Verify the documents ii. Inform the ministry of Environment and Forests, Govt. of India of any illegal traffic 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	X	X	X	X
2.	Bulk Consumer	√	√	X	X	X	X
3.	Urban Local Bodies	√	X	X	X	X	X
4.	Collection Centre	√	√	√	√	X	X
5.	Producer –offer to sell	√	√	√	√	X	√
6.	Producer - importer	√	√	√	√	X	√
7.	Producer - Manufacturing EEE	√	√	√	√	X	√
8.	Dismantler	√	√	√	√	√	X
9.	Recycler	√	√	√	√	√	X

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 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.

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 Telecommunication Equipment**																				
1.	Centralized Data Processing	√	√	√	√	√		√	√	√	√		√					√	√		√
2.	Mainframes	√	√	√	√	√		√	√	√	√		√					√	√		√
3.	Mini Computers	√	√	√	√	√	√	√	√	√	√		√					√	√		√
4.	Personal Computing	√	√	√	√		√	√	√	√	√		√								
5.	Personal Computers (Central processing unit with input and output devices)	√	√	√	√		√	√	√	√	√	√	√						√		√
6.	Laptop Computers (Central processing unit with input and output devices)		√	√	√	√		√	√	√	√		√	√				√	√		√
7.	Notebook Computers	√	√	√	√	√		√	√	√	√		√	√				√	√		√
8.	Notepad Computers	√	√	√	√	√		√	√	√	√		√	√				√	√		√
9.	Printers including cartridges	√	√	√	√	√			√	√	√		√					√			√
10.	Copying Equipment	√	√	√	√	√		√	√	√	√		√					√			√
11.	User Terminals and Systems	√		√	√	√	√		√	√	√	√	√					√			√
12.	Facsimile	√	√	√	√				√	√	√		√					√			√
13.	Telephones	√		√	√				√	√	√		√								√
14.	Pay Telephones	√		√	√			√	√	√	√		√					√	√		√
15.	Cordless Telephones	√		√	√			√	√	√			√					√	√		√
16.	Cellular Telephones	√	√	√	√	√		√	√	√			√					√	√		√
17.	Answering Systems	√	√	√	√			√	√	√			√					√	√		√
II.	**Consumer Electrical and Electronics**																				
18.	Cathode Ray Tube (CRT) TV	√		√		√				√	√	√	√					√			√
19.	Liquid Crystal Display (LCD) TV	√		√		√				√	√		√	√				√			√
20.	Light Emitting Diode (LED) TV	√		√		√				√	√		√	√				√			√
21.	Refrigerator	√	√	√	√	√			√	√					√		√	√		√	√
22.	Washing Machine	√	√	√		√			√	√			√			√	√				√
23.	Air Conditioners excluding centralized air conditioning plants	√	√	√	√				√	√			√				√	√		√	√
24.	Compact Fluorescent Lamp CFL																				

√ 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**.

Table 3.2: Possible Hazardous Substances in E-waste Components

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

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.

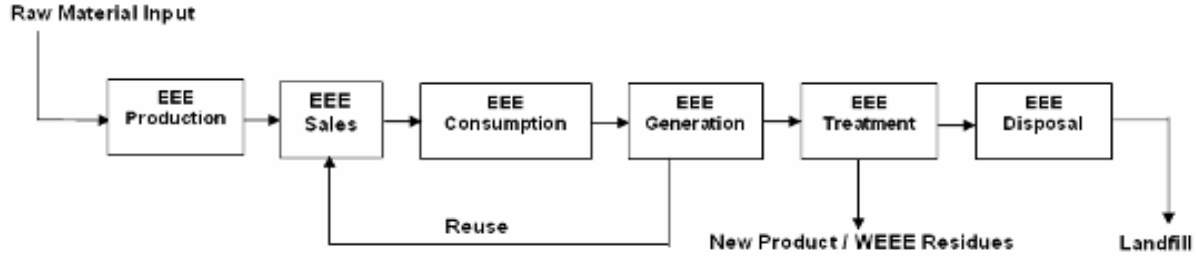


Figure 3.1: Conceptual E-waste trade value chain

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.

Table 3.3: Phases of material flow model

S.No.	Phase	Stakeholders
1.	Phase I: 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.	Phase II: 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.	Phase III: 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.	Phase IV: 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.

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.

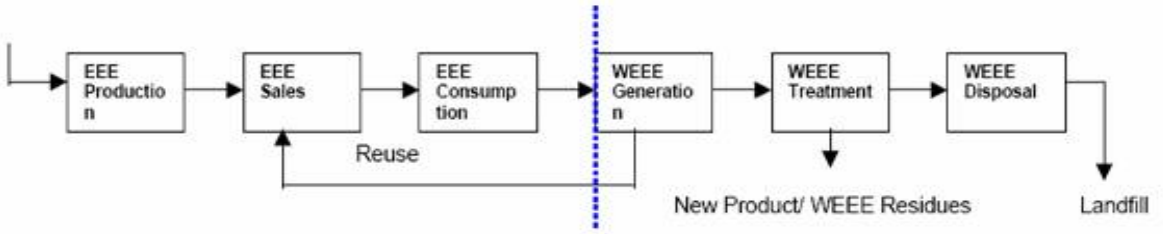


Figure 3.2: Generic E-waste trade value chain in a developing country

Source: UNEP Manual Vol. II; Inventory Assessment Manual

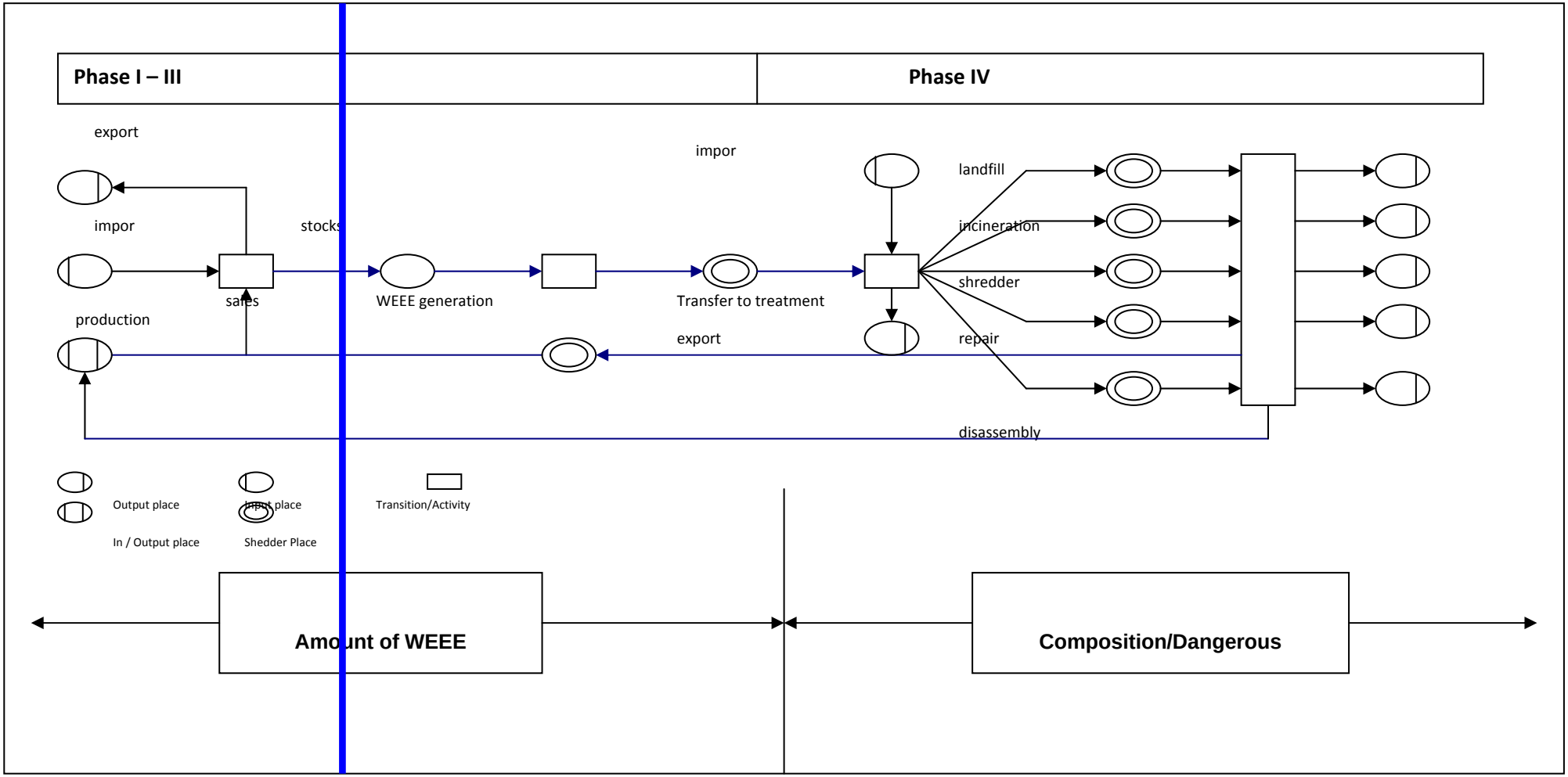


Figure 3.3: The 'Four-Phase-Model'

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.

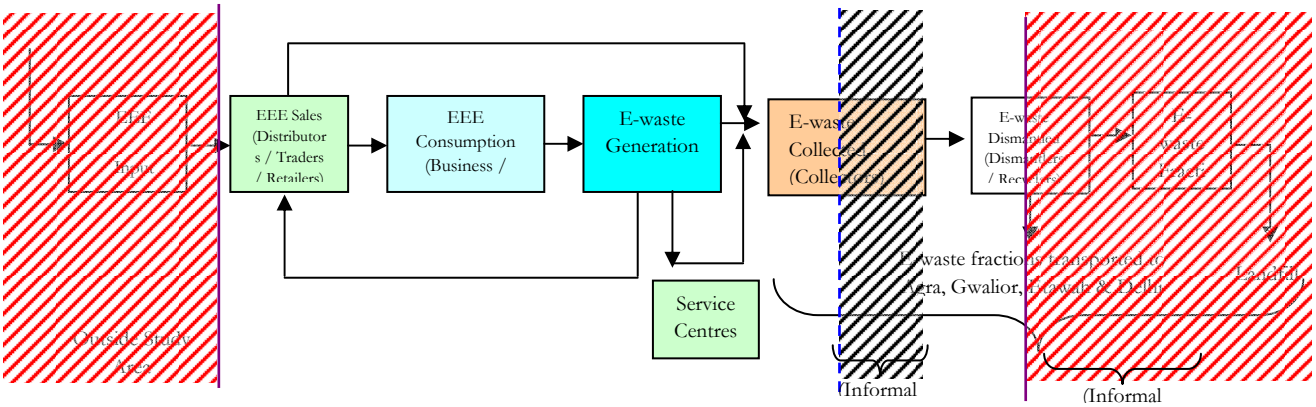


Figure 3.4: Tentative E-waste trade value chain in Study Area

Producers

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.

Consumers

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**.

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
LG	√		√	√	
Panasonic	√		√		
Samsung	√			√	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	√	√			Exchange your electronic item to your nearest dealer or where you buy the product
Electrolux	√	√			Exchange your electronic item to your nearest dealer or where you buy the product
Godrej	√	√			
Hitachi	√				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	√	√			E-waste Regarding no information Contact to nearest dealer
Philips	√			√	Call on customer care door to door collection of E-waste / discarded items of Philips
Whirlpool	√	√			To dealer he exchange your electronic item
Printers					
HP	√	√			Drop your items as dealer's drop off locations.

Brands	Collection through Call Centre	Collection through Dealers / Retailer	Collection through Service Centre	Collection through Collection Centre / establishment	Remarks
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.

Informal Sector

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.

Market Features

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**.

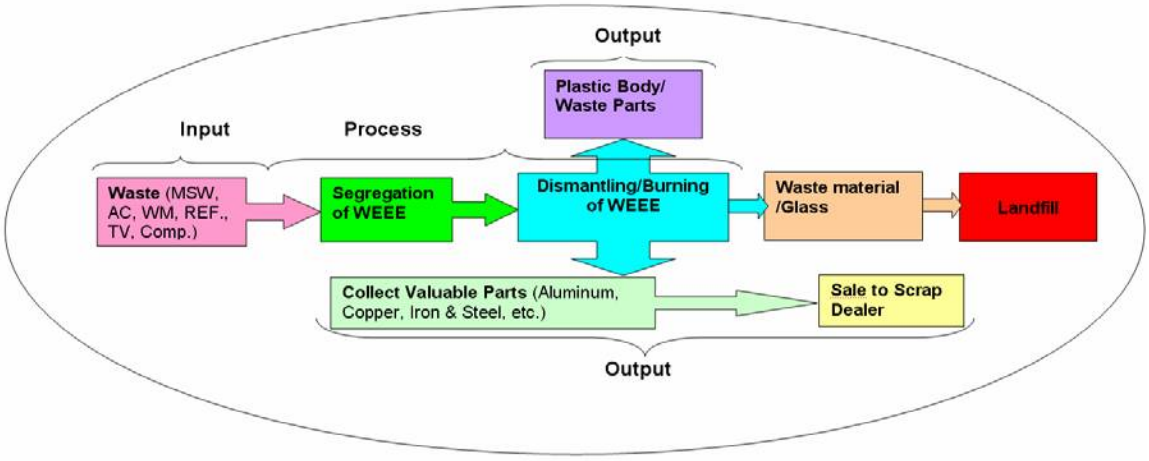


Figure 3.5: Processes observed at dumpsite

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**.

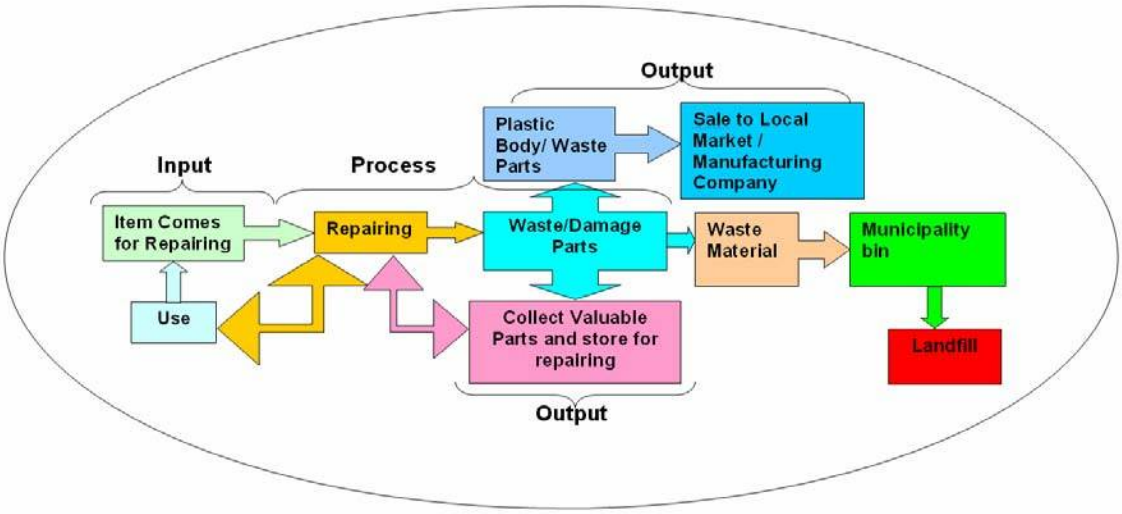


Figure 3.6: Processes observed at scrap dealers / junkyards

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**.

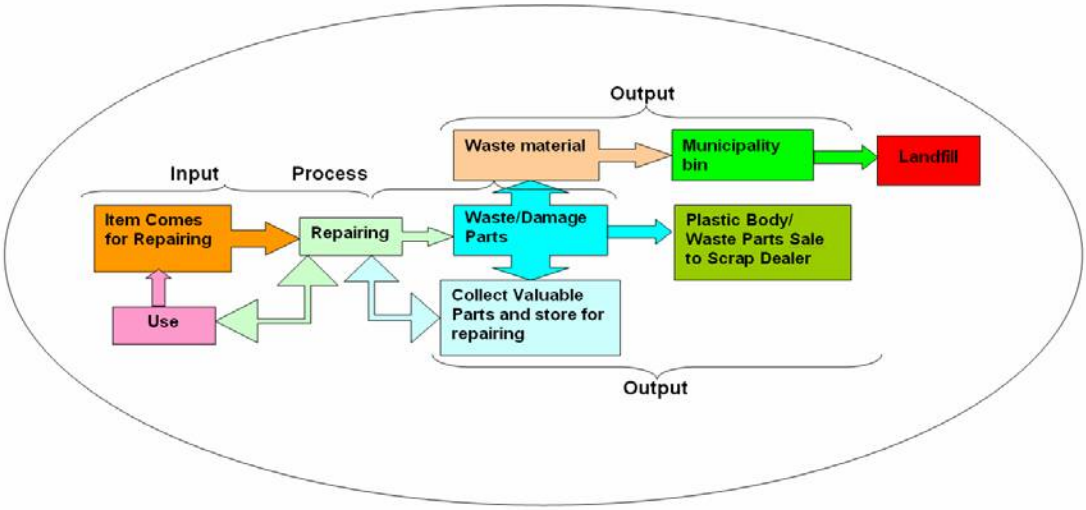


Figure 3.7: Processes observed at AC, Washing Machine, and Refrigerator Repair Shop

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**.

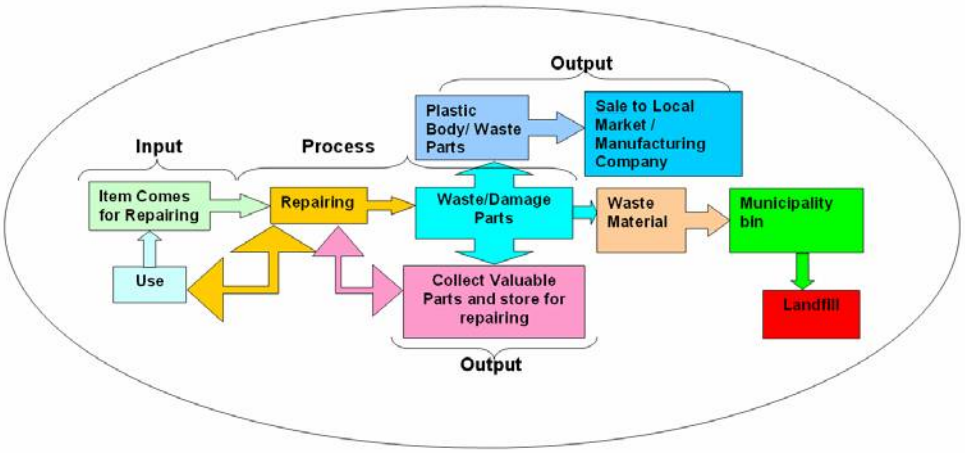


Figure 3.8: Processes observed at TV, Computer, and Mobile Phone Repair Shop

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 Bastar, Bijapur, Dantewada, Kanker, Kondagaon, Narayanpur and Sukma are mentioned in **Table 3.5**.

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

Sr. No.	Process name	Process Status						
		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

Sr. No.	Process name	Process Status						
		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.

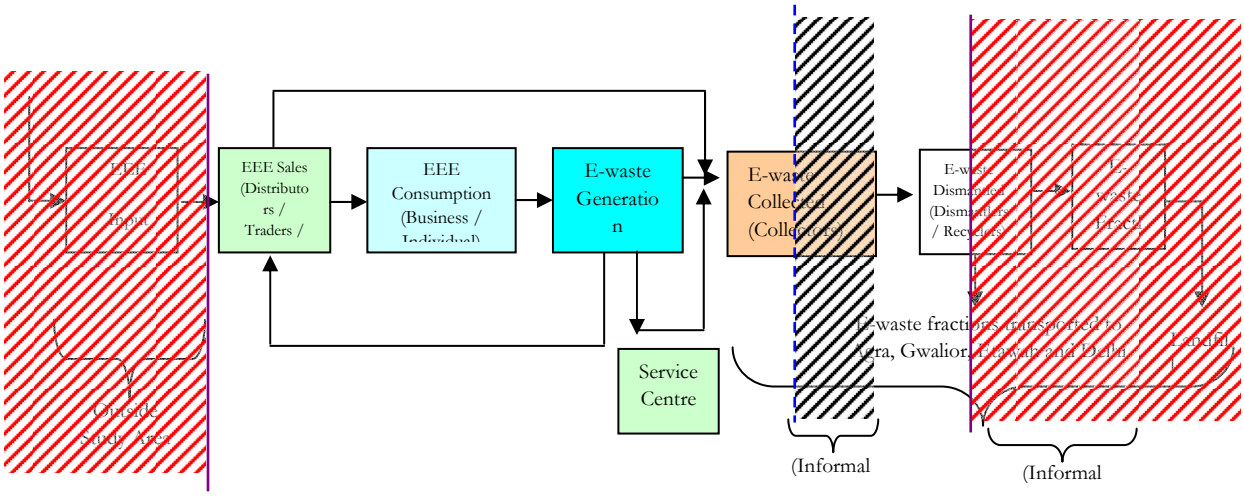


Figure 4.1: E-waste material flow chain in Study Area

Major observations related to data availability are given below.

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 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)
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)		

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.

Table 4.2: Data Matrix Vs Methodology

Methodology/ Data Requirement	Saturation Level		Number of Household	Calculated Sales			Stock Data		Average Lifetime	Storage data	Reuse	Recycle / dismantling	Landfill
	Household	Industry		Export Data	Import Data	Manufacturing / Production	Private	Industry					
Time Step Method	X		√	X	X	√	X	X					
Market				X	X	√			√				

Methodology/ Data Requirement	Saturation Level		Number of Household	Calculated Sales			Stock Data		Average Lifetime	Storage data	Reuse	Recycle / dismantling	Land fill
	Household	Industry		Export Data	Import Data	Manufacturing / Production	Private	Industry					
Supply Method													
Carnegie Mellon Method				X	X	√			√	√	√	√	√
Approximation 1	X	X	√			√	X	X	√				
Approximation 2				X	X	√							

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.

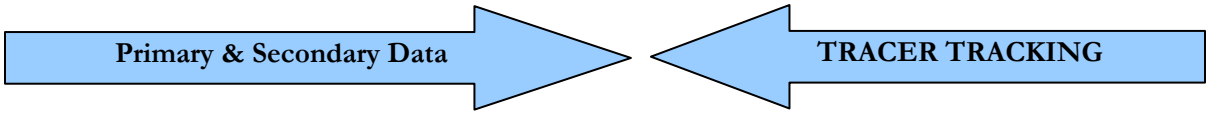


Figure 4.2: WEEE/E-waste data collection approach along the material flow chain in Bastar Division

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**.

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

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

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

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

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

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

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

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 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

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

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

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)

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

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

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

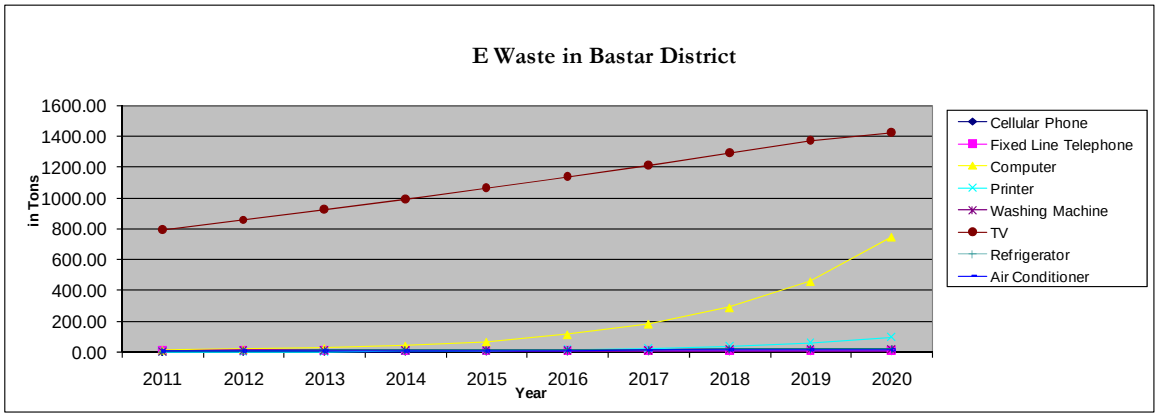


Figure 5.1: Item wise E-waste Projection of Bastar District

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

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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 5.15: E-waste Inventory of Bijapur District (in Tons)

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

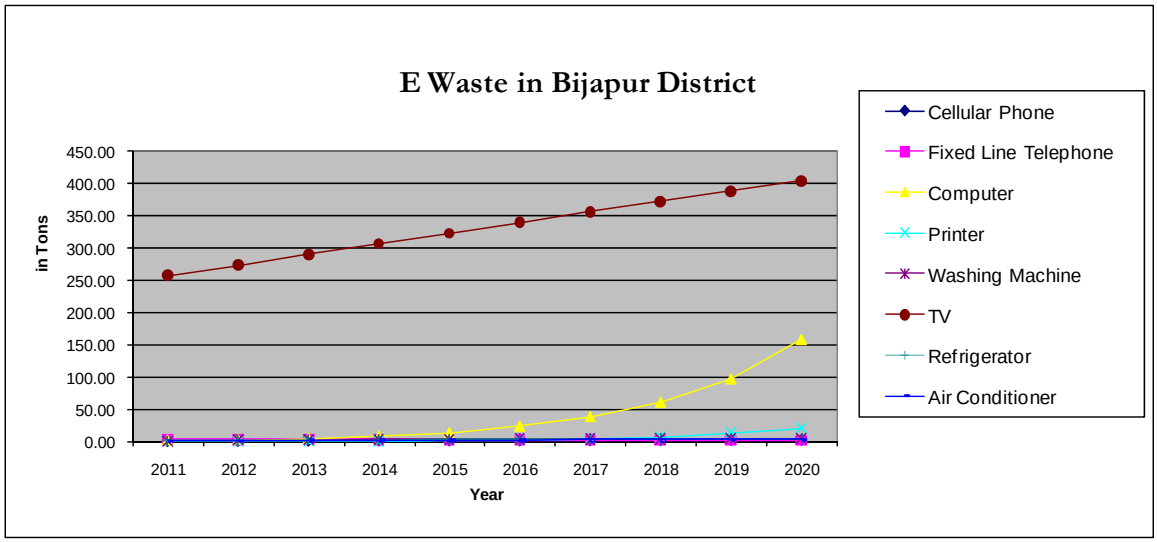


Figure 5.2: Item wise E-waste Projection of Bijapur District

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

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

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

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

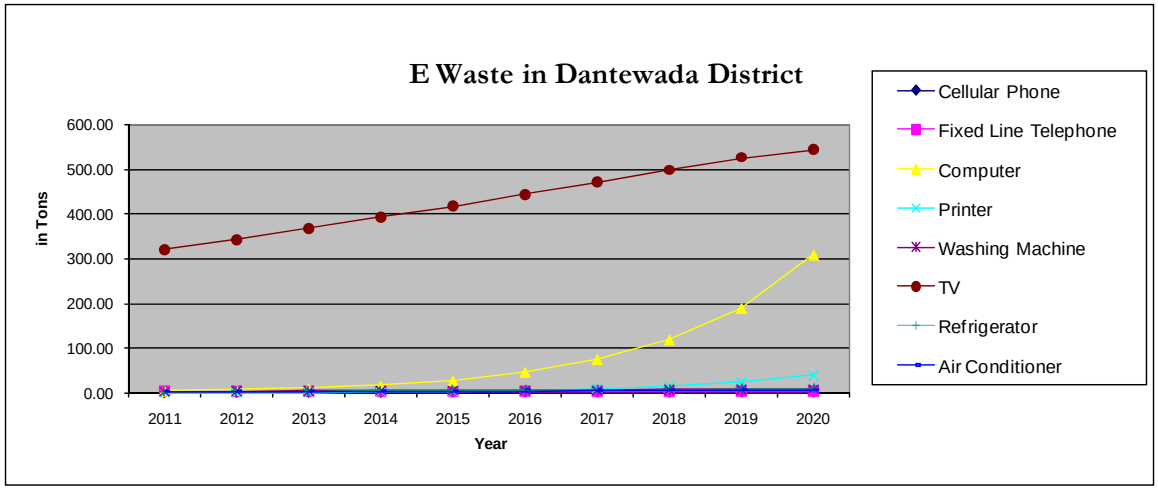


Figure 5.3: Item wise E-waste Projection of Dantewada District

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

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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 5.19: E-waste Inventory of Kanker District (in Tons)

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

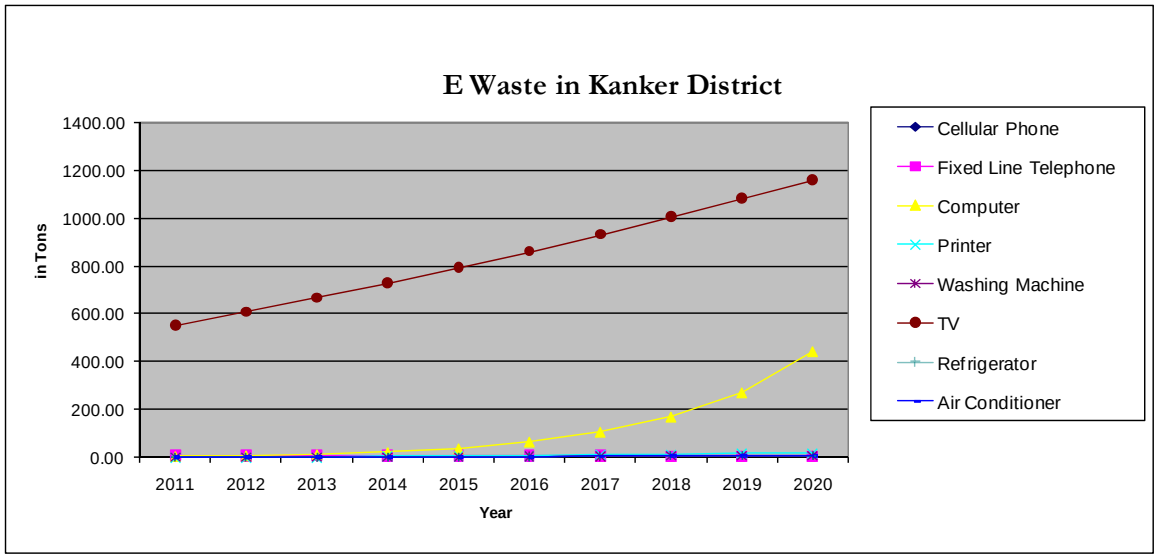


Figure 5.4: Item wise E-waste Projection of Kanker District

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

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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 5.21: E-waste Inventory of Kondagaon District (in Tons)

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

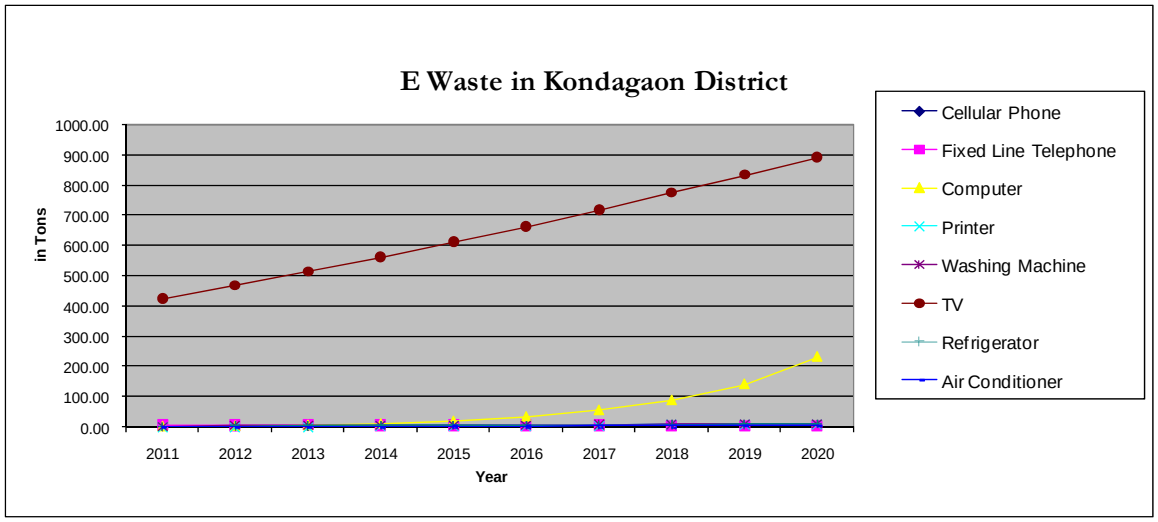


Figure 5.5: Item wise E-waste Projection of Kondagaon District

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

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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 5.23: E-waste Inventory of Narayanpur District (in Tons)

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

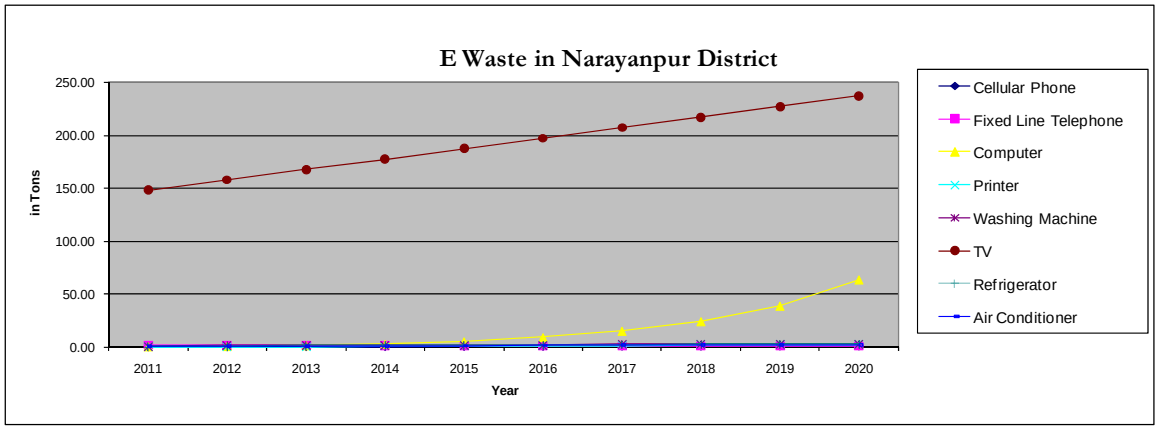


Figure 5.6: Item wise E-waste Projection of Narayanpur District

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

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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 5.25: E-waste Inventory of Sukma District (in Tons)

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

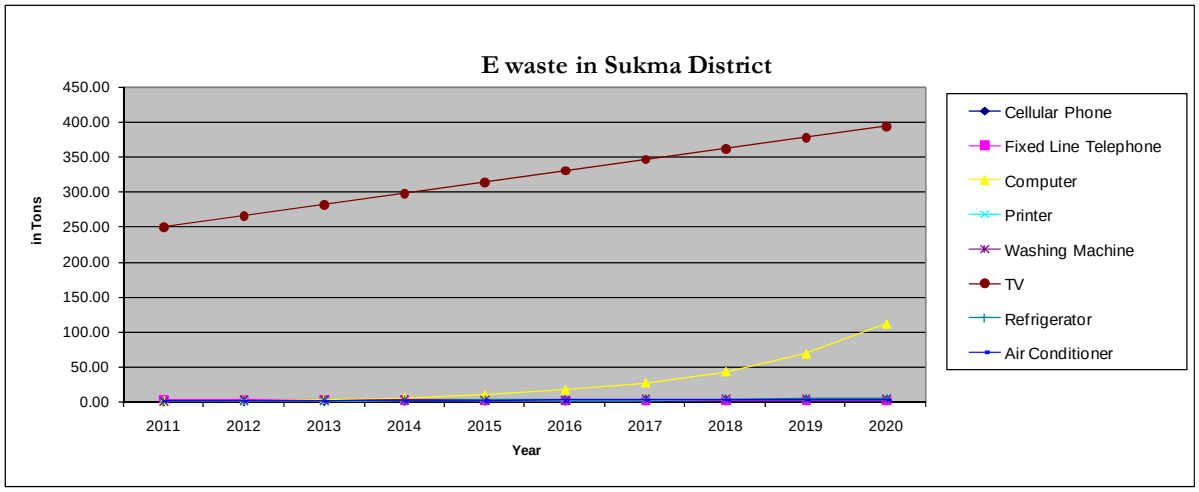


Figure 5.7: Item wise E-waste Projection of Sukma District

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

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

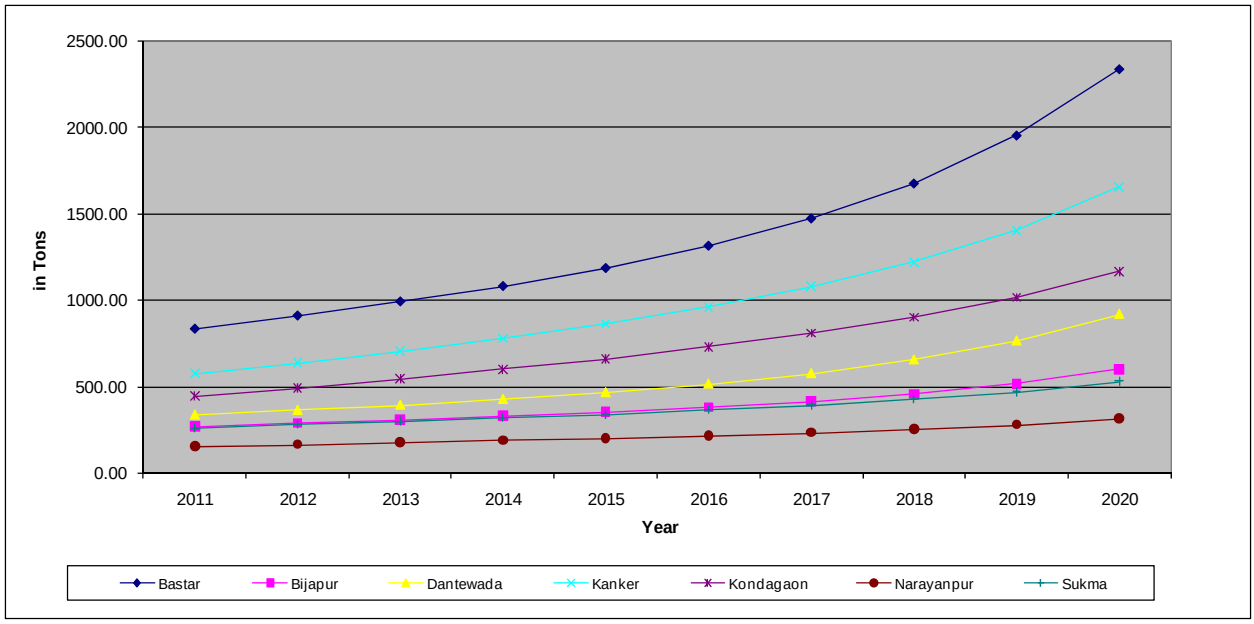


Figure 5.8: District wise Total E-waste Inventory Projection

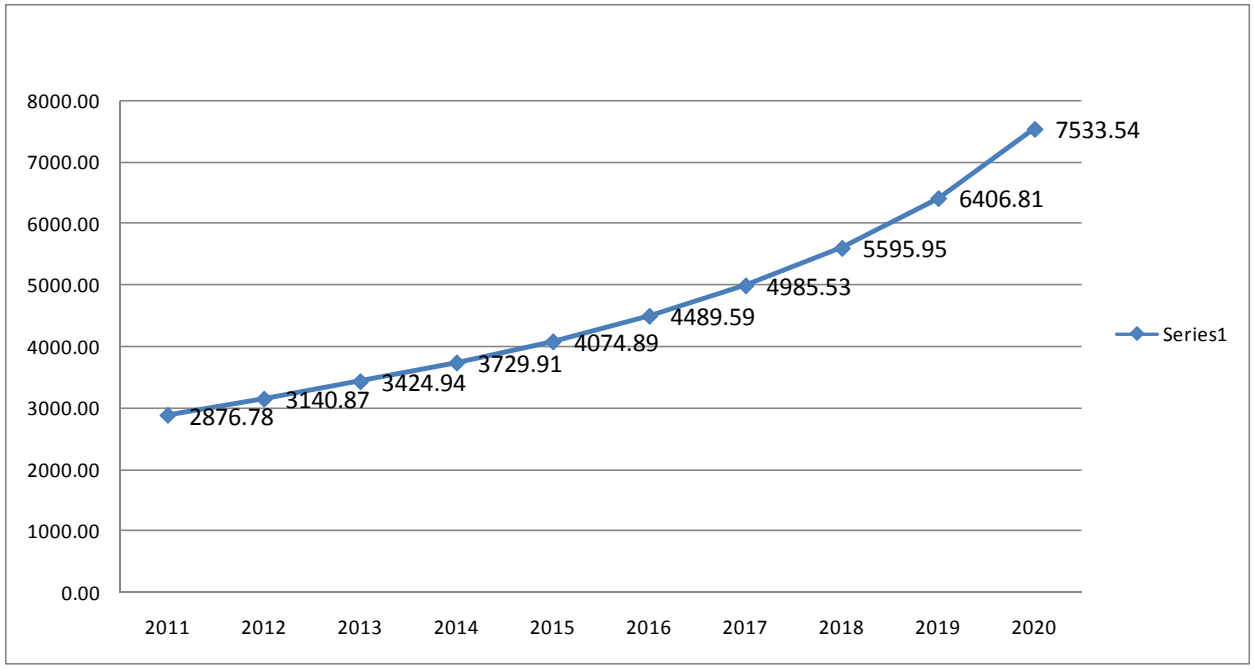


Figure 5.9: Total E-waste Inventory Projection in Bastar Division from 2011 to 2020

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.

2. 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%).

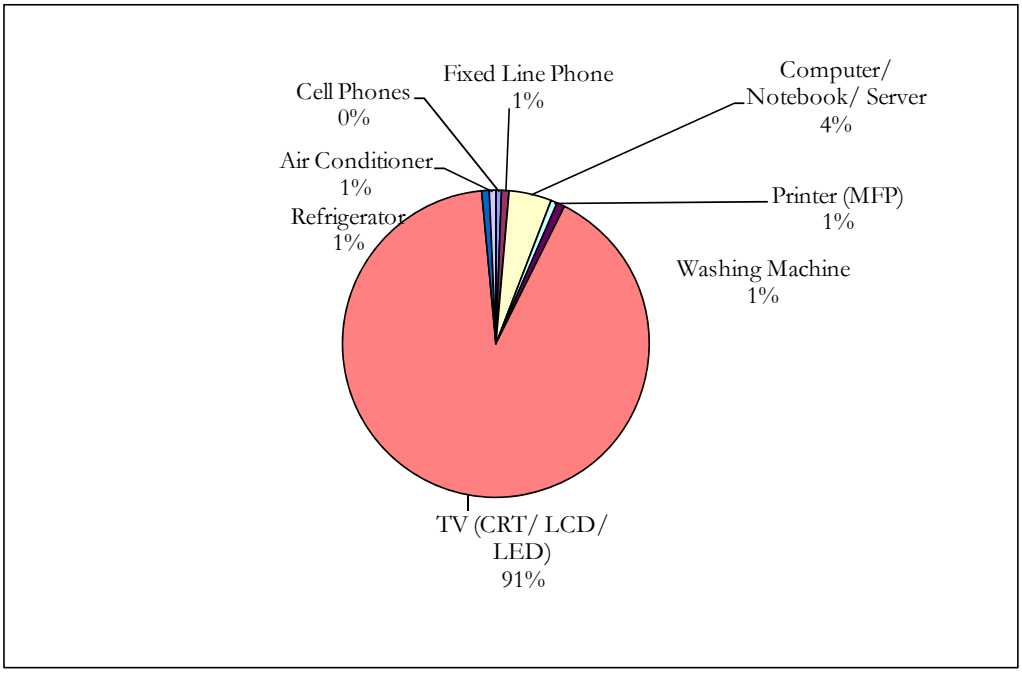


Figure 5.10: Item-wise E-waste in Percent for Bastar Division in 2015

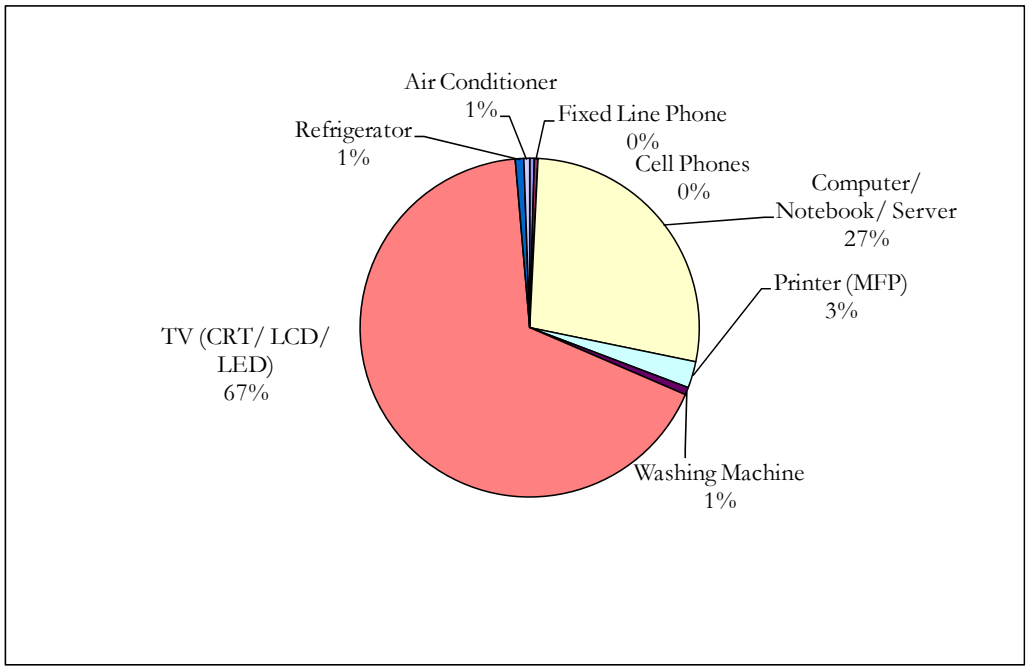


Figure 5.11: Item-wise E-waste in Percent for Bastar Division in 2020

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 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.

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

Sr. No.	Process name	Process Status						
		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

Sr. No.	Process name	Process Status						
		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.

Table 5.28: Trade economics of Bastar Division E-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

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 of raw material	Short term		√	
	Long term		√	
Risk associated with collection	Short term	√		
	Long term		√	
Risk associated with transportation	Short term			√
	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 E-waste 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. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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
		Group Companies		**Allied JB Friction Private Limited** A-12, Site IV, Industrial Area, 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 – 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 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. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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) 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, 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.

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Plot No. 94 & 95, Sector 8, IMT Manesar, Gurgaon - 122050 (HR) Ph. No. +91 (124) 4124800 / 4812300 / 4812400
				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	LG Electronics India Pvt. Ltd, Plot No. 51, Udyog Vihar, Surajpur Kasna Road, Greater Noida: 201306 Uttar Pradesh
		Manufacturing Facilities	Markson	**SGV Industries** 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
				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
		Head Office		PLOT No. 378, F.I.E, PATPARGANJ, DEHLI - 110092 Ph. No. +91-11-43086501-502, 22157662-63
		Corporate & Head Office	Moser Baer	43B, Okhla Industrial Estate, New Delhi - 110020. India. Tel +91 11 40594444, 91 11 26911570 - 74 Fax +91 11 41635211, 26911860
		Branch Offices		**Chennai** Moser Baer India Ltd. 81, IInd Floor Valluvarkottam High Road Nungambakkam, Chennai - 600 034 Tel: Ph.+91-44-42664358-59
				M & ES Office Moser Baer India Ltd.

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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
				Pune Moser Baer Photo Voltaic Ltd.

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				311, IIIrd Floor Connaught Place 28 Bund Garden Road Pune - 411 001
		Representative & Distributor		**USA Distributor** **Media Masters LLC** #440, 2601 S. Minnesota Ave., Ste 105 Sioux Falls, SD 57105-4750 USA Phone: +1-(888)-243-4465 Fax: +1-(877) 835-2834 E-mail: sales@mediamastersdisc .com
		Manufacturing Facilities		**BOM & M& ES** 66, Udyog Vihar, 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
		Corporate Address	Onida	MIRC Electronics Ltd. Onida House, G-1, M.I.D.C, Mahakali Caves Road, Andheri (E), Mumbai - 400 093. 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	**Samsung India Electronics**

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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	**Philips Electronics India Limited** 9th Floor, DLF 9-B, 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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				54/55 Fax 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
				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 Category	Brand	Address / Contact Details
				#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. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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	**TCL India Holding Pvt. Ltd.** Sco 254, 2nd Floor, Sector 44 C 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
			T-Series	**Laxbro Manufacturing Company** W-53, MIDC Area, Bhosari Indl. Estate, PMC – 411026, Maharashtra
			Toshiba	**TOSHIBA INDIA PVT. LTD.** 3rd Floor, Building No. 10 Tower - B, Phase - II 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. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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	**Videocon Industries Ltd.** 14 Kms Stone, Aurangabad- Paithan 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
			Weston	**Westway Electronics Limited** B-102, Phase – II, Noida – 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
			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	Next Retail India Limited, 3rd Floor, Aadeshwar Arcade Above Loop Gallary, Opp. Sangam Cinema, Andheri Kurla Road, Mumbai 400 102 Phone: +91-7498218860
			Onida	Given Above
			Panasonic	Given Above
			Samsung	Given Above

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
			Philips	Given Above
			Salora	Given Above
			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

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. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 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
	Air Conditioner	Window	Blue star	**Corporate Headquarters** Kasturi Buildings, Mohan T Advani Chowk, Jamshedji Tata Road, 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 **Tel:** (91) (22) 66544000 **Fax:** (91) (22) 66544001
				Regional Headquarters **Chennai** No.104, Old No. 46,

Sr. No.	Product Name	Product Sub Category	Brand	Address / 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 Category	Brand	Address / Contact Details
				2573670 / 2570024 **Fax:** (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 **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

Sr. No.	Product Name	Product 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 **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

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 **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
			Carrier	**INDIAN HEADQUARTERS :** **Carrier Airconditioning & Refrigeration Limited** Delhi - Jalpur Highway, Narsingpur, Gurgaon, Haryana, 122 004, India Ph. No. +91-124-4825500

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 & 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 7028

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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/ 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 &

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 & 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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 : 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 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 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
	Corporate Headquarters		Voltas	**Voltas Limited** Voltas House 'A' Block Dr. Babasaheb Ambedkar Road Chinchpokli Mumbai 400 033 Tel: 022-66656 666
	Factories			2nd, Pokhran Road, 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
			Mitsubishi	**Gurgaon Head Office**

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				2nd Floor, Tower A & B, DLF Cyber Greens, Dlf Cyber City, DLF Phase -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.
				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,

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. No.	Product Name	Product 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
			Siemens	Registered & Corporate Office 130, Pandurang Budhkar Marg, Worli, Maharashtra, Mumbai 400 018. Tel: +91 22 3967 7000 Fax: +91 22 3967 7500
	Mobile Phones		Acer	Acer India Private Limited Ground Floor, B- 28, Okhla Phase - I, New Delhi - 110020, Delhi, India Tel: +(91)-(11)-40568000
			Alcatel	**India Office** TCT Mobile International Limited,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 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	**Amazon Development Center India Pvt Ltd** Q-city, 2nd Floor-Block A & Block B Survey Number-109,110,111/2, 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

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: (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	**BLU Products** 10814 NW 33rd St# 100 Doral, FL 33172 (305) 715 – 7171
			Bosch	Bosch Sicherheitssysteme GmbH Robert-Bosch-Ring 5 85630 Grasbrunn GERMANY Tel: +49 (0) 89 6290-0
				Bosch Security Systems 130 Perinton Parkway

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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
				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 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
				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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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
			HP	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 Category	Brand	Address / Contact Details
				Block, 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 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
				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
				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
				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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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	**Huawei Telecommunication (INDIA) Co. Pvt Ltd.** 7th Floor, Tower A, Spaze I-Tech Park, Sohna Road, 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	Karbonn Mobiles #39/13, off 7th main, HAL 2nd stage Appareddy Palya, Indiranagar, Bangalore – 560038 Tel: 080 40894888
				Karbonn Mobiles D-170, Okhla Industrial Area, Phase-1 New Delhi – 110020 011 46604660
			Kyocera	**KYOCERA Corporation** **Cutting Tool Group** 6 Takeda, Tobadono-cho, 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
				KYOCERA Asia Pacific India 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 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

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

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

Sl. No.	Name	Address	Latitude			Lognitute		
			Dig.	Min.	Sec.	Dig.	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
15	**Khurana Radio**	Main Road, Gol Bazar, Jagdalpur, Bastar	19	5	17.5	82	1	29.8

Sl. No.	Name	Address	Latitude			Lognitute		
			Dig.	Min.	Sec.	Dig.	Min.	Sec.
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

Sl. No.	Name	Address	Latitude			Lognitute		
			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 No.-13, 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						
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

Sl. No.	Name	Address	Latitude			Lognitute		
			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 No.-8, 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

Sl. No.	Name	Address	Latitude			Lognitute		
			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

Partial List of Bulk Consumers in Bilaspur Division- Annexure 3

Sl. No.	Name	Address	Latitude			Lognitute		
			Dig.	Min.	Sec.	Dig.	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
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

Sl. No.	Name	Address	Latitude			Lognitute		
			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

Sl. No.	Name	Address	Latitude			Lognitute		
			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.	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

Partial List of Service centers in BBastar division- Annexure 4

Sl. No.	Name of Shops	Address	Latitude			Lognitute		
			Dig.	Min.	Sec.	Dig.	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
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

Sl. No.	Name of Shops	Address	Latitude			Lognitute		
			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								

Sl. No.	Name of Shops	Address	Latitude			Lognitute		
			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						
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

Sl. No.	Name of Shops	Address	Latitude			Lognitute		
			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

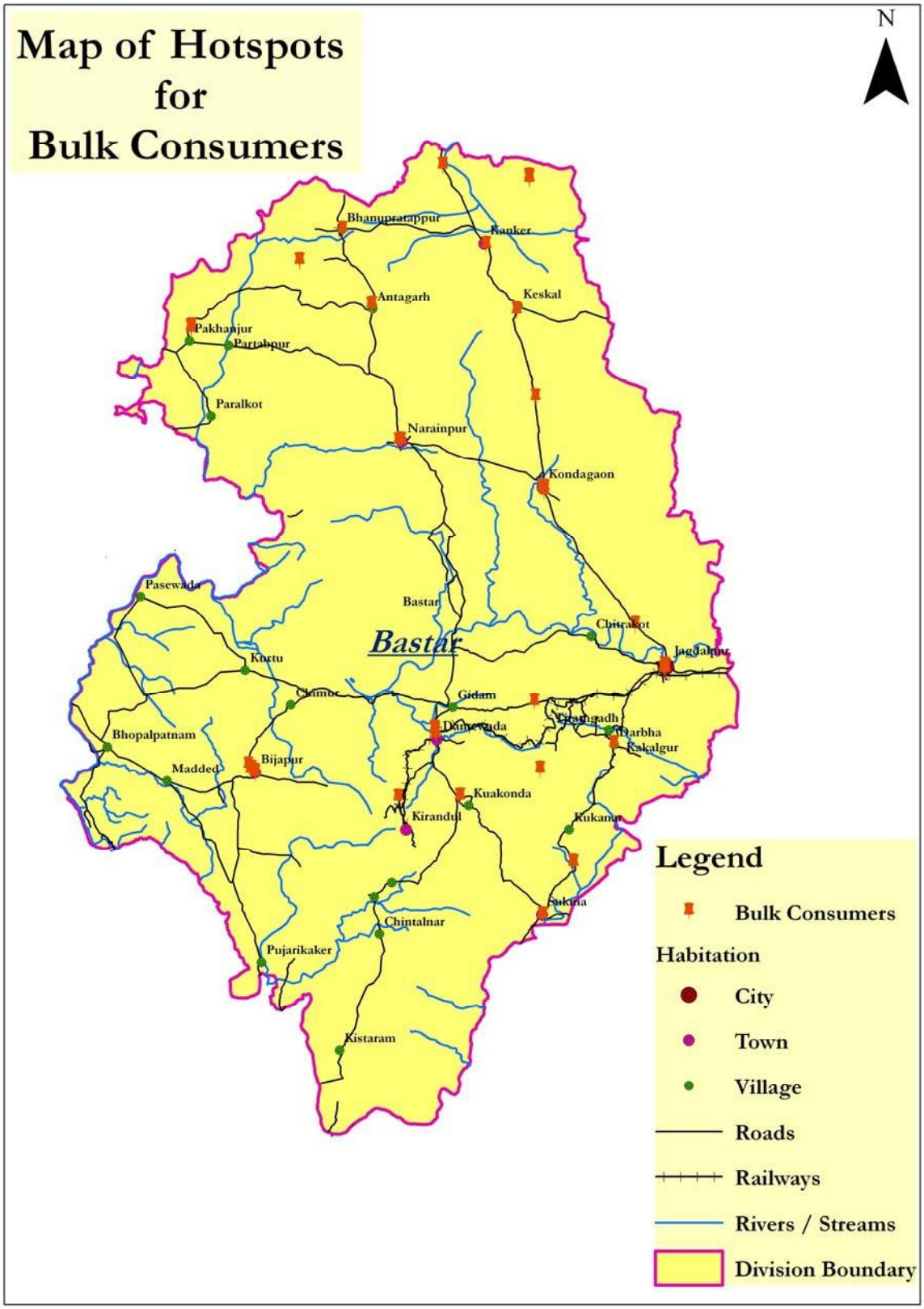
Inventory of Established Collection centers- Annexure 5

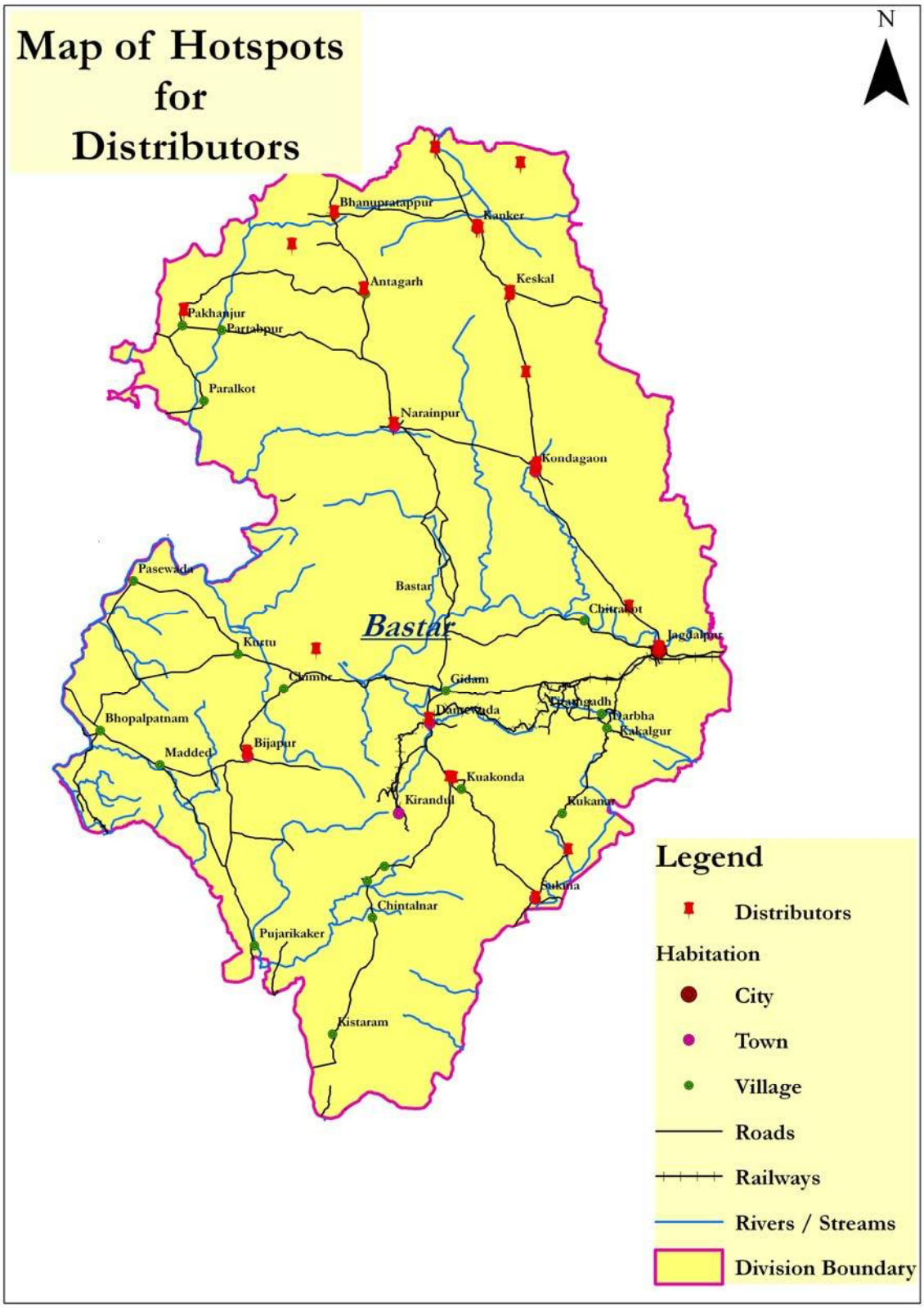
Sl No.	Name	Address
1.	M/s Navrachna Recycling Pvt. Ltd.	**Plot No 1B, Somni Industrial Area, Rajnandgaon**
2.	M/S ADV Metal Combine Private Limited	**Borai Industrial Growth Center, Durg**

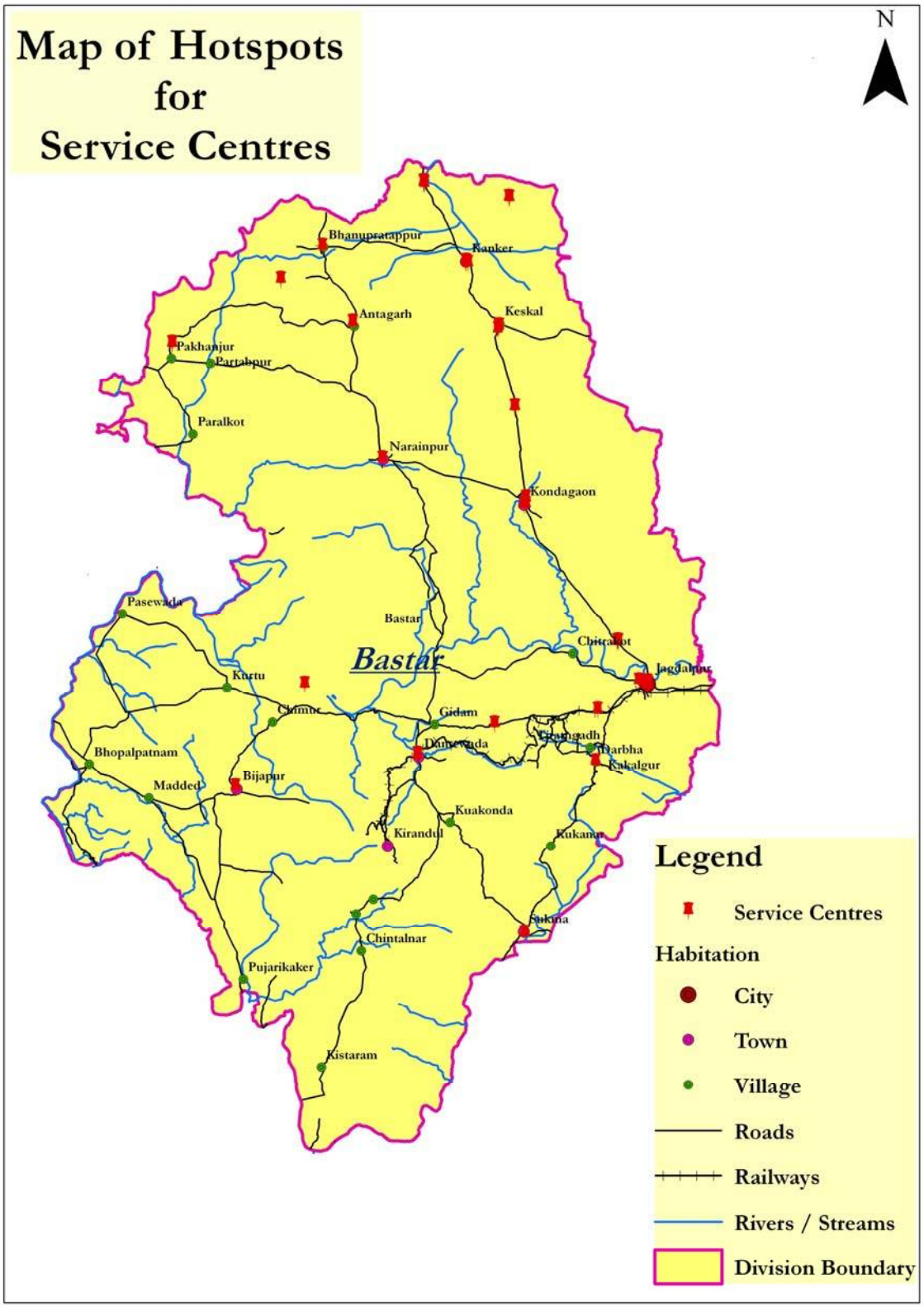
Partial Inventory of Scrap vendor/ Dismantler in Bastar Division – Annexure 6

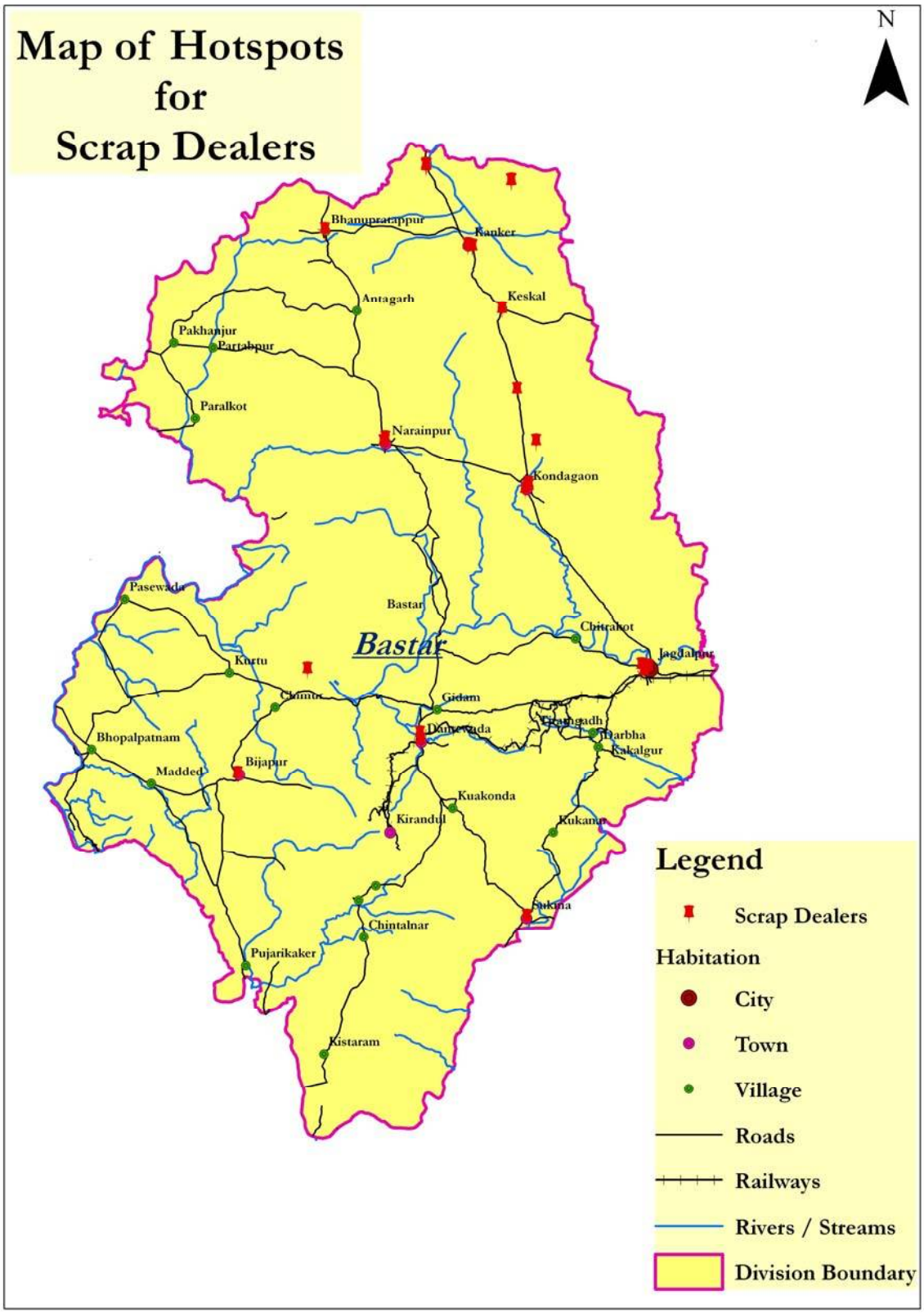
Sl. No.	Name	Address	Latitude			Lognitute		
			Dig.	Min.	Sec.	Dig.	Min.	Sec.
Bastar								
1	**Saligram**	Dharampura No.-1, Jagdalpur, Bastar	19	5	39.8	81	59	50.3
2	**Aslam Kabadi**	Raut Para, Jagdalpur, Bastar	19	5	6.5	81	0	59.9
3	**Dev Saran Lal Sahu**	Geedam Road, Jagdalpur, Baster	19	4	39.7	82	0	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
Dantewada								
13	**Mahabir Mandabi**	Aura Bhata, Dantewada	18	54	23.6	81	20	48.3
14	**Thakur Ram**	Ward No.-6, Dantewada	18	54	22.6	81	20	49.1
15	**Navrang Devraj**	Ward No.-15, Dantewada	18	53	17.2	81	20	55.4
Bijapur								
16	**G. Subba Raw**	Ward No.-8, Rajender Prasad	18	47	39.0	80	48	42.1

Sl. No.	Name	Address	Latitude			Lognitute		
			Dig.	Min.	Sec.	Dig.	Min.	Sec.
		Ward, Bijapur						
Narayanpur								
17	**Tapan Manjhi**	Ward No.-5, 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 No.-14, 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 Bulk Consumers
N
Bhanupratappur
Kanker
Antagarh
Keskal
Pakhanjur
Partabpur
Paralkot
Narainpur
Kondagaon
Pasewada
Bastar
Bastar
Chitrakot
Jagdalpur
Kuttu
Gidam
Bhopalpatnam
Bijapur
Madded
Kuakonda
Kirandul
Kukanar
Sukma
Chintalnar
Pujarikaker
Kistaram
Legend
Bulk Consumers
Habitation
City
Town
Village
Roads
Railways
Rivers / Streams
Division Boundary


Map of Hotspots for Distributors
N
Bhanupratappur
Kanker
Antagarh
Keskal
Pakhanjur
Partabpur
Paralkot
Narainpur
Kondagaon
Pasewada
Bastar
Bastar
Chitrakot
Jagdalpur
Kurtu
Chimbor
Gidam
Dantewada
Bhopalpatnam
Bijapur
Madded
Kuakonda
Kirandul
Sukma
Chintalnar
Pujarikaker
Kistaram
Legend
Distributors
Habitation
City
Town
Village
Roads
Railways
Rivers / Streams
Division Boundary


Map of Hotspots for Service Centres
N
Bhanupratappur
Kanker
Antagarh
Keskal
Pakhanjur
Partabpur
Paralkot
Narainpur
Kondagaon
Pasewada
Bastar
Bastar
Kurtu
Jagdalpur
Gidam
Bhopalpatnam
Bijapur
Madded
Kuakonda
Kirandul
Sukma
Chintalnar
Pujarikaker
Kistaram
Legend
Service Centres
Habitation
City
Town
Village
Roads
Railways
Rivers / Streams
Division Boundary


Map of Hotspots for Scrap Dealers
N
Bhanupratappur
Kanker
Antagarh
Keskal
Pakhanjur
Partabpur
Paralkot
Narainpur
Kondagaon
Pasewada
Bastar
Bastar
Chitrakot
Jagdalpur
Kurtu
Gidam
Bhopalpatnam
Dantewada
Barbha
Kakalgur
Madded
Bijapur
Kuakonda
Kirandul
Kukanar
Sukma
Chintalnar
Pujarikaker
Kistaram
Legend
Scrap Dealers
Habitation
City
Town
Village
Roads
Railways
Rivers / Streams
Division Boundary

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) $= [\text{Stock}(t1) - \text{Stock}(t)]_{\text{private}} + [\text{Stock}(t1) - \text{Stock}(t)]_{\text{industry}} + \bullet \text{Sales}(n) - \bullet \text{WEEE}(n)$ $\quad n=t1+1 \text{ to } t-1 \quad n=t1+1 \text{ to } t \text{ with } t1 < t$

$\text{Stock}_{\text{private}}$ = Number of households * (saturation level of households / 100)

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

$\text{Stock}_{\text{industry}}$ = 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

d_S - 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)

Features of the five inventory assessment methods

Methodology/Features	Requirements	Constraints	Advantages
The Time Step Method	1. Information about domestic sales. 2. Appliance stock levels for household. 3. Industrial stock levels.	1. Household saturation levels are based on predetermined stock levels 2. Industrial stock levels are assumed in the calculations because they are difficult to obtain and require assumptions. 3. Assumption that all the WEEE/E-waste generated is collected and transferred to treatment and disposal facility.	1. Calculations can be carried out very easily. 2. Method gives good results in a saturated market.
The market Supply Method	1. Information about domestic sales. 2. Average life of new and second hand items.	1. 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. 2. WEEE/ E-waste are often stored for years. 3. Assumed that all appliances produced in the same year will be in line for disposal after exactly the average life. 4. 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	1. Necessary data need not be very wide-ranging 2. Calculations can be carried out very easily using a simple formula 3. 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.

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.	1. 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. 2. This model also requires a full coverage of sales data as early as possible in the WEEE/E-waste trade value chain.	1. The model allows for an electrical and electronic equipment to be purchased, reused, stored and finally recycled or landfilled representing "material flow" more precisely. 2. 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.	1. A product's constant mean lifespan is assumed in this method. 2. 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.

Data Requirements for E-waste Inventory Assessment

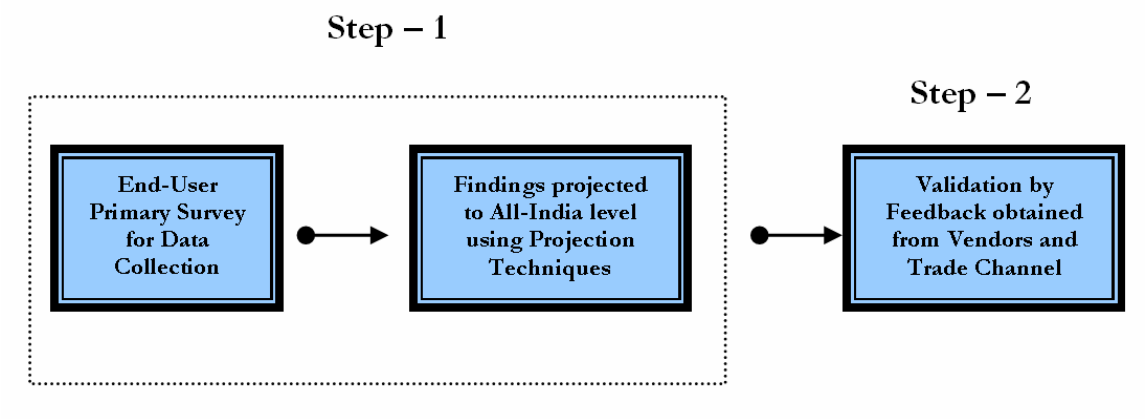
Methodology/ Data Requirement	Saturation Level		Number of	Calculated Sales			Stock Data		Average	Storage data	Reuse	Recycle	Landfill
	Household	Industry	Household	Export Data	Import Data	Manufacturing /Production	Private	Industry	Lifetime				
Time Step Method	√	√	√	√	√	√	√	√					
Market Supply Method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

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.

$$\sum_{i=1}^{n} \text{Last one year market size in employee band } i = \sum_{i=1}^{n} \left(\text{Acquisition rate in employee band } i \times \text{Universe of estab. in employee band } i \right)$$

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 1. Pure households 2. 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.

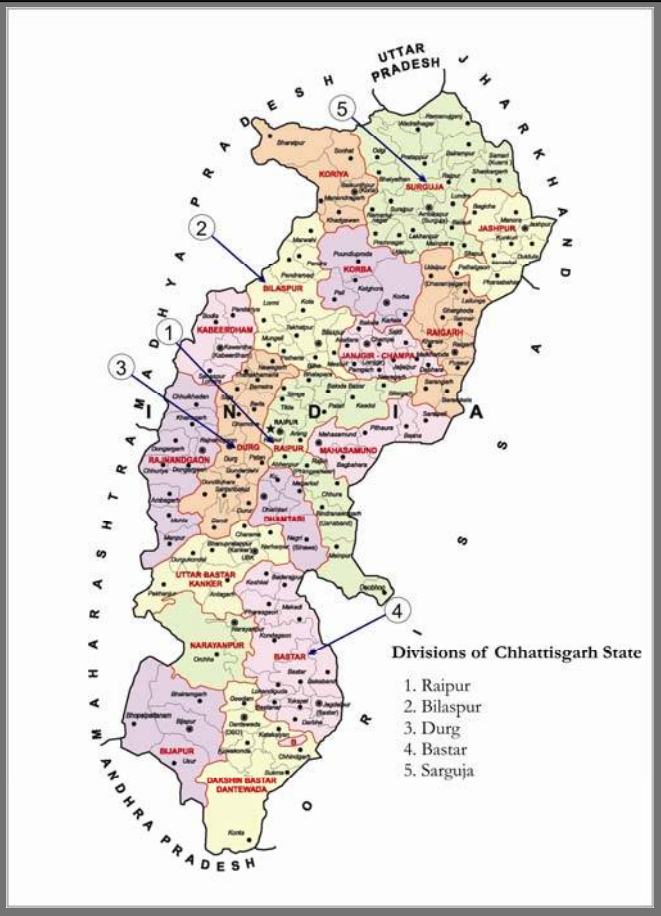
List of Sources of Data in the Study Area- Annexure 10

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	

2016

FINAL REPORT

E-Waste Inventorization of Bilaspur Division



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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 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.

Producers: 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, 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.

Consumers: 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. 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.

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.

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. 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 E-waste 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 E-waste 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 E-waste 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, Bastar and Sarguja. The overall aim of this initiative is to assess the generators, quantity and present practices for handling of E-waste 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
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**.

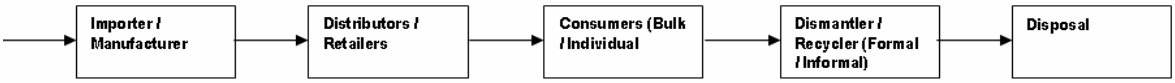


Figure 1.1: Conceptual WEEE business chain

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 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.

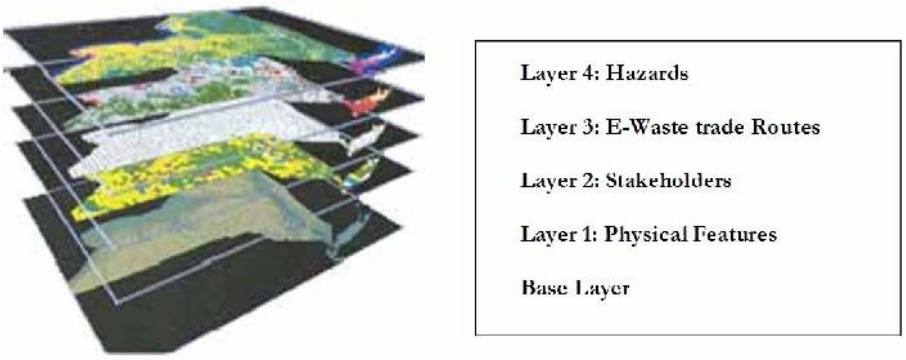


Figure 1.2: Geographical mapping of different attributes

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.

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**.

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, 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

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

Regulations / Guidelines	E-waste Management		Export & Import of E-waste	
	Pre 1st May 2012	Post 1st May 2012	Pre 1st May 2012	Post 1st May 2012
E-waste (Management & Handling) Rules 2011		√		
Hazardous Waste (Management, Handling & Transboundary) Rules 2008	√		√	√
Guidelines for Environmentally Sound Management of E-waste 2008	√	√		
Guidelines for Implementation of E-waste Regulations 2012	√	√		

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.

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
Collection	**Manufacturing**	√					
	End of Life	√					
Take-back	**Individual**	√					
	Collectively	√					
Transportation to	**Producer**		√	√			
	Collection Centre	√	√	√			
	Dismantlers/ Recyclers	√	√	√	√	√	
	TSDF* Facility	√				√	√
Storage					√	√	√
Financing		√					
Registration		√			√	√	
Filing of Annual Returns		√			√	√	√
Return of Annual Inventory Handled		√		√	√	√	√

Note: √ 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, poly-brominated 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 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.

<u>Scope of EPR for the Producer:</u>

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**.

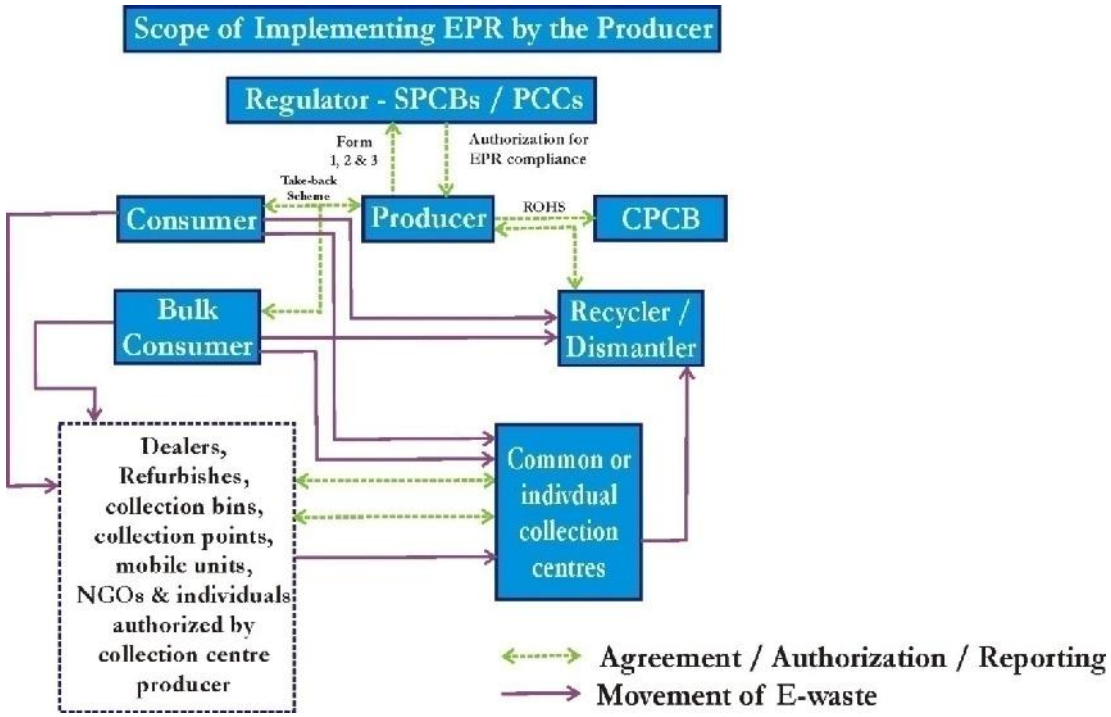


Figure 2.1: Scope of implementing EPR for Producers

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.

<u>The criteria for setting up collection centres are</u>

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.

    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**.

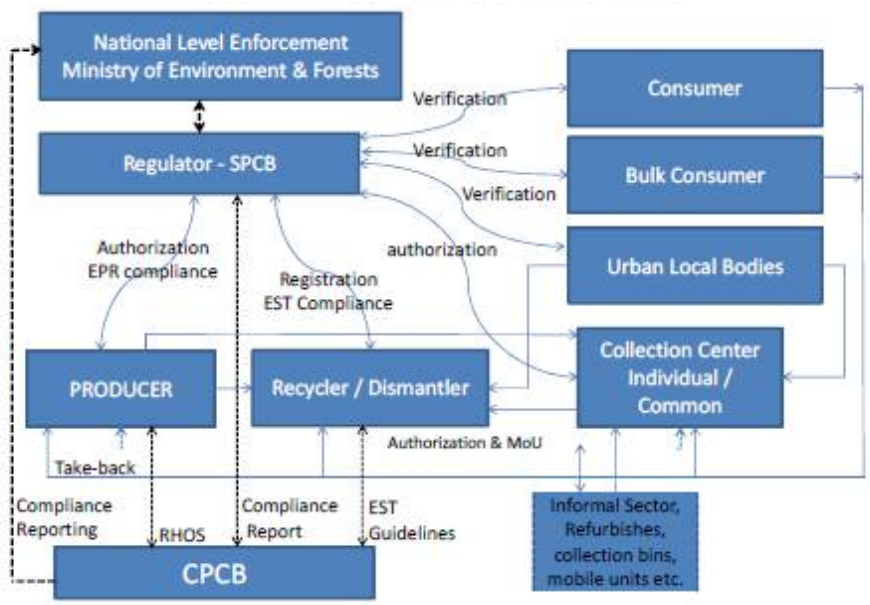


Figure 2.2: Implementation of E-Waste Rules 2011

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**.

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

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

Sr. No.	Authority/(ies)	Duties
		viii. Any other function delegated by the Ministry under these rules
3.	Urban Local Bodies (Municipal Committee/Council/Corporation)	(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**.

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
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 MoEF.
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	i. Grant licence for import of hazardous wastes ii. Refuse licence for hazardous wastes prohibited for imports and exports.

Sr. No.	Authority/(ies)	Duties and Corresponding Rule
5.	Port Authorities under Indian Port Act 1908 and Customs Authorities under the customs Act, 1962	i. Verify the documents ii. Inform the ministry of Environment and Forests, Govt. of India of any illegal traffic 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	X	X	X	X
2.	Bulk Consumer	√	√	X	X	X	X
3.	Urban Local Bodies	√	X	X	X	X	X
4.	Collection Centre	√	√	√	√	X	X
5.	Producer –offer to sell	√	√	√	√	X	√
6.	Producer - importer	√	√	√	√	X	√
7.	Producer - Manufacturing EEE	√	√	√	√	X	√
8.	Dismantler	√	√	√	√	√	X
9.	Recycler	√	√	√	√	√	X

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 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.

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 Telecommunication Equipment**																				
1.	Centralized Data Processing	√	√	√	√	√		√	√	√	√		√					√	√		√
2.	Mainframes	√	√	√	√	√		√	√	√	√		√					√	√		√
3.	Mini Computers	√	√	√	√	√	√	√	√	√	√		√					√	√		√
4.	Personal Computing	√	√	√	√		√	√	√	√	√		√								
5.	Personal Computers (Central processing unit with input and output devices)	√	√	√	√		√	√	√	√	√	√	√						√		√
6.	Laptop Computers (Central processing unit with input and output devices)		√	√	√	√		√	√	√	√		√	√				√	√		√
7.	Notebook Computers	√	√	√	√	√		√	√	√	√		√	√				√	√		√
8.	Notepad Computers	√	√	√	√	√		√	√	√	√		√	√				√	√		√
9.	Printers including cartridges	√	√	√	√	√			√	√	√		√					√			√
10.	Copying Equipment	√	√	√	√	√		√	√	√	√		√					√			√
11.	User Terminals and Systems	√		√	√	√	√		√	√	√	√	√					√			√
12.	Facsimile	√	√	√	√				√	√	√		√					√			√
13.	Telephones	√		√	√				√	√	√		√								√
14.	Pay Telephones	√		√	√			√	√	√	√		√					√	√		√
15.	Cordless Telephones	√		√	√			√	√	√			√					√	√		√
16.	Cellular Telephones	√	√	√	√	√		√	√	√			√					√	√		√
17.	Answering Systems	√	√	√	√			√	√	√			√					√	√		√
II.	**Consumer Electrical and Electronics**																				
18.	Cathode Ray Tube (CRT) TV	√		√		√				√	√	√	√					√			√
19.	Liquid Crystal Display (LCD) TV	√		√		√				√	√		√	√				√			√
20.	Light Emitting Diode (LED) TV	√		√		√				√	√		√	√				√			√
21.	Refrigerator	√	√	√	√	√			√	√					√		√	√		√	√
22.	Washing Machine	√	√	√		√			√	√			√			√	√				√
23.	Air Conditioners excluding centralized air conditioning plants	√	√	√	√				√	√			√				√	√		√	√
24.	Compact Fluorescent Lamp CFL																				

√ 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**.

Table 3.2: Possible Hazardous Substances in E-waste Components

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

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.

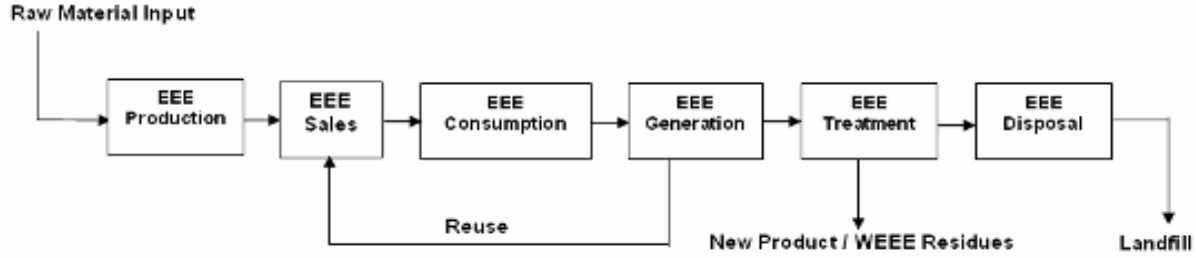


Figure 3.1: Conceptual E-waste trade value chain

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.

Table 3.3: Phases of material flow model

S.No.	Phase	Stakeholders
1.	Phase I: 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.	Phase II: 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.	Phase III: 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.	Phase IV: 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.

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.

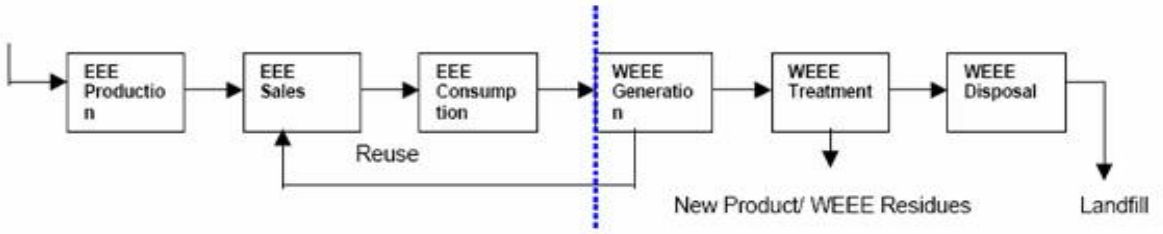


Figure 3.2: Generic E-waste trade value chain in a developing country

Source: UNEP Manual Vol. II; Inventory Assessment Manual

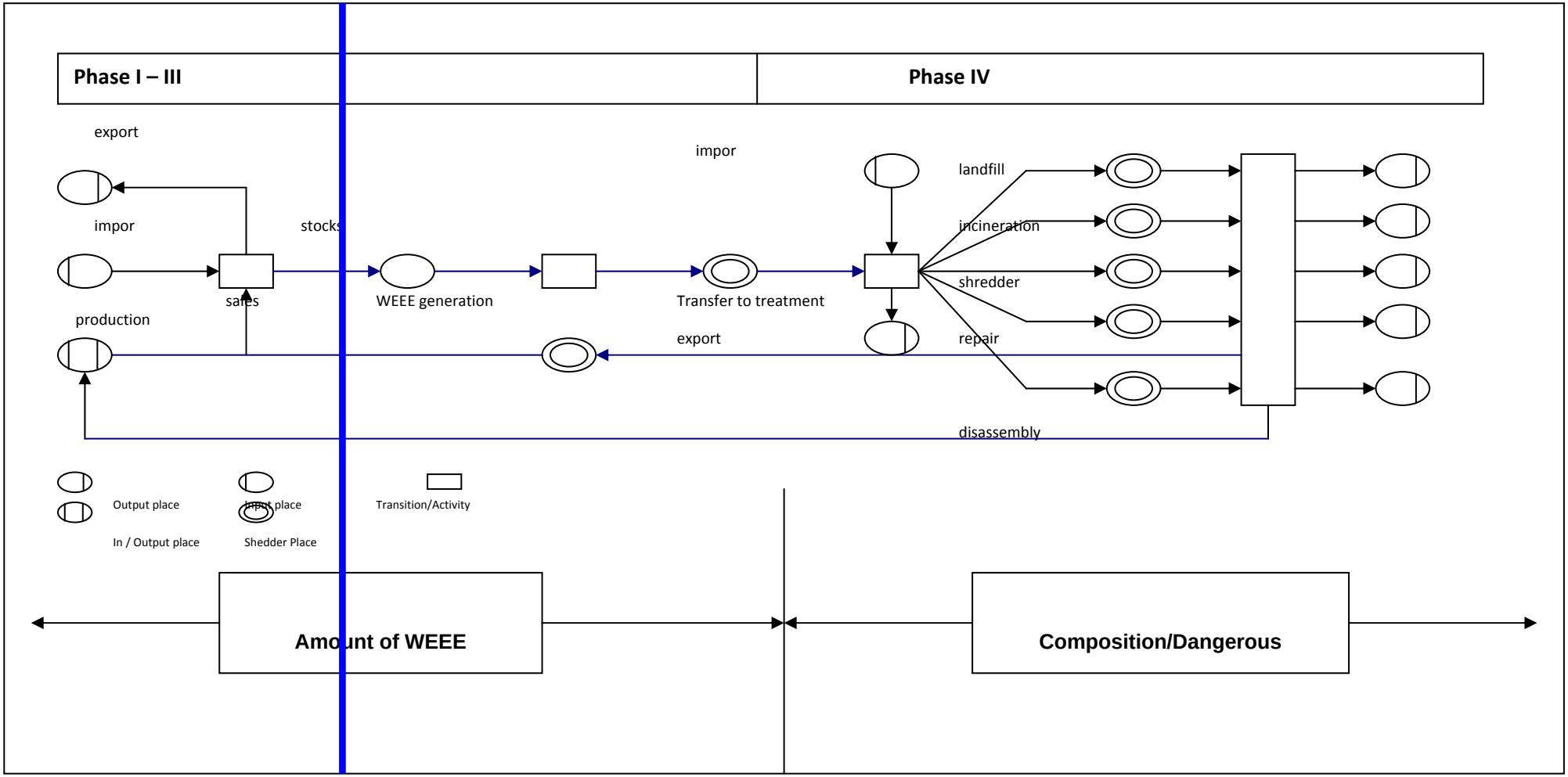


Figure 3.3: The 'Four-Phase-Model'

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.

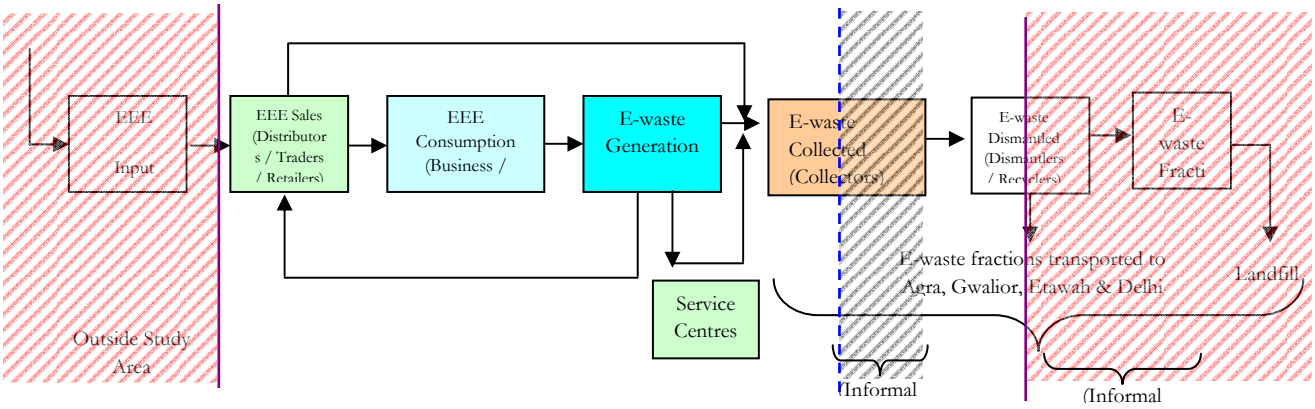


Figure 3.4: Tentative E-waste trade value chain in Study Area

Producers

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.

Consumers

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**.

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
LG	√		√	√	
Panasonic	√		√		
Samsung	√			√	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	√	√			Exchange your electronic item to your nearest dealer or where you buy the product
Electrolux	√	√			Exchange your electronic item to your nearest dealer or where you buy the product
Godrej	√	√			
Hitachi	√				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	√	√			E-waste Regarding no information Contact to nearest dealer
Philips	√			√	Call on customer care door to door collection of E-waste / discarded items of Philips
Whirlpool	√	√			To dealer he exchange your

Brands	Collection through Call Centre	Collection through Dealers / Retailer	Collection through Service Centre	Collection through Collection Centre / establishment	Remarks
					electronic item
Printers					
HP	√	√			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.

Informal Sector

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.

Market Features

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**.

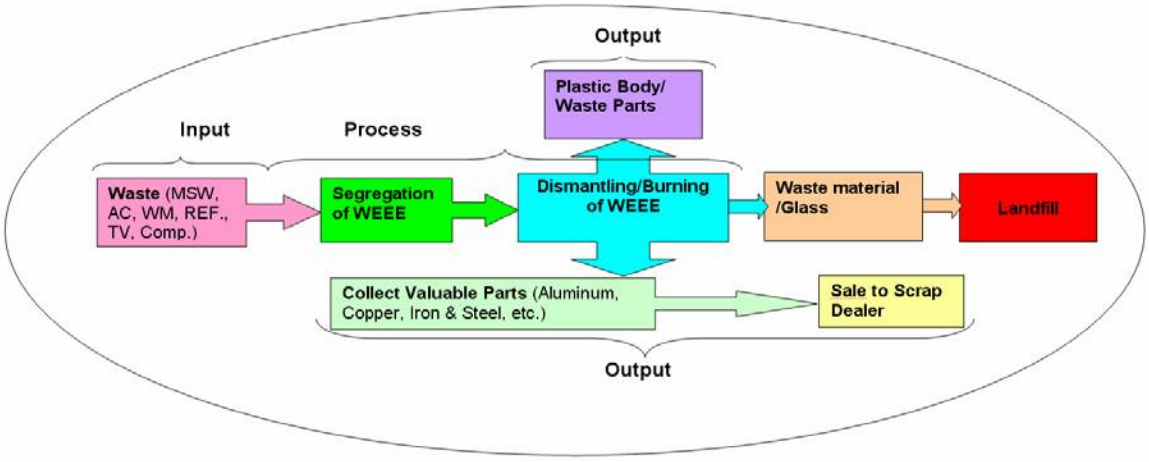


Figure 3.5: Processes observed at dumpsite

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.

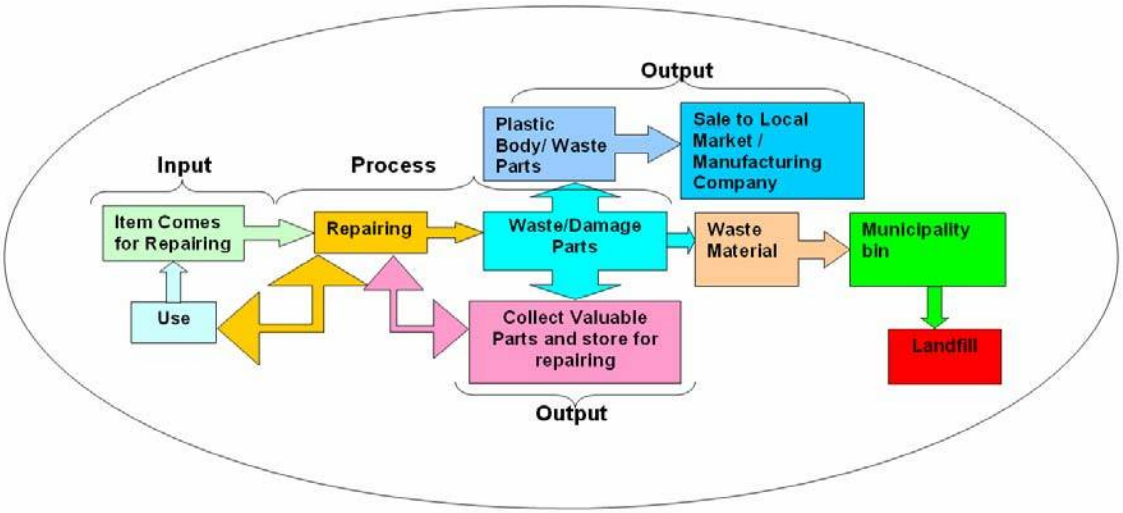


Figure 3.6: Processes observed at scrap dealers / junkyards

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 3.6** and illustrated in **Figure 3.7**.

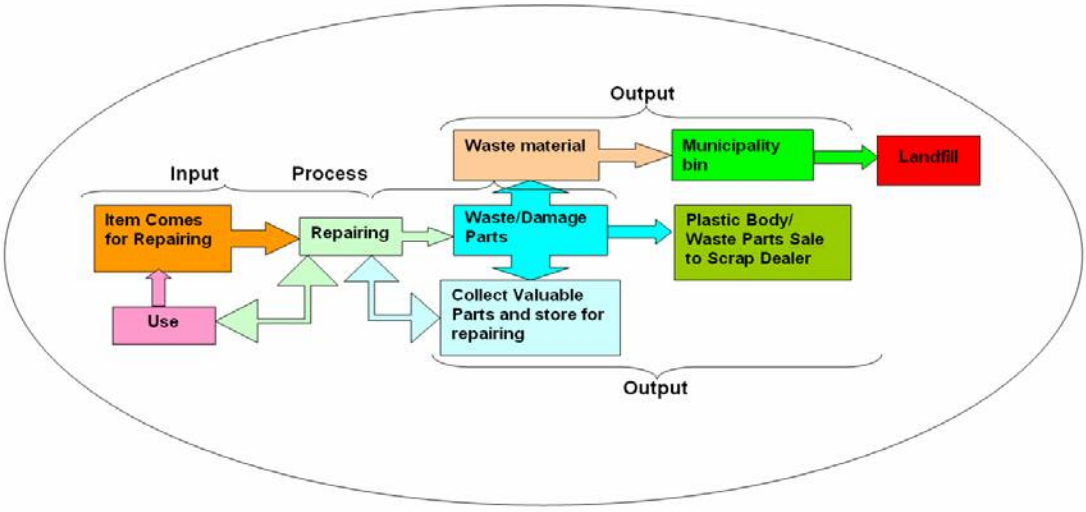


Figure 3.7: Processes observed at AC, Washing Machine, and Refrigerator Repair Shop

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**

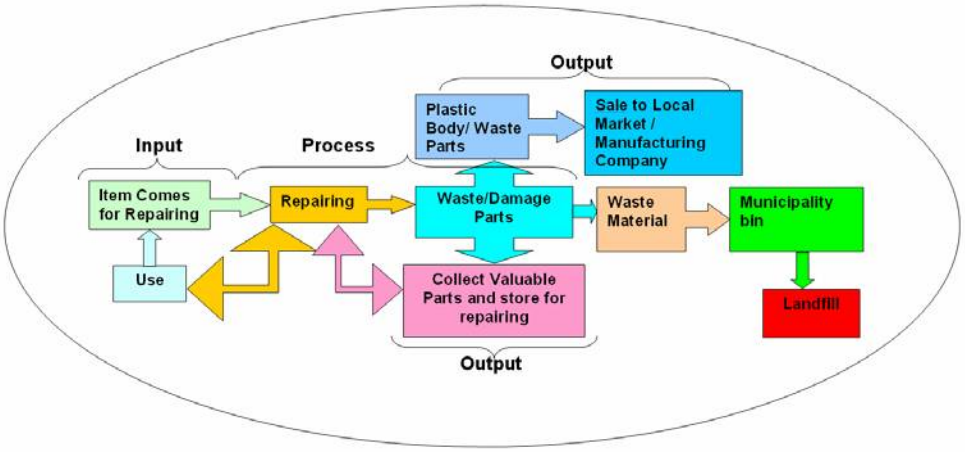


Figure 3.9: Processes observed at TV, Computer, and Mobile Phone Repair Shop

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**.

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

Sr. No.	Process name	Process Status				
		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

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.

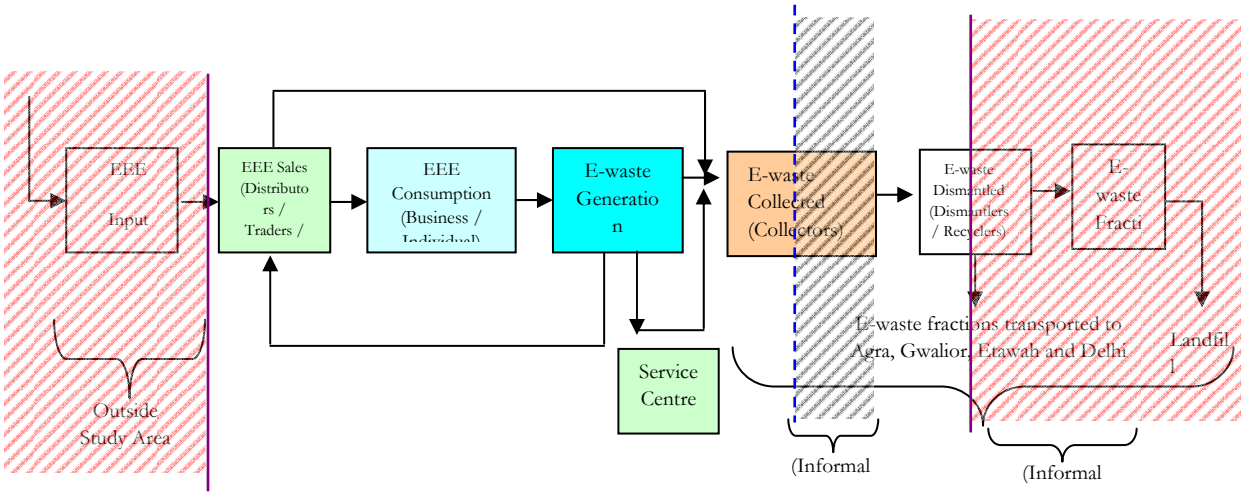


Figure 4.1: E-waste material flow chain in Study Area

Major observations related to data availability are given below.

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 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)
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)		

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.

Table 4.2: Data Matrix Vs Methodology

Methodology/ Data Requirement	Saturation Level		Number of Household	Calculated Sales			Stock Data		Average Lifetime	Storage data	Reuse	Recycle / dismantling	Land fill
	Household	Industry		Export Data	Import Data	Manufacturing / Production	Private	Industry					
Time Step Method	X		√	X	X	√	X	X					
Market Supply Method				X	X	√			√				
Carnegie Mellon Method				X	X	√			√	√	√	√	√
Approximation 1	X	X	√			√	X	X	√				
Approximation 2				X	X	√							

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.

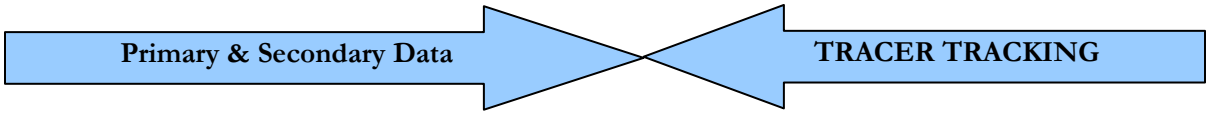


Figure 4.2: WEEE/E-waste data collection approach along the material flow chain in Bilaspur Division

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**.

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

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

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 Area (in numbers)

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)

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

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

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

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

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

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

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

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

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

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

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

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.

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**.

Table 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

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**.

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

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 5.13: 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

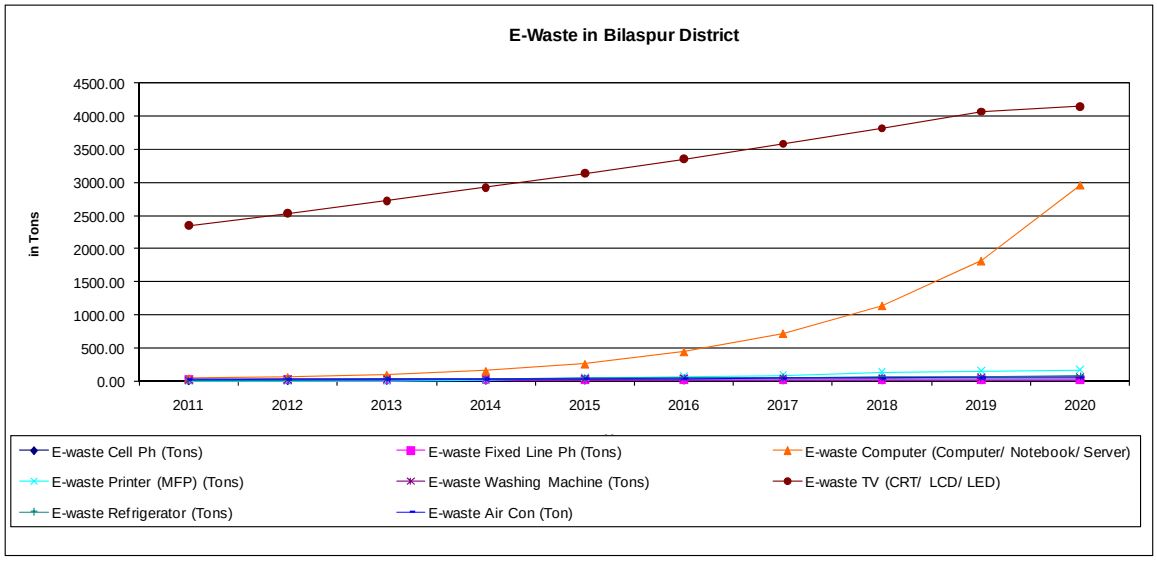


Figure 5.1: Item wise E-waste Projection of Bilaspur District

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

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 5.15: 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

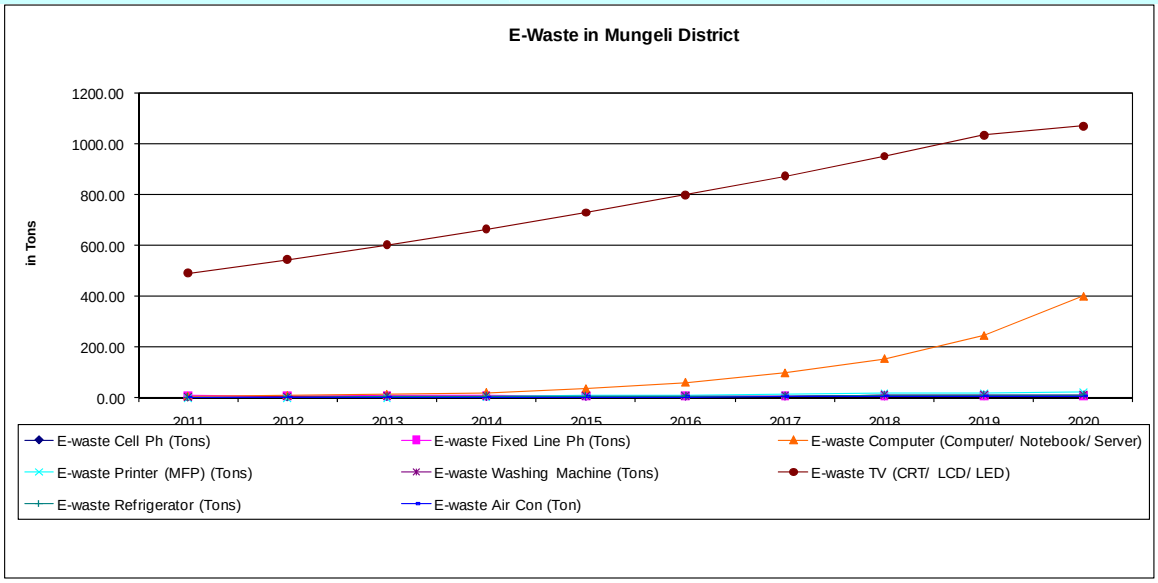


Figure 5.2: Item wise E-waste Projection of Mungeli District

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

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 5.17: 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

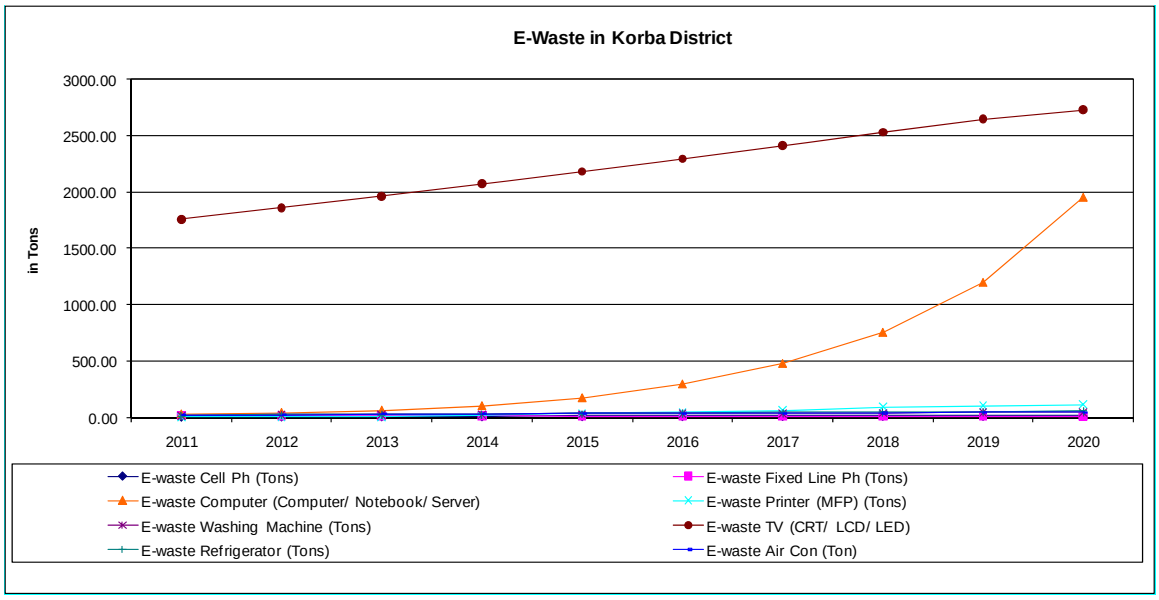


Figure 5.3: Item wise E-waste Projection of Korba District

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

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 5.19: 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

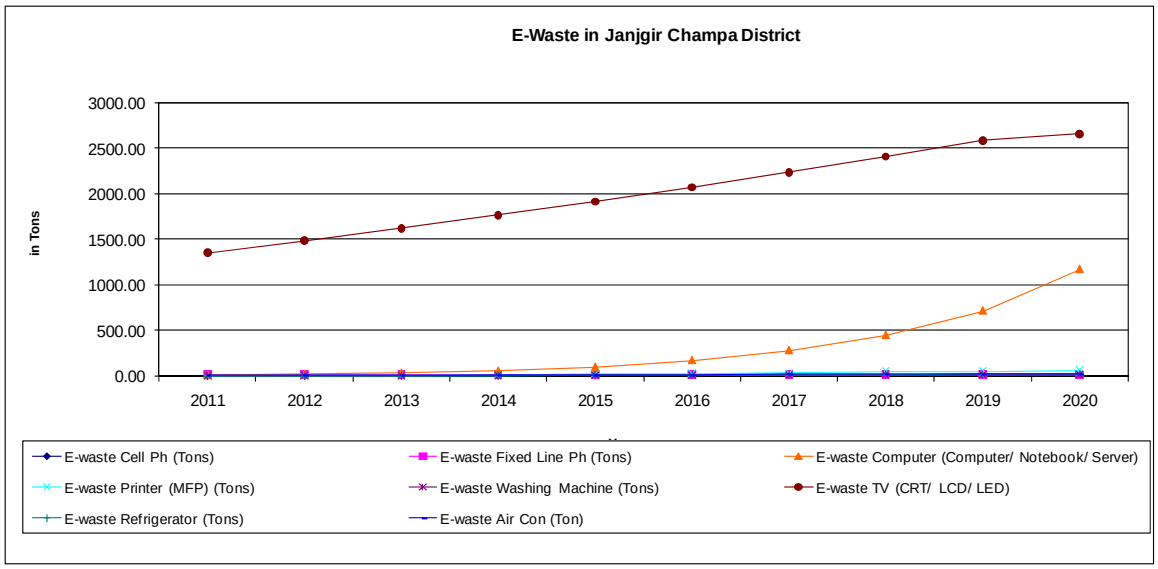


Figure 5.3: Item wise E-waste Projection of Janjgir Champa District

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

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 5.21: 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

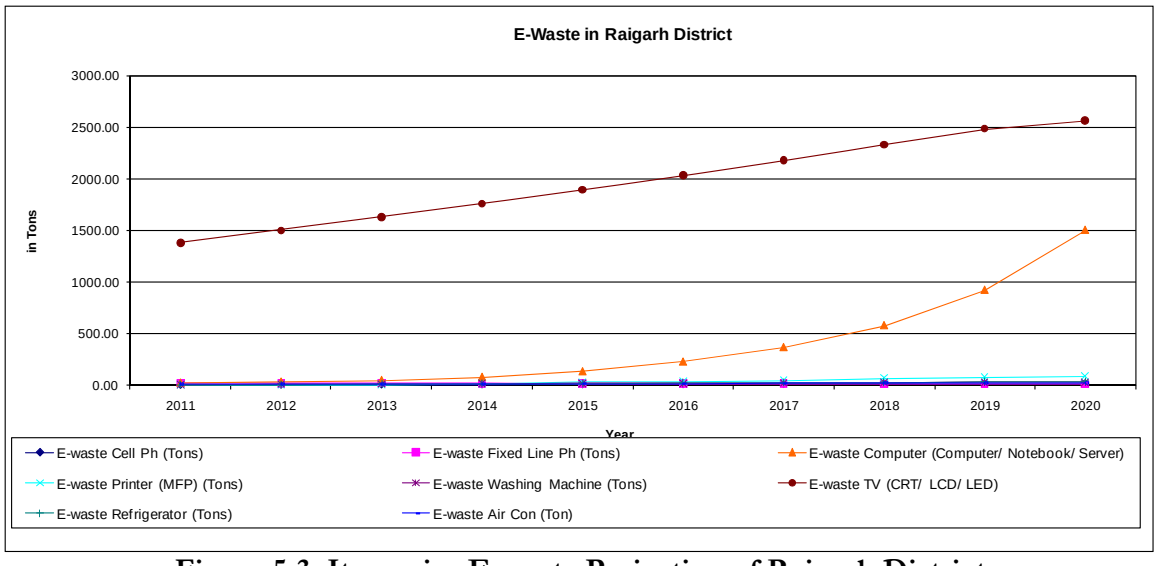


Figure 5.3: Item wise E-waste Projection of Raigarh District

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

Year	Bilaspur	Mungeli	Korba	Janjgir Champa	Raigarh	Total
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

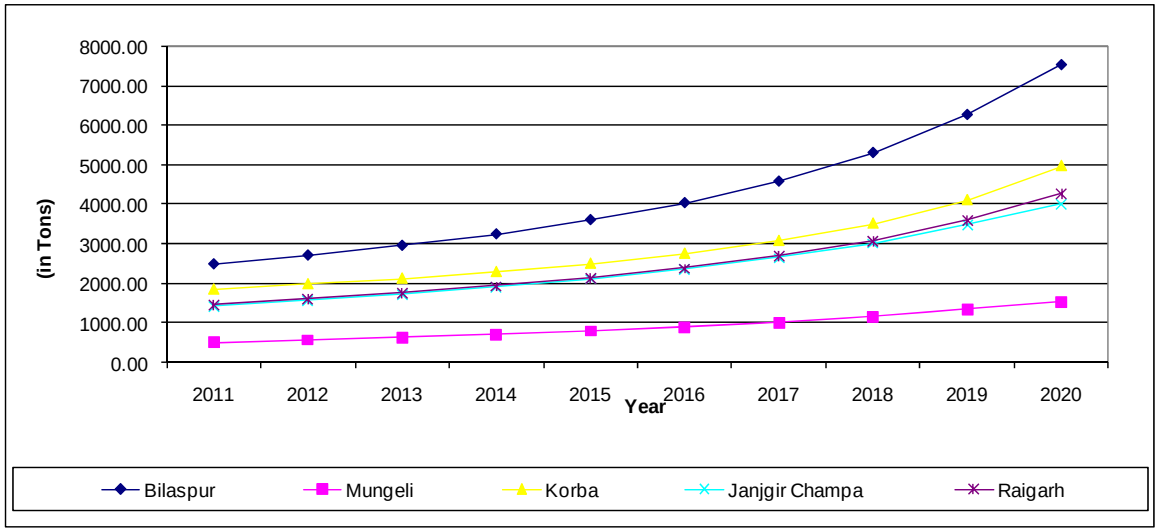


Figure 5.6: District wise Total E-waste Inventory Projection

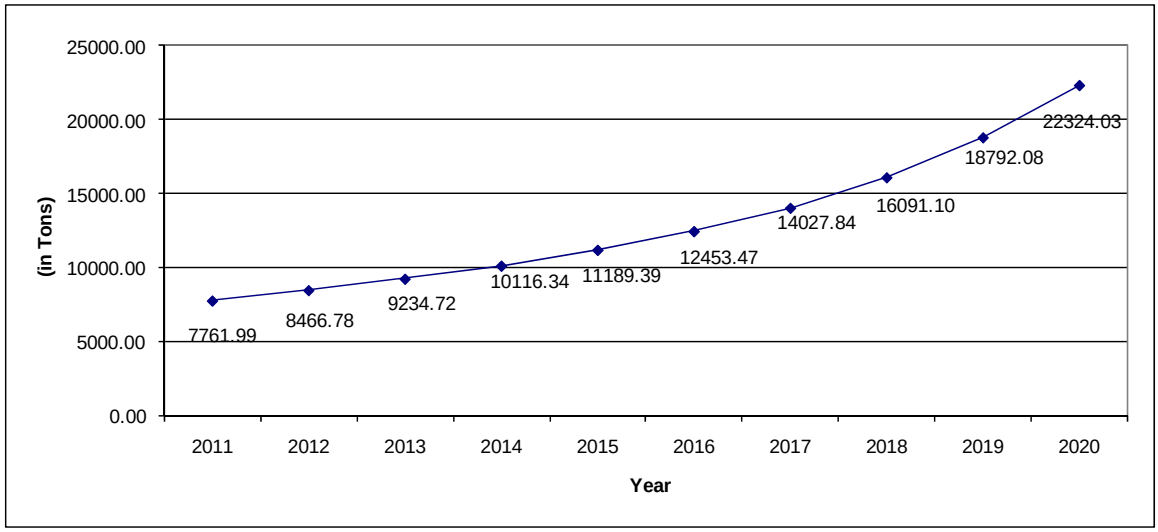


Figure 5.7: Total E-waste Inventory Projection in Bilaspur Division from 2011 to 2020

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.
2. 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%).

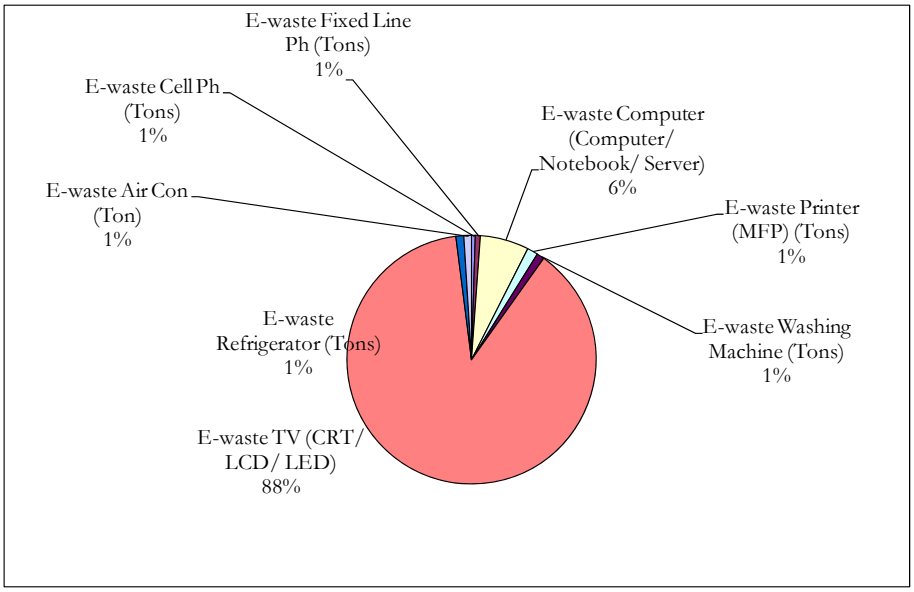


Figure 5.8: Item-wise E-waste in Percent for Bilaspur Division in 2015

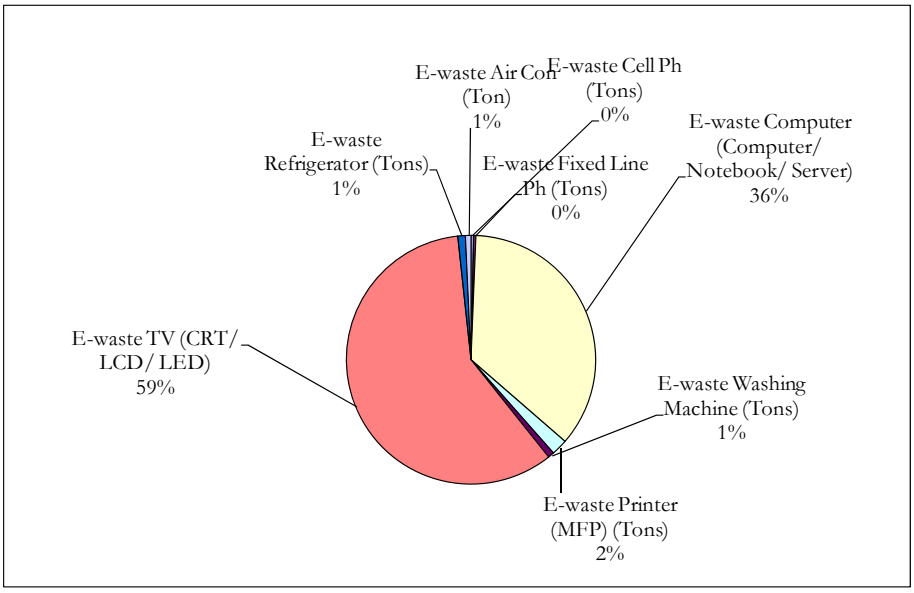


Figure 5.9: Item-wise E-waste in Percent for Bilaspur Division in 2020

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 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.

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

Sr. No.	Process name	Process Status				
		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

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 economics of Bilaspur Division E-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

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 Risk Matrix

Risks/ intensities		High	Medium	Low
Risks of availability of raw material	Short term		√	
	Long term		√	
Risk associated with collection	Short term	√		
	Long term		√	
Risk associated with transportation	Short term			√
	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 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
		Group Companies		**Allied JB Friction Private Limited** A-12, Site IV, Industrial Area, 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 – 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 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 Category	Brand	Address / Contact Details
				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) 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, 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. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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	LG Electronics India Pvt. Ltd, Plot No. 51, Udyog Vihar, Surajpur Kasna Road, Greater Noida: 201306 Uttar Pradesh
		Manufacturing Facilities	Markson	**SGV Industries** Plot No.41 & 42, Sector-6A, Sidcul Indl Area, Haridwar (Uttrakhand) Pin Code - 249401 Ph. 01334-239662/63/64

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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, Baddi, Tehsil Nalagarh, Dist. Solan,(H.P.). Pin Code - 173205 Ph.01795- 244703 Fax - 01795- 244703 Contact - Mr. Alok Kumar (Facility Incharge) Mob. 9212669513
		Head Office		PLOT No. 378, F.I.E, PATPARGANJ, DEHLI - 110092 Ph. No. +91-11-43086501-502, 22157662-63
		Corporate & Head Office	Moser Baer	43B, Okhla Industrial Estate, New Delhi - 110020. India. Tel +91 11 40594444, 91 11 26911570 - 74 Fax +91 11 41635211, 26911860
		Branch Offices		**Chennai** Moser Baer India Ltd. 81, IInd Floor 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
		Representative & Distributor		**USA Distributor** **Media Masters LLC** #440, 2601 S. Minnesota Ave., Ste 105 Sioux Falls, SD 57105-4750 USA Phone: +1-(888)-243-4465 Fax: +1-(877) 835-2834 E-mail: sales@mediamastersdisc.com
		Manufacturing Facilities		**BOM & M& ES** 66, Udyog Vihar, 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
		Corporate Address	Onida	MIRC Electronics Ltd. Onida House, G-1, M.I.D.C, Mahakali Caves Road, Andheri (E), Mumbai - 400 093. 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	**Samsung India Electronics** 6th, 7th & 8th Floors, Ifci Tower, 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	**Philips Electronics India Limited** 9th Floor, DLF 9-B, 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, 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.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
				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	**TCL India Holding Pvt. Ltd.** Sco 254, 2nd Floor, Sector 44 C 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
			T-Series	**Laxbro Manufacturing Company** W-53, MIDC Area, Bhosari Indl. Estate, PMC – 411026, Maharashtra
			Toshiba	**TOSHIBA INDIA PVT. LTD.** 3rd Floor, Building No. 10 Tower - B, Phase - II 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. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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	**Videocon Industries Ltd.** 14 Kms Stone, Aurangabad- Paithan 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
			Weston	**Westway Electronics Limited** B-102, Phase – II, Noida – 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. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
		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
			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	Next Retail India Limited, 3rd Floor, Aadeshwar Arcade Above Loop Gallary, 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

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. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 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
	Air Conditioner	Window	Blue star	**Corporate Headquarters** Kasturi Buildings, Mohan T Advani Chowk, Jamshedji Tata Road, 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 **Tel:** (91) (22) 66544000 **Fax:** (91) (22) 66544001
				Regional Headquarters **Chennai** No.104, Old No. 46, Garuda Buildings, Cathedral Road,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 Nahan Road Ranpur Jattan

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
				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 / 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 **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

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 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
			Carrier	**INDIAN HEADQUARTERS :** **Carrier Airconditioning & Refrigeration Limited** Delhi - Jalpur Highway, Narsingpur, Gurgaon, 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,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 & 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 7028 Fax:- 0832 - 244 7027
				Carrier Airconditioning & Refrigeration Ltd 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:- 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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 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 Tel : 022 - 42455300 / 02
				ETA General Pvt. Ltd. 203, 2nd Floor, Sankalp 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 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 KOLKATA - 700 017 Tel : 033 - 40602006
			Godrej	Given Above
			Haier	Given Above
			Hitachi	Given Above
			LG	Given Above

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
			Onida	Given Above
			Samsung	Given Above
			Videocon	Given Above
			TCL	Given Above
	Corporate Headquarters		Voltas	**Voltas Limited** Voltas House 'A' Block Dr. Babasaheb Ambedkar Road Chinchpokli Mumbai 400 033 Tel: 022-66656 666
	Factories			2nd, Pokhran Road, 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
			Mitsubishi	**Gurgaon Head Office** 2nd Floor, Tower A & B, DLF 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 , 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: +91 (44) 2847-7374
			Panasonic	Given Above
			Samsung	Given Above
			Sanyo	Given Above

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
			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
			Siemens	Registered & Corporate Office 130, Pandurang Budhkar Marg, Worli, Maharashtra, Mumbai 400 018. Tel: +91 22 3967 7000 Fax: +91 22 3967 7500
	Mobile Phones		Acer	Acer India Private Limited 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, Vinayaka 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	**Amazon Development Center India Pvt Ltd** Q-city, 2nd Floor-Block A & Block B Survey Number-109,110,111/2, 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

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 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 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, 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	**BLU Products** 10814 NW 33rd St# 100 Doral, FL 33172 (305) 715 – 7171
			Bosch	Bosch Sicherheitssysteme GmbH Robert-Bosch-Ring 5 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

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 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
				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
				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,

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, 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

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 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
				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

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
			HTC	1800 266 3566
			Huawei	**Huawei Telecommunication (INDIA) Co. Pvt Ltd.** 7th Floor, Tower A, Spaze I-Tech Park, Sohna Road, 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	Karbonn Mobiles #39/13, off 7th main, HAL 2nd stage Appareddy Palya, Indiranagar, Bangalore – 560038 Tel: 080 40894888
				Karbonn Mobiles D-170, Okhla Industrial Area, Phase-1 New Delhi – 110020 011 46604660
			Kyocera	**KYOCERA Corporation** **Cutting Tool Group** 6 Takeda, Tobadono-cho, 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
				KYOCERA Asia Pacific India 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 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

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

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

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

Sl. No.	Name	Address	Latitude			Longitude		
			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								
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

Sl. No.	Name	Address	Latitude			Longitude		
			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

Sl. No.	Name	Address	Latitude			Longitude		
			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

Sl. No.	Name	Address	Latitude			Longitude		
			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

Sl. No.	Name	Address	Latitude			Longitude		
			Deg.	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

Partial List of Bulk Consumers in Bilaspur Division- Annexure 3

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
2	**Tahsil 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								
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

Sl. No.	Name	Address	Latitude			Longitude		
			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

Partial List of Service centers in Bilaspur division- Annexure 4

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			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**	Kharargani, 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

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			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, 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

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			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

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
	Engineering Training)							
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

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
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

Sl. 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

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
		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 No.-23, 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

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**

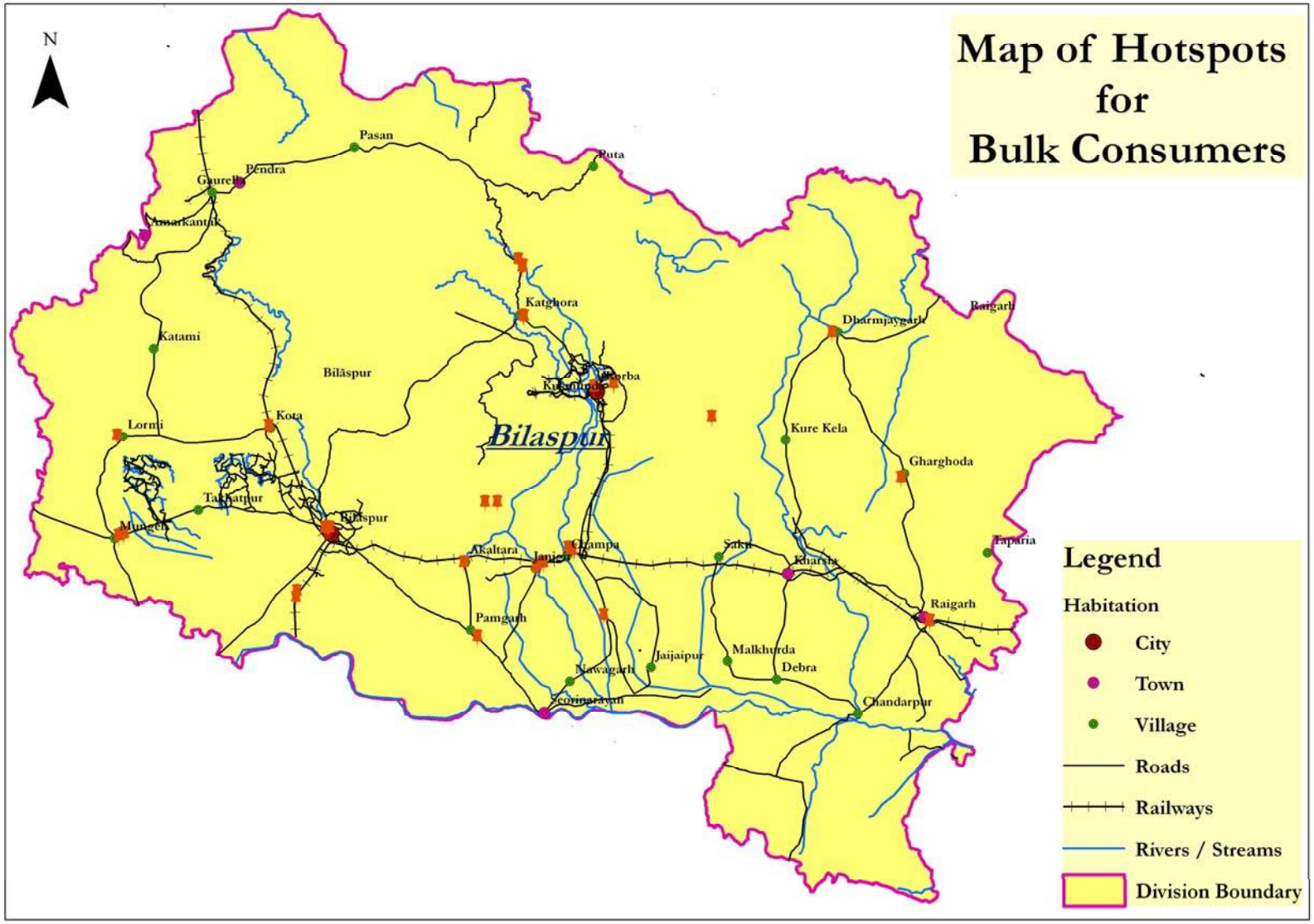
Partial Inventory of Scrap vendor/ Dismantler in Bilaspur Division – Annexure 6

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**	Kharargani, Bilaspur	22	5	3.0	82	9	21.2
7	**Smyle**	Kharargani, Bilaspur	22	5	3.2	82	9	20.4
8	**Salim Quiraisi**	Kharargani, 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								
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

Sl. No.	Name	Address	Latitude			Longitude		
			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

Sl. No.	Name	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
		Janjgir						
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
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


Map of Hotspots for Bulk Consumers
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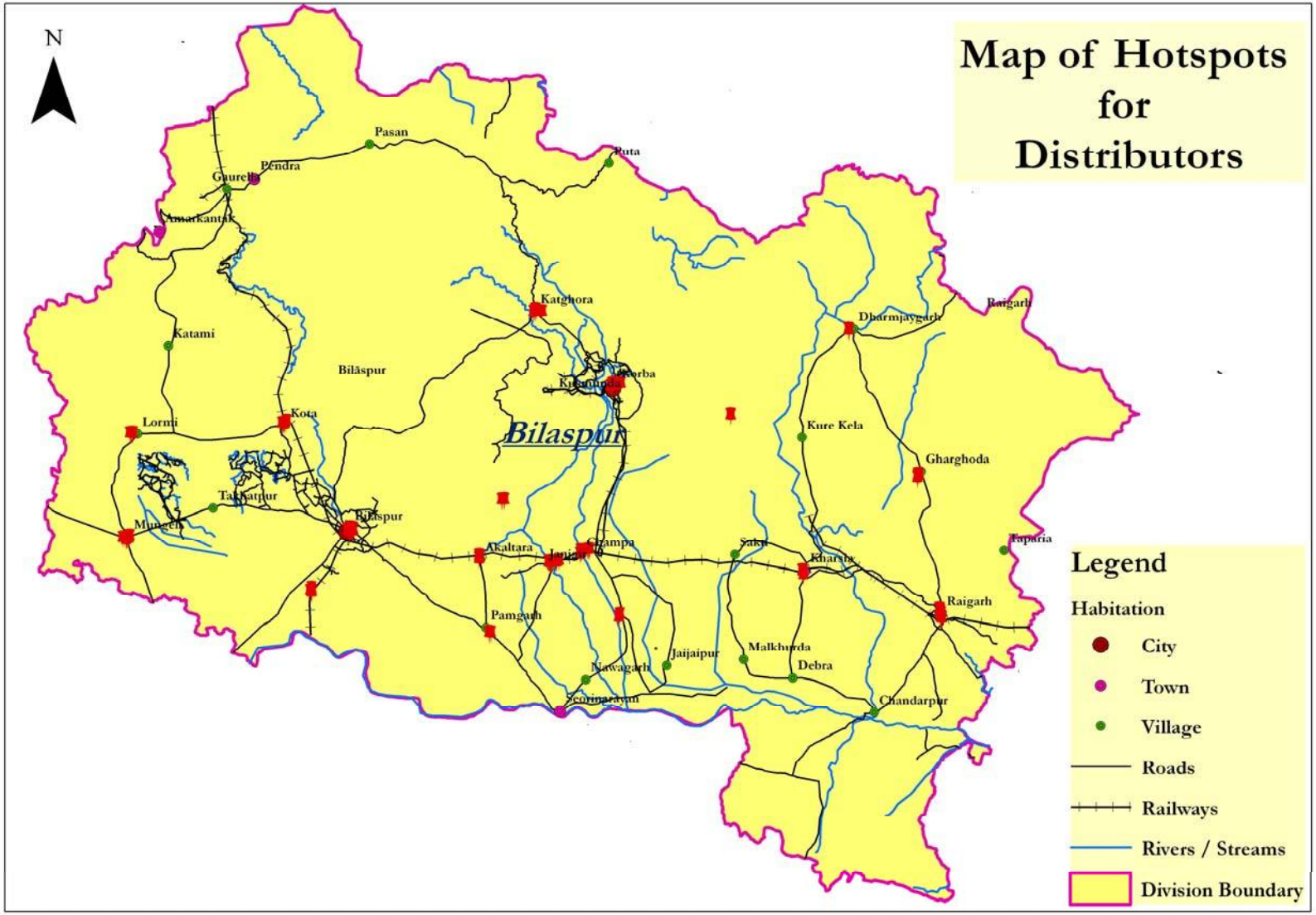
Pendra
Gaurela
Amarkantak
Puta
Katghora
Katami
Bilāspur
Korba
Kusmunda
Bilaspur
Lormi
Kota
Takhatpur
Bilaspur
Mungeli
Akaltara
Janjgir
Champa
Saksi
Kharsia
Dharmjaygarh
Raigarh
Kure Kela
Gharghoda
Taparia
Pamgarh
Jaijaipur
Malkhurda
Debra
Nawagarh
Sarangarh
Chandarpur
Legend
Habitation
City
Town
Village
Roads
Railways
Rivers / Streams
Division Boundary


Map of Hotspots for Distributors
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Pasan
Pendra
Gaurella
Amarkantak
Puta
Katghora
Katami
Bilāspur
Korba
Kusmunda
Bilaspur
Lormi
Kota
Takhatpur
Bilaspur
Mungeli
Akaltara
Janjgir
Champa
Sakti
Kharsia
Dharmjaygarh
Raigarh
Kure Kela
Gharghoda
Taparia
Pamgarh
Jaijaipur
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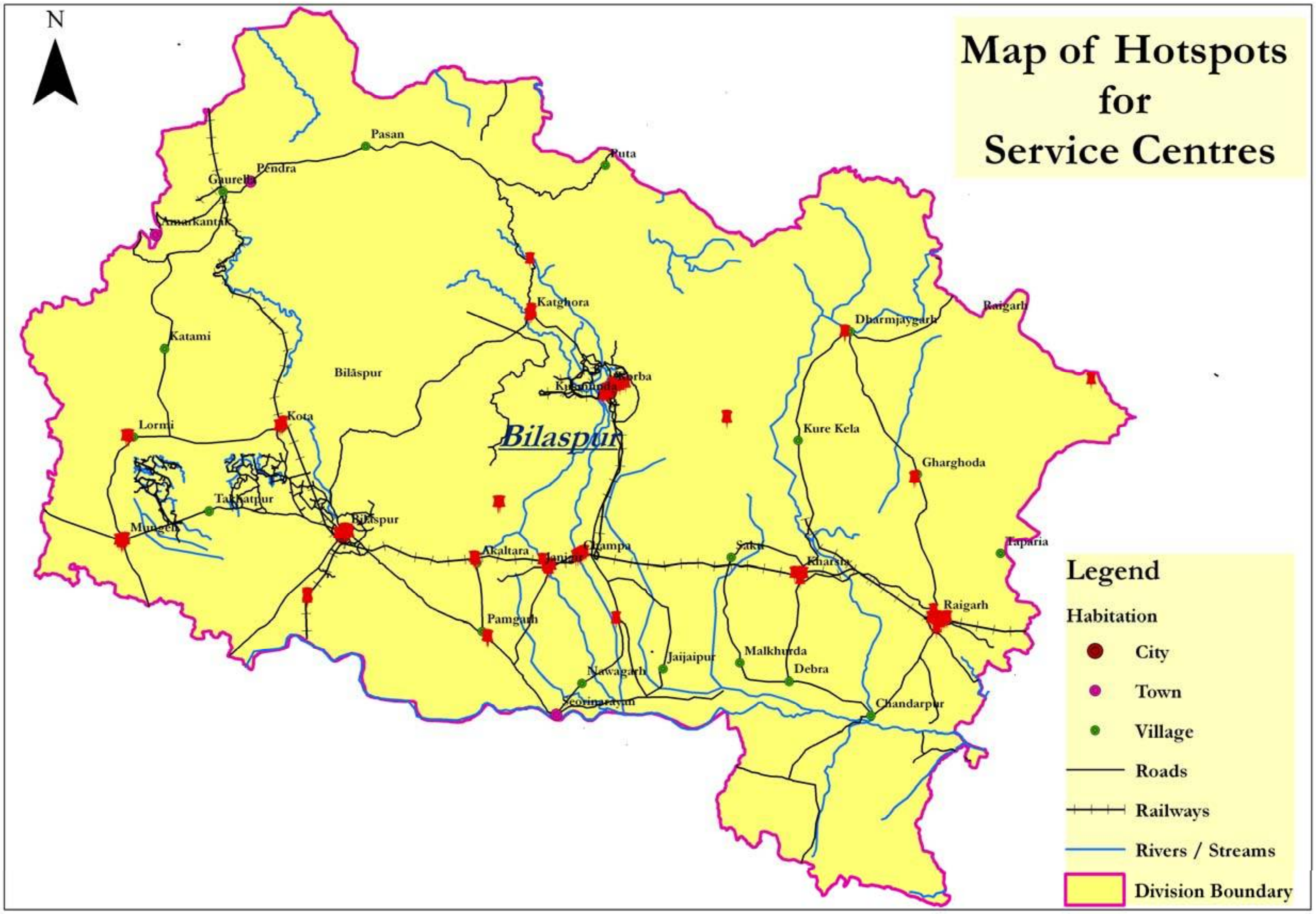
Habitation
City
Town
Village
Roads
Railways
Rivers / Streams
Division Boundary


Map of Hotspots
for
Service Centres
N
Bilaspur
Pasan
Puta
Pendra
Gaurella
Amarkantak
Katghora
Katami
Bilāspur
Korba
Lormi
Kota
Kure Kela
Gharghoda
Dharmjaygarh
Raigarh
Takhatpur
Mungeli
Bilāspur
Akaltara
Janjgir
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Sakti
Kharsia
Taparia
Raigarh
Pamgarh
Jaijaipur
Malkhurda
Debra
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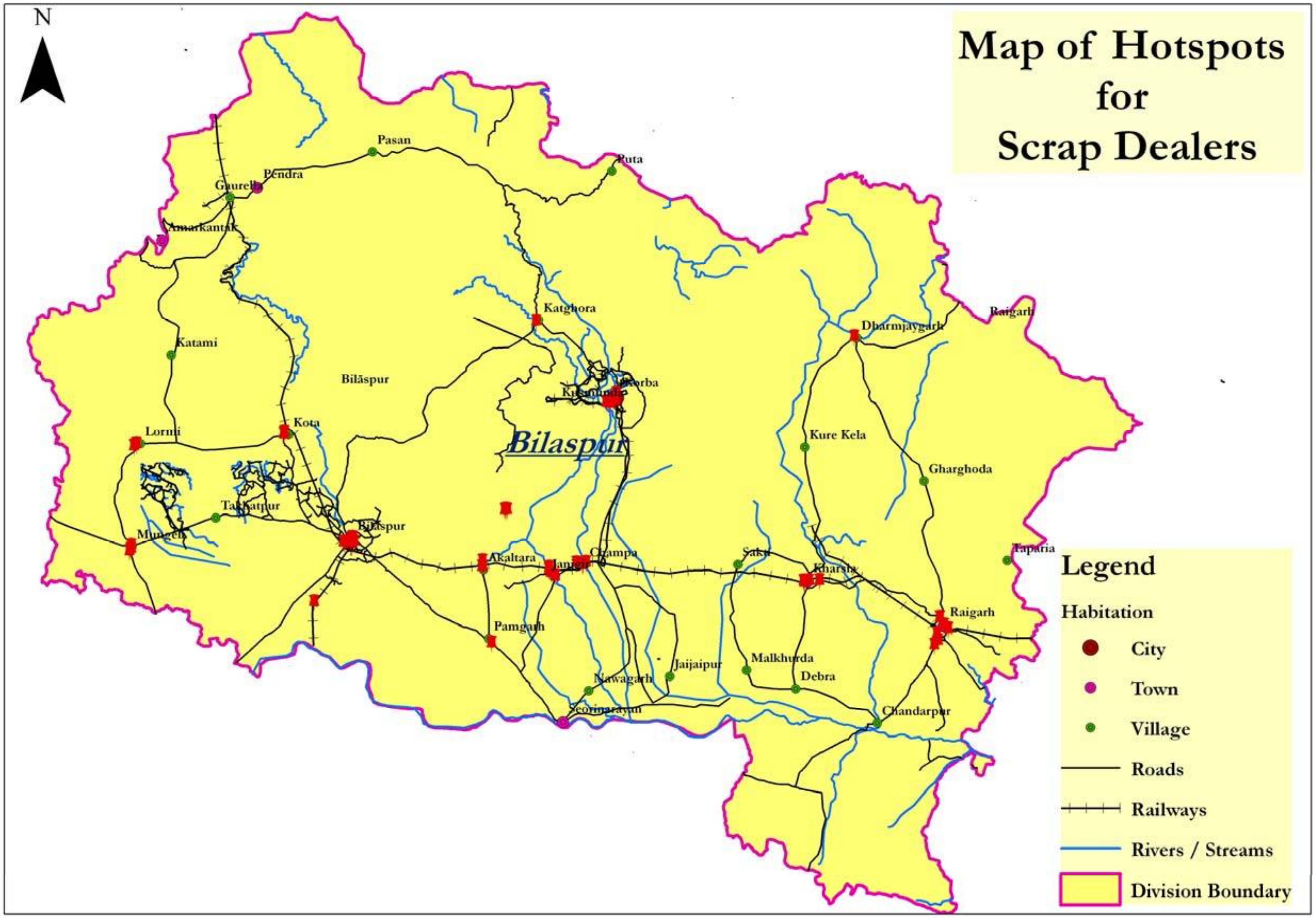
Habitation
City
Town
Village
Roads
Railways
Rivers / Streams
Division Boundary


Map of Hotspots
for
Scrap Dealers
N
Legend
Habitation
City
Town
Village
Roads
Railways
Rivers / Streams
Division Boundary
Bilaspur
Pasan
Pendra
Puta
Katghora
Dharmjaygarh
Raigarh
Katami
Bilāspur
Lormi
Kota
Kure Kela
Gharghoda
Akaltara
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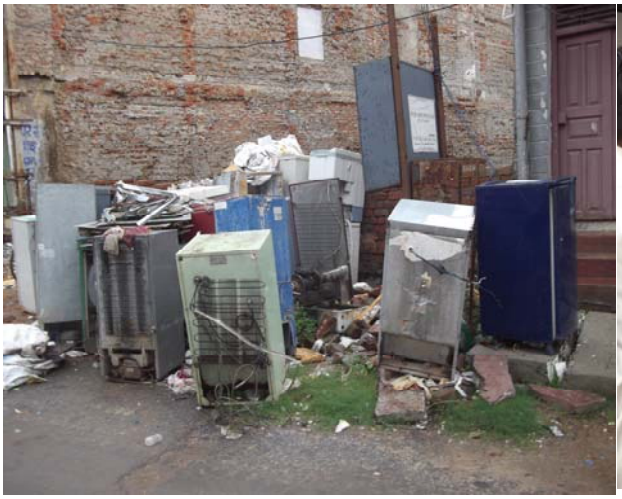
Sakti
Pamgarh
Malkhurda
Debra
Jaijaipur
Nawagarh
Chandarpur

Sample Photo Documentation – Annexure 8




TE-LAX
E-LAX


शिवम रेडियो टीवी से


Whirlpool Service Centre
A-1

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) $= [\text{Stock}(t_1) - \text{Stock}(t)]_{\text{private}} + [\text{Stock}(t_1) - \text{Stock}(t)]_{\text{industry}} + \bullet \text{Sales}(n) - \bullet \text{WEEE}(n)$ $\quad n=t1+1 \text{ to } t-1 \quad n=t1+1 \text{ to } t \text{ with } t_1 < t$

$\text{Stock}_{\text{private}}$ = Number of households * (saturation level of households / 100)

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

$\text{Stock}_{\text{industry}}$ = 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

d_S - 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)

Features of the five inventory assessment methods

Methodology/Features	Requirements	Constraints	Advantages
The Time Step Method	1. Information about domestic sales. 2. Appliance stock levels for household. 3. Industrial stock levels.	1. Household saturation levels are based on predetermined stock levels 2. Industrial stock levels are assumed in the calculations because they are difficult to obtain and require assumptions. 3. Assumption that all the WEEE/E-waste generated is collected and transferred to treatment and disposal facility.	1. Calculations can be carried out very easily. 2. Method gives good results in a saturated market.
The market Supply Method	1. Information about domestic sales. 2. Average life of new and second hand items.	1. 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. 2. WEEE/ E-waste are often stored for years. 3. Assumed that all appliances produced in the same year will be in line for disposal after exactly the average life. 4. Assumption that the average variance in life of items of EEE does not change very much, whereas, in reality, lifetimes may	1. Necessary data need not be very wide-ranging 2. Calculations can be carried out very easily using a simple formula 3. 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.

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.	1. 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. 2. This model also requires a full coverage of sales data as early as possible in the WEEE/E-waste trade value chain.	1. The model allows for an electrical and electronic equipment to be purchased, reused, stored and finally recycled or landfilled representing "material flow" more precisely. 2. 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.	1. A product's constant mean lifespan is assumed in this method. 2. 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.	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 appliances plays a significant role in consumer behaviour.	1. This method is suitable for carrying 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.

Data Requirements for E-waste Inventory Assessment

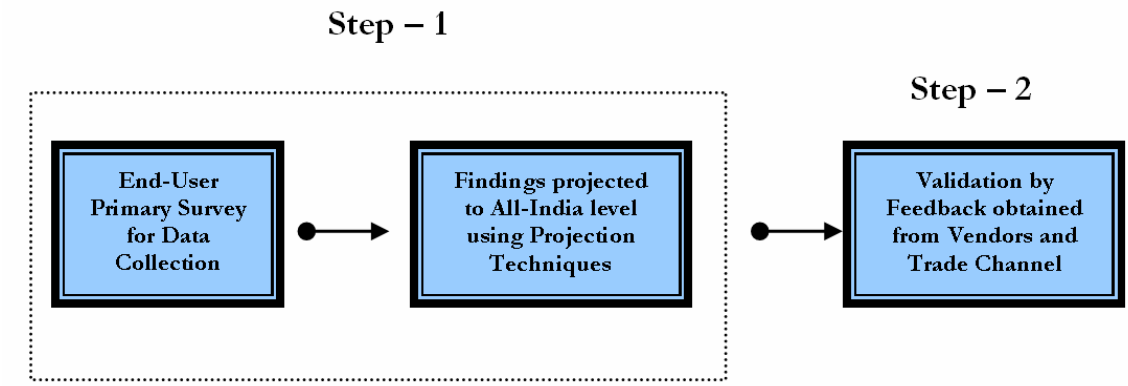
Methodology/ Data Requirement	Saturation Level		Number of Household	Calculated Sales			Stock Data		Average Lifetime	Storage data	Reuse	Recycle	Landfill
	Household	Industry		Export Data	Import Data	Manufacturing /Production	Private	Industry					
Time Step Method	√	√	√	√	√	√	√	√					
Market Supply Method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

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.

$$\sum_{i=1}^{n} \text{Last one year market size in employee band i} = \sum_{i=1}^{n} \left(\text{Acquisition rate in employee band i} \times \text{Universe of estab. in employee band i} \right)$$

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 1. Pure households 2. 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-

Step	Purpose
	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.

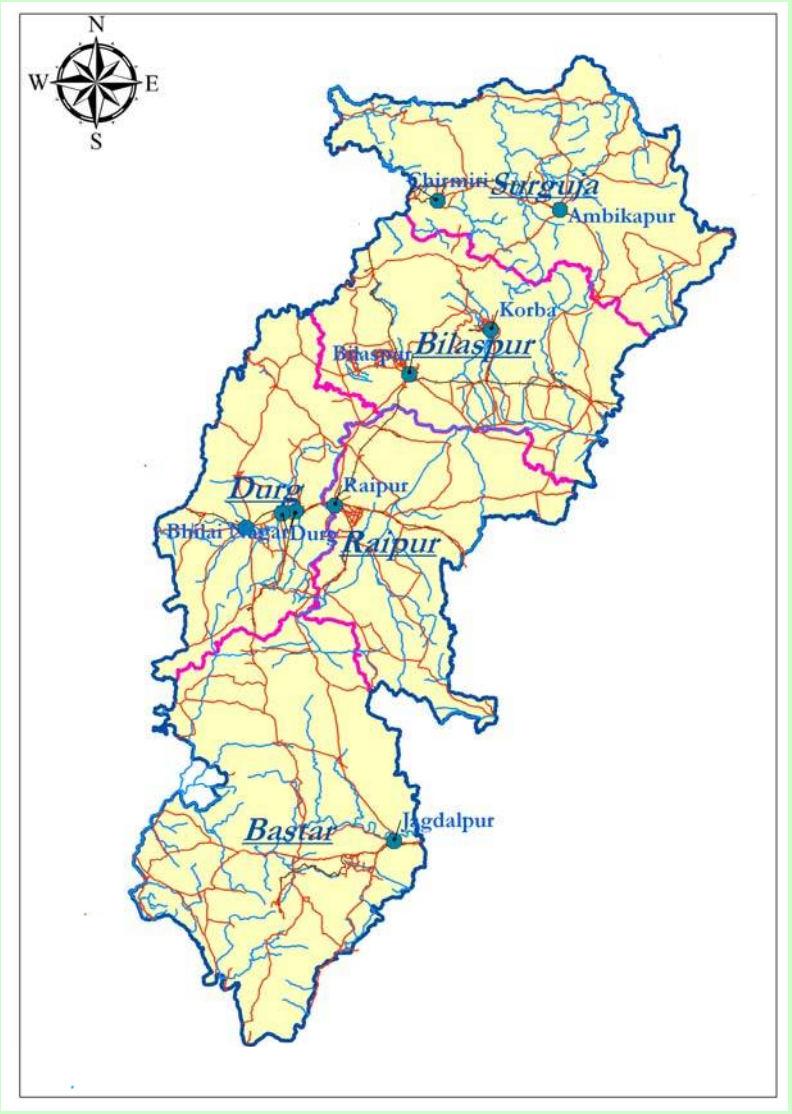
List of Sources of Data in the Study Area- Annexure 10

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	

2016

FINAL REPORT

E-WASTE INVENTORIZATION IN ALL FIVE DIVISIONS OF CHHATTISGARH



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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
CPCB	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
MT	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 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.

Producers: 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**.

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.

Consumers: 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**.

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. 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**.

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.

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. 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 **Raipur 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. 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 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 **Chhattisgarh** 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 E-waste 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 E-waste 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**.

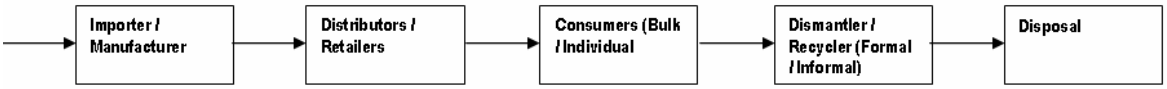

Figure 1.1: Conceptual WEEE business chain

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.

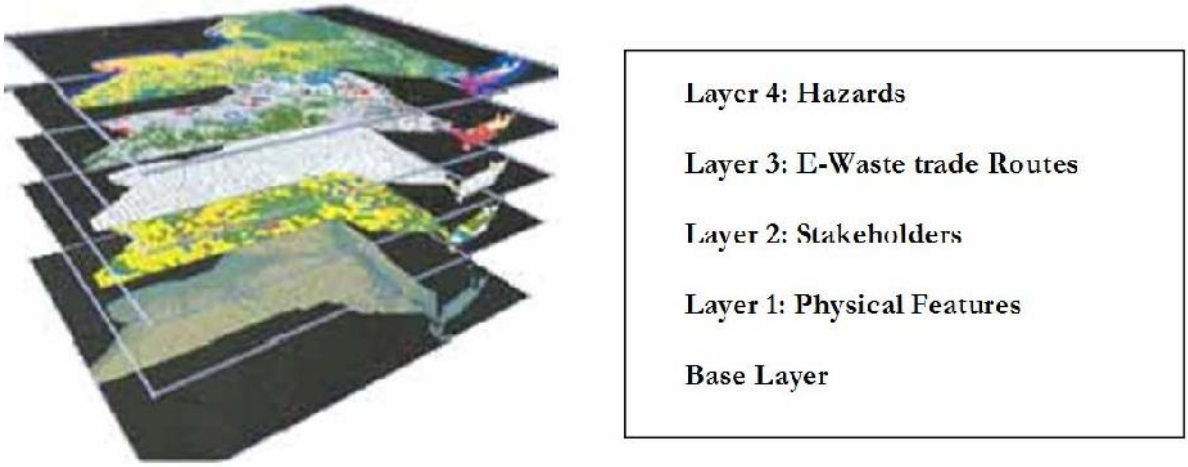

Figure 1.2: Geographical mapping of different attributes

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**.

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 / 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	E-waste quantity input is estimated Percentage of imported / household E-waste is known
		Survey of key-players for import: structured questionnaires /interviews	
	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

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 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 Management		Export & Import of E-waste	
	Pre 1st May 2012	Post 1st May 2012	Pre 1st May 2012	Post 1st May 2012
E-waste (Management & Handling) Rules 2011		√		
Hazardous Waste (Management, Handling & Transboundary) Rules 2008	√		√	√
Guidelines for Environmentally Sound Management of E-waste 2008	√	√		
Guidelines for Implementation of E-waste Regulations 2012	√	√		

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.

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
Collection	Manufacturing	√					
	End of Life	√					
Take-back	Individual	√					
	Collectively	√					
Transportation to	Producer		√	√			
	Collection Centre	√	√	√			
	Dismantlers/ Recyclers	√	√	√	√	√	
	TSDF* Facility	√				√	√
Storage					√	√	√
Financing		√					
Registration		√			√	√	√
Filing of Annual Returns		√			√	√	√

Responsibilities	Producer	Consumer	Bulk Consumer	Collection Centre	Dismantler	Recycler/ Reprocessor
Return of Annual Inventory Handled	√		√	√	√	√

Note: √ 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, poly-brominated 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**.

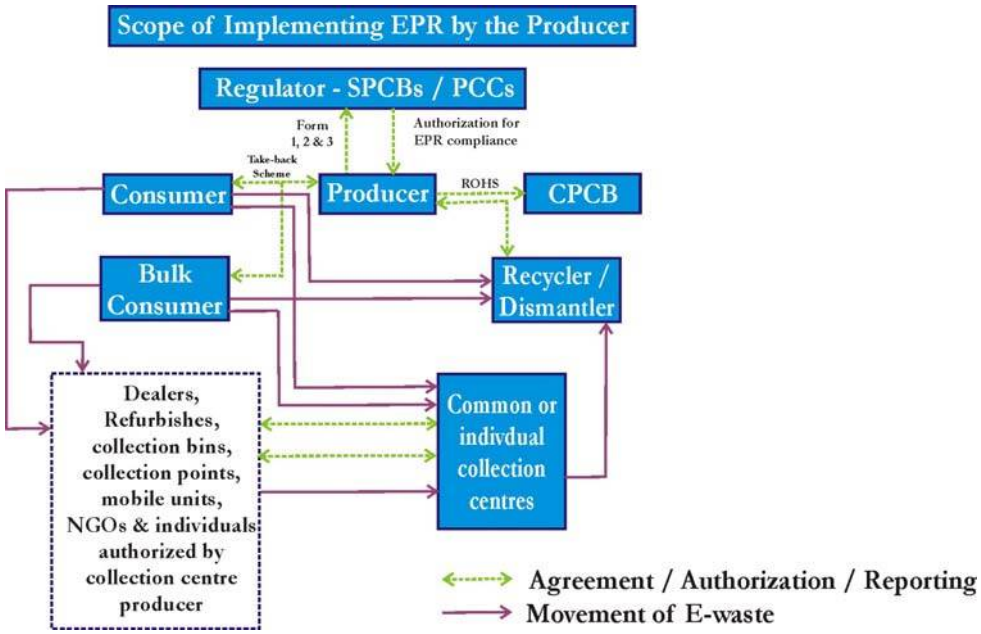

Figure 2.1: Scope of implementing EPR for Producers
Source: E-waste Regulation Guidelines 2012

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.

<u>The criteria for setting up collection centres are:</u>

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**.

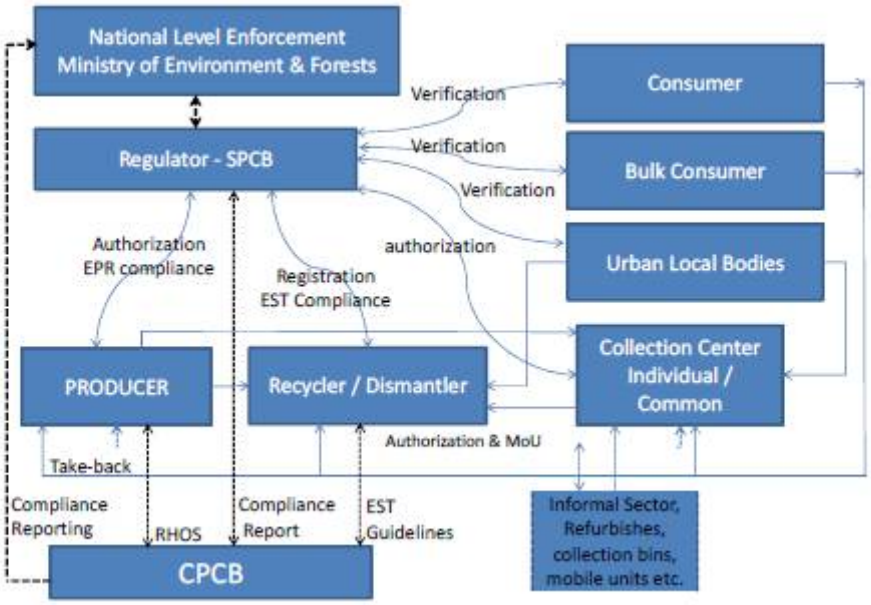

Figure 2.2: Implementation of E-Waste Rules 2011

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**.

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

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/Corporation)	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.

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, duties and corresponding rule as per Schedule VII of the HW Rules, 2008

Sr. No.	Authority/(ies)	Duties and Corresponding Rule
1.	Ministry of Environment and forests, under the Environment (protection) Act, 1986	Identification of hazardous wastes Permission to exporters of hazardous wastes 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 waste treatment, storage and disposal facility (TSDF). Assess EIA reports and convey the decision of approval of site or otherwise. Acquire the site or inform operator of facility or occupier or association of occupiers to acquire site. Notification of sites. 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	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.	Port Authorities under Indian Port Act 1908 and Customs Authorities under the customs Act, 1962	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 Wastes Rules and in analysis of hazardous wastes. 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 Form - 3	Authorization in Form-I	Registration Form-IV	RoHS Compliance
1.	Consumer	X	X	X	X	X	X

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
2.	Bulk Consumer	√	√	X	X	X	X
3.	Urban Local Bodies	√	X	X	X	X	X
4.	Collection Centre	√	√	√	√	X	X
5.	Producer –offer to sell	√	√	√	√	X	√
6.	Producer - importer	√	√	√	√	X	√
7.	Producer - Manufacturing EEE	√	√	√	√	X	√
8.	Dismantler	√	√	√	√	√	X
9.	Recycler	√	√	√	√	√	X

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 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.

Table 3.1: Components in E-waste

of cal & onic ment'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
ation Technology and Telecommunication Equipment																			
lized	√	√	√	√	√		√	√	√	√		√					√	√	
rocessing																			
ames	√	√	√	√	√		√	√	√	√		√					√	√	
omputers	√	√	√	√	√	√	√	√	√	√		√					√	√	
al	√	√	√	√		√	√	√	√	√		√							
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ones	√		√	√				√	√	√		√							
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ss	√		√	√			√	√	√			√					√	√	
ones																			

r ones	√	√	√	√	√		√	√	√			√					√	√		
ring s	√	√	√	√			√	√	√			√					√	√		
mer Electrical and Electronics																				
le Ray (CRT) TV	√		√		√				√	√	√	√					√			
Crystal y (LCD)	√		√		√				√	√		√	√				√			
Emitting (LED)	√		√		√				√	√		√	√				√			
erator	√	√	√	√	√			√	√					√		√	√		√	
ng	√	√	√		√			√	√			√			√	√				
ne																				
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

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

Table 3.2: Possible Hazardous Substances in E-waste Components

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

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.

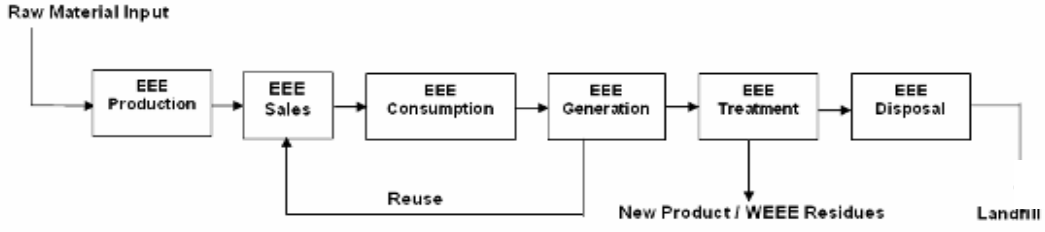


Figure 3.1: Conceptual E-waste trade value chain
Source: UNEP Manual Vol. I; Inventory Assessment Manual

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.

Table 3.3: Phases of material flow model

Sr. No.	Phase	Stakeholders
	Phase I: 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)
	Phase II: 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
	Phase III: 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
	Phase IV: 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.

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.

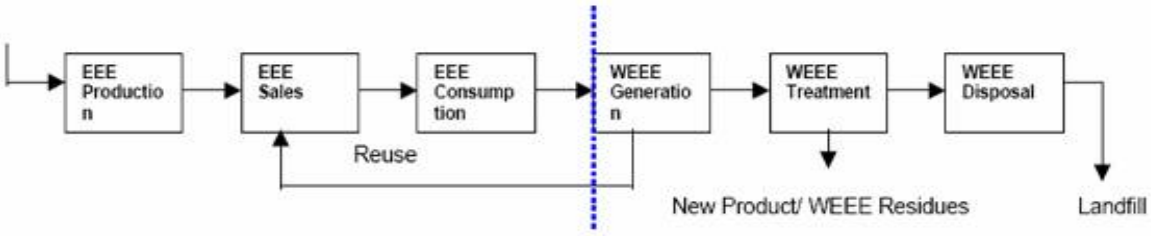


Figure 3.2: Generic E-waste trade value chain in a developing country

Source: UNEP Manual Vol. II; Inventory Assessment Manual

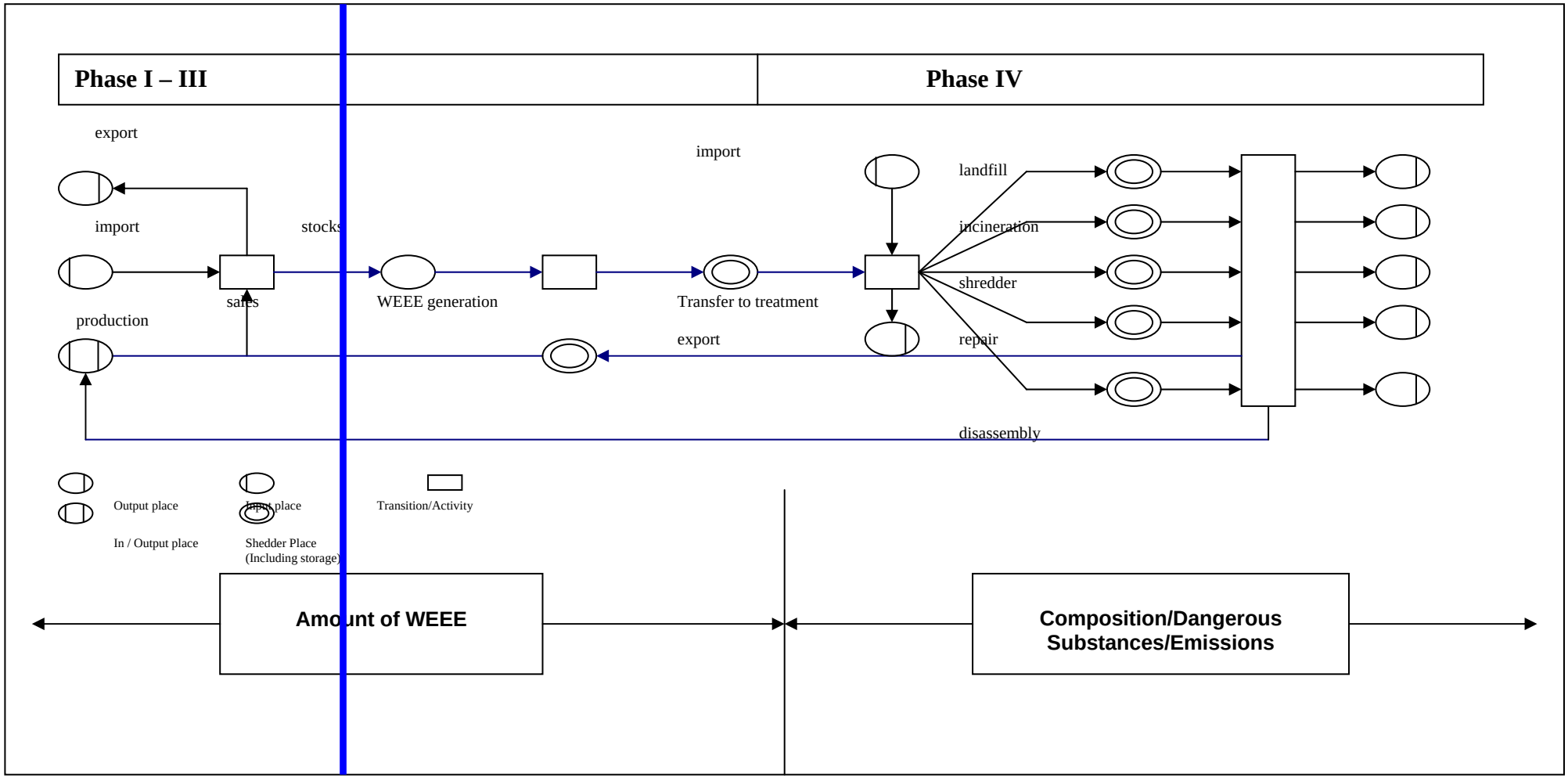


Figure 3.3: The 'Four-Phase-Model'

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.

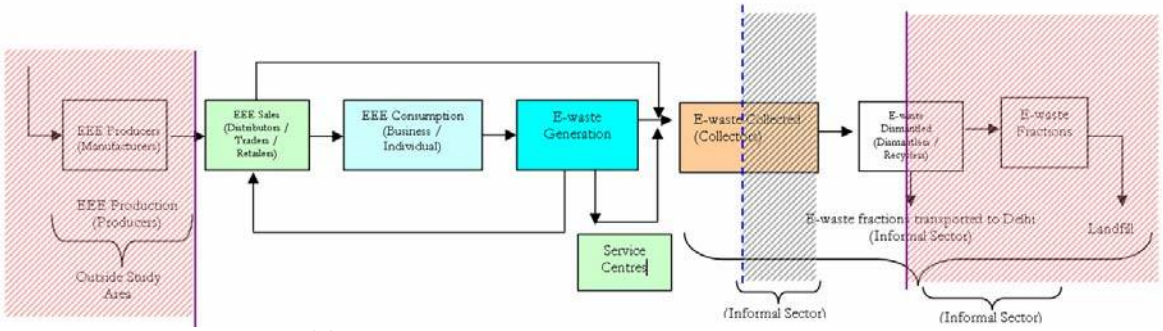


Figure 3.4: Tentative E-waste trade value chain in Study Area

Producers

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.

Consumers

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**.

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
LG			√	√	Mainly done by Attero Recycling Collection Centre
Panasonic	√		√	√	Through Collection Centre / Service Centre
Samsung	√			√	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	√		√	√	Through Collection Centre / Service Centre
Kelvinator	√	√			Exchange your electronic item to your nearest dealer or where you buy the product
Electrolux	√	√			Exchange your electronic item to your nearest dealer or where you buy the product
Godrej	√	√			Exchange offer contact to your dealer no collection centre
Hitachi	√				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	√	√			Contact to your dealer where you buy the product
Akai	√	√			To the dealer he gives the cost of the product.
Sansui	√	√			E-waste Regarding no information Contact to nearest dealer

Brands	Collection through Call Centre	Collection through Dealers / Retailer	Collection through Service Centre	Collection through Collection Centre / establishment	Remarks
Philips	√			√	Call on customer care door to door collection of E-waste / discarded items of Philips
Whirlpool	√	√			To dealer he exchange your electronic item
			Printers		
HP	√	√			Drop your items as dealer's drop off locations.
Canon	√		√	√	Through Collection Centre / Service Centre
Brother			√	√	Through Collection Centre / Service Centre
TVSE	√		√	√	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.

Market Features

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.

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**.

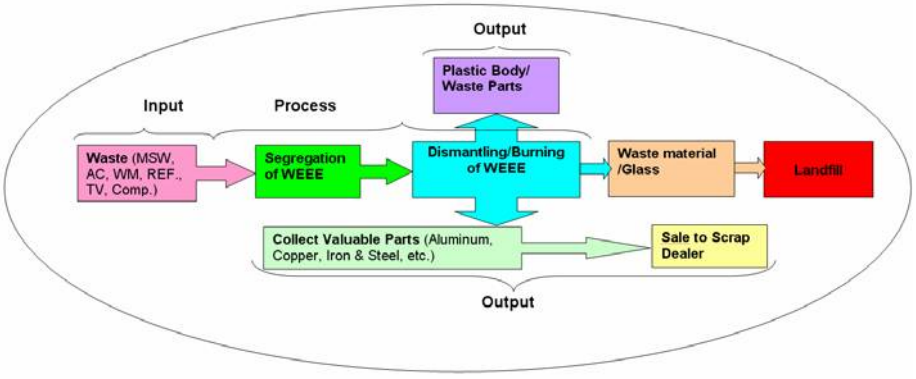


Figure 3.5: Processes observed at dumpsite

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**.

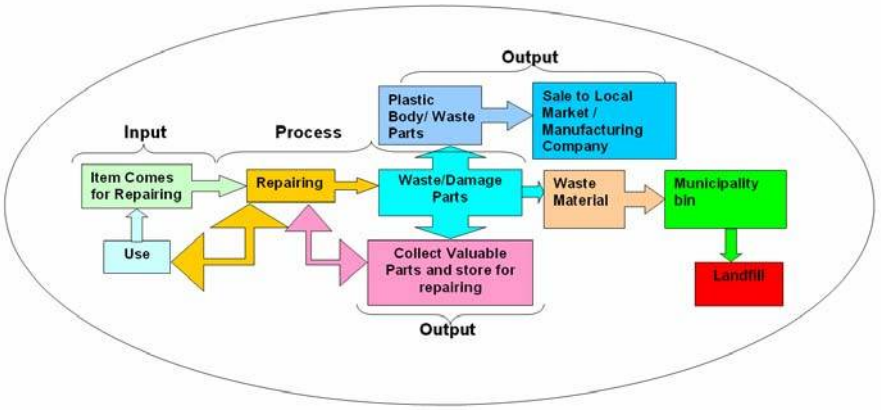


Figure 3.6: Processes observed at scrap dealers / junkyards

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**

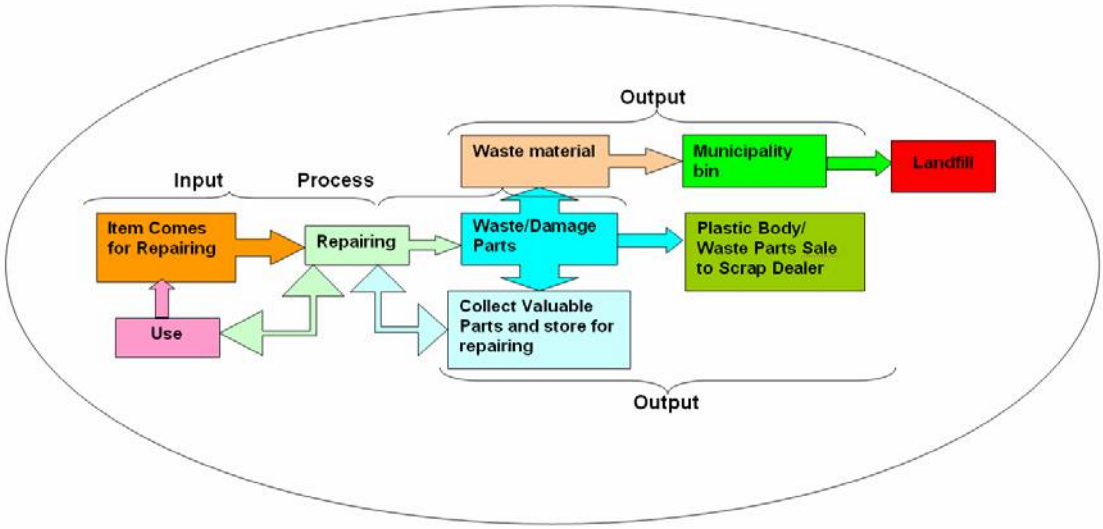


Figure 3.7: Processes observed at AC, Washing Machine, and Refrigerator Repair Shop

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 shown in **Figure 3.8**.

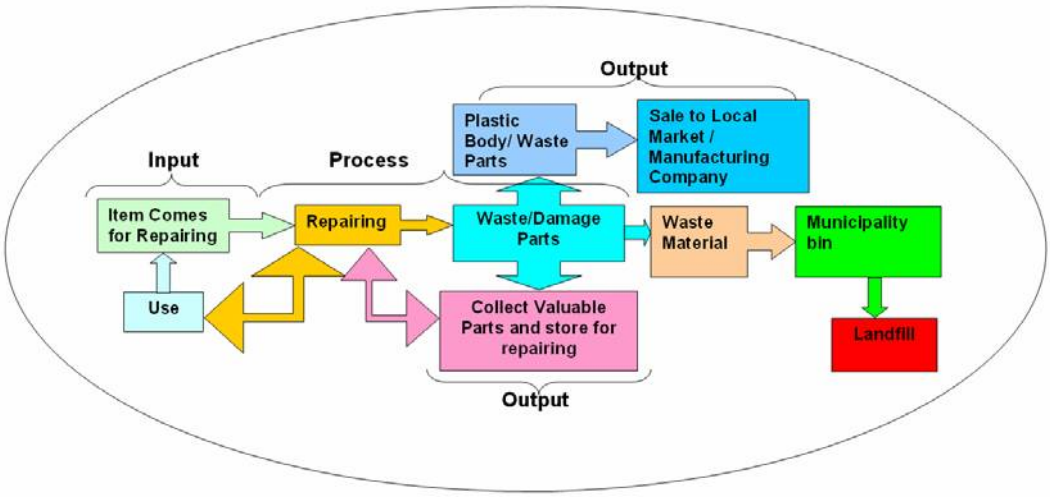


Figure 3.8: Processes observed at TV, Computer, and Mobile Phone Repair Shop

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**.

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

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

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.

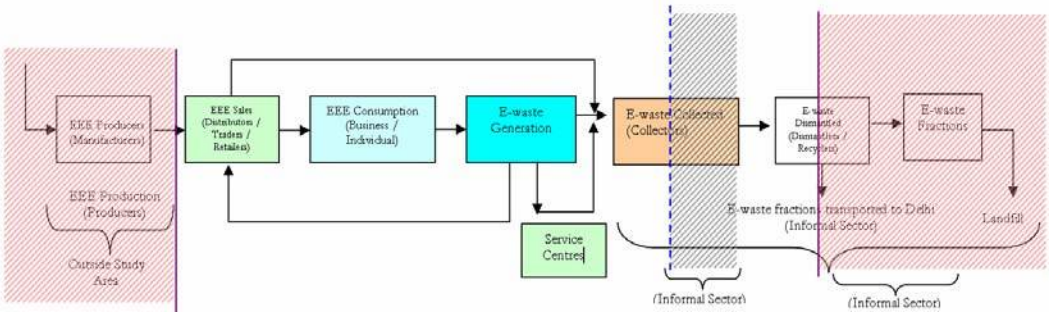


Figure 4.1: E-waste material flow chain in Study Area

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.

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 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)
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		
Import Data	Not required		

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)	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 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 4.2: Data Matrix Vs Methodology

Methodology / Data Requirement	Saturation Level		Calculated Sales			Stock Data						
	Household	Industry	Number of Household	Export Data	Import Data	Manufacturing / Production	Private	Industry	Average Lifetime	Storage data	Reuse	Recycle / dismantling	Landfill
Time Step Method	X		√	X	X	√	X	X					
Market Supply Method				X	X	√			√				
Carnegie Mellon				X	X	√			√	√	√	√	√

Methodology / Data Requirement	Saturation Level		Number of Household	Calculated Sales			Stock Data		Average Lifetime	Storage data	Reuse	Recycle / dismantling	Landfill
	Household	Industry		Export Data	Import Data	Manufacturing / Production	Private	Industry					
Method													
Approximation 1	X	X	√			√	X	X	√				
Approximation 2				X	X	√							

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 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 & 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.

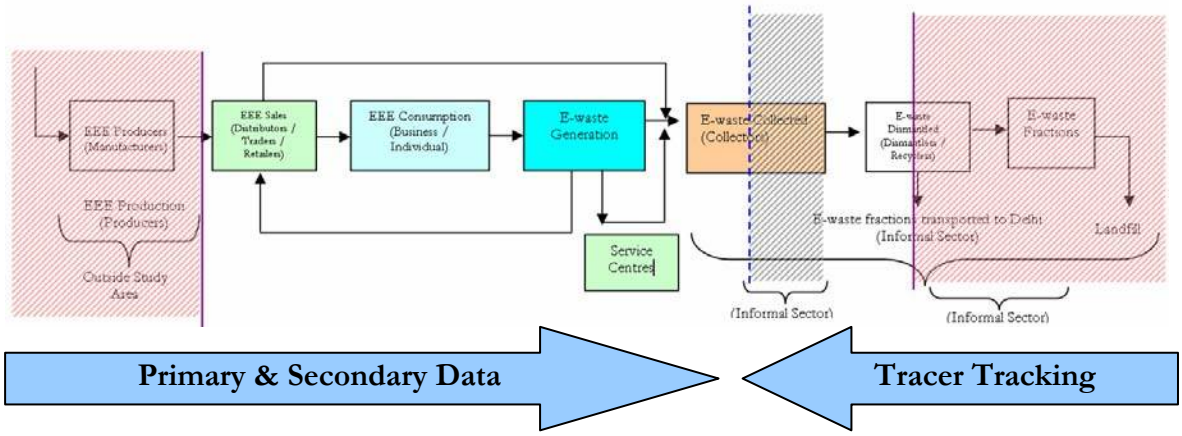


Figure 4.2: E-waste data collection approach along the material flow chain in the study area

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**.

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

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

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

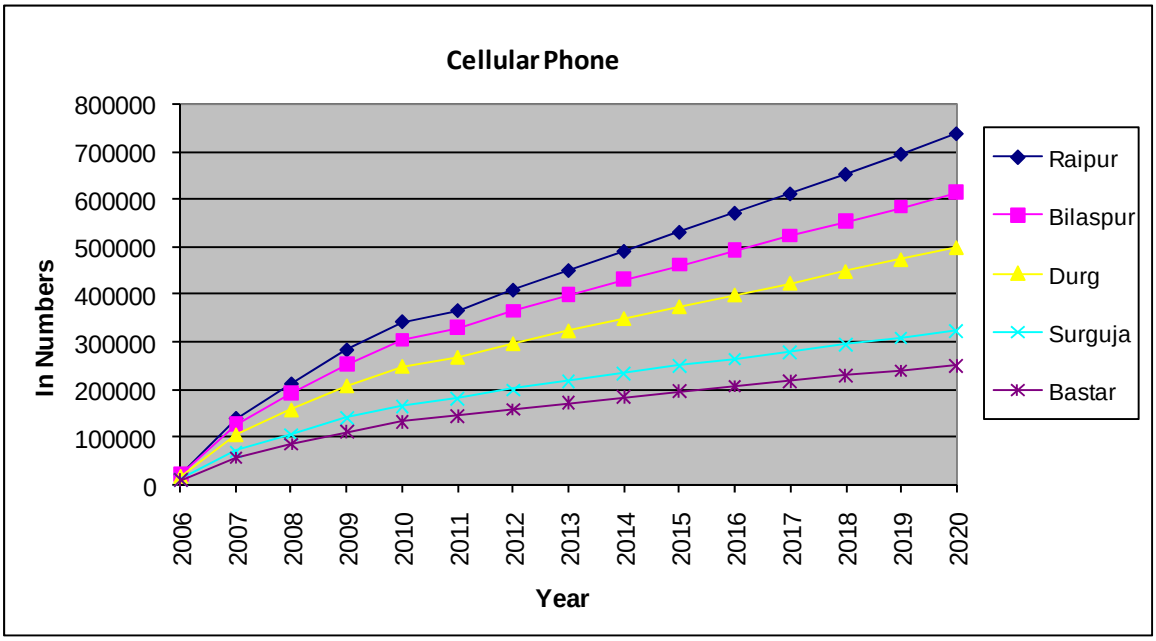


Figure 5.1: Installed base for Cellular Phone in Study Area

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

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

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

* ➔ Private Telecom Operators were allowed in 2008

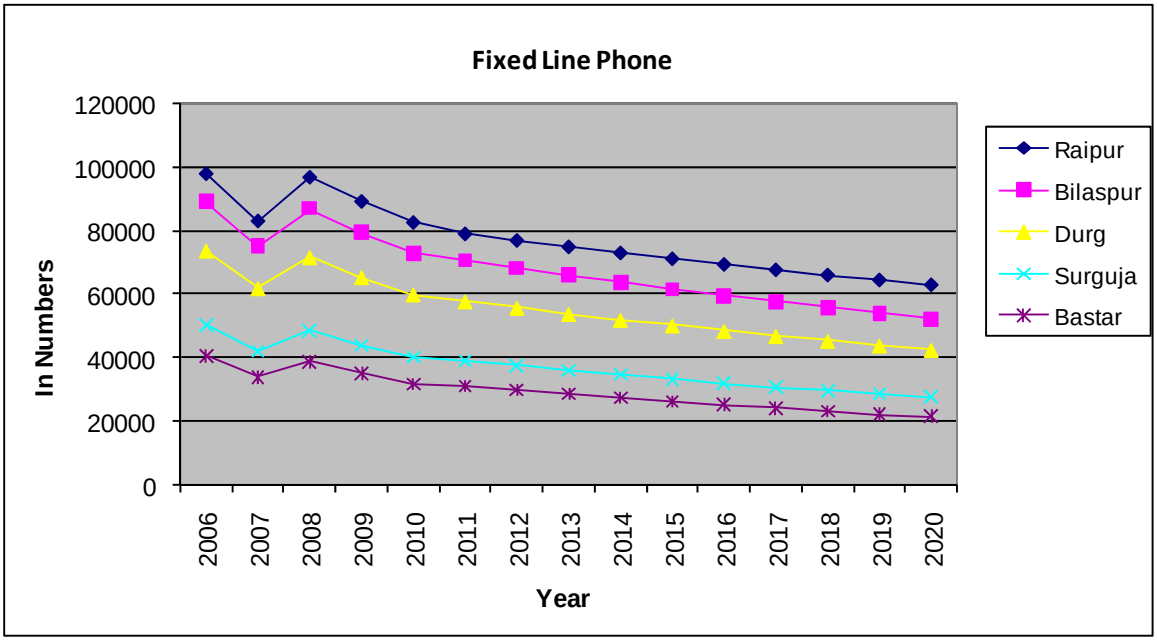


Figure 5.2: Installed base for Fixed Line Phone in Study Area

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

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

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

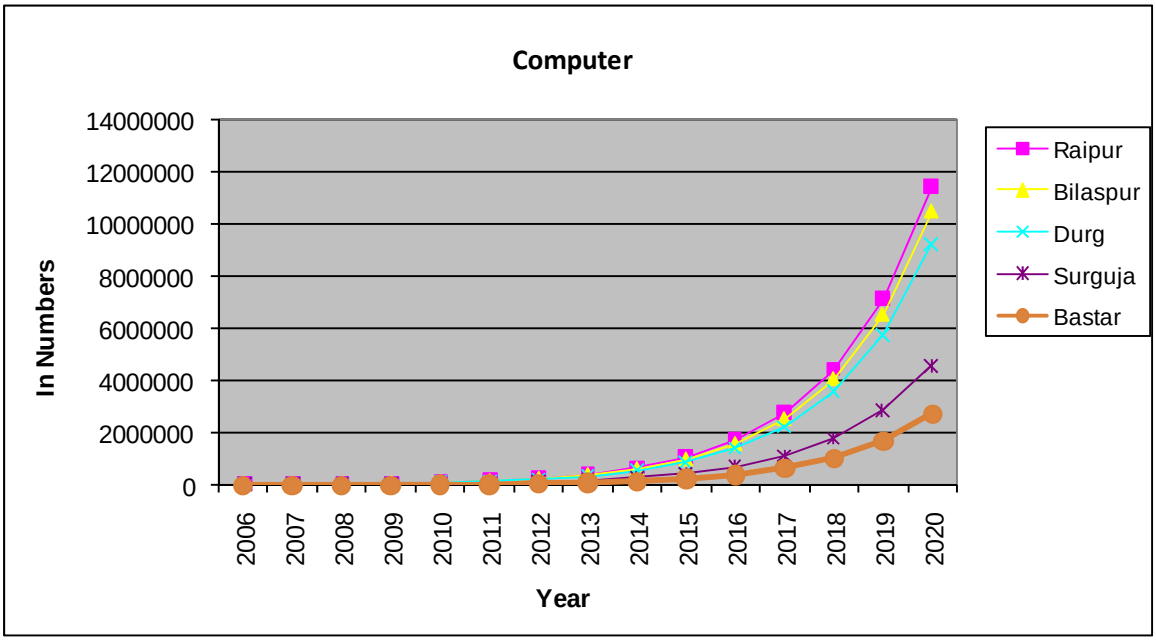


Figure 5.3: Installed base for Computer in Study Area

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

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

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

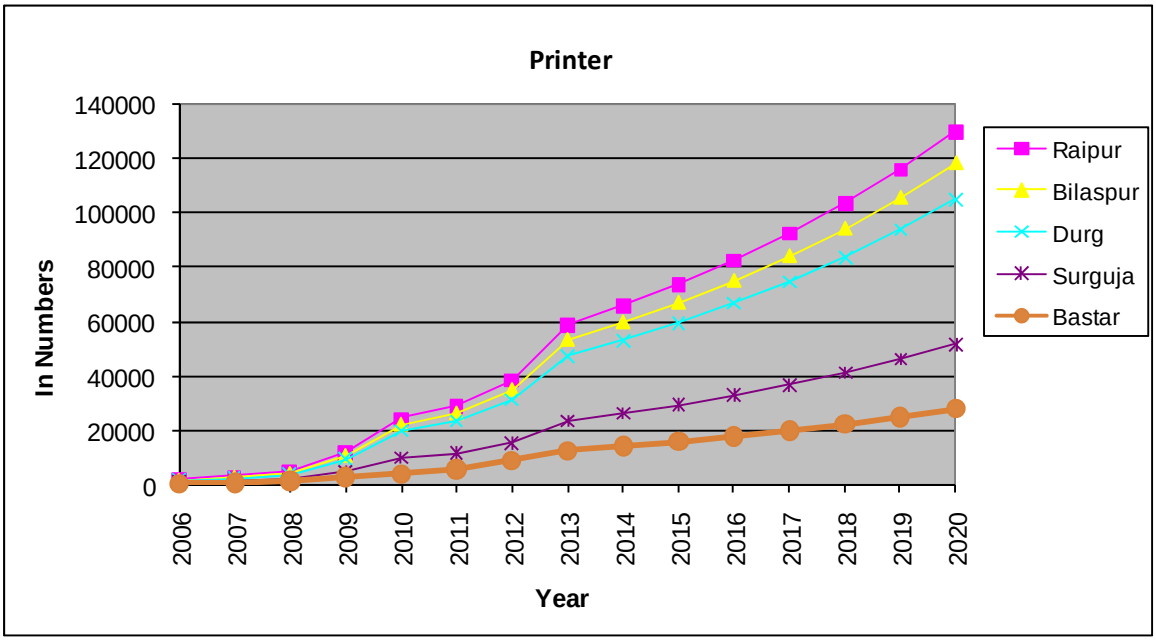


Figure 5.4: Installed base for Printers in Study Area

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

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

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

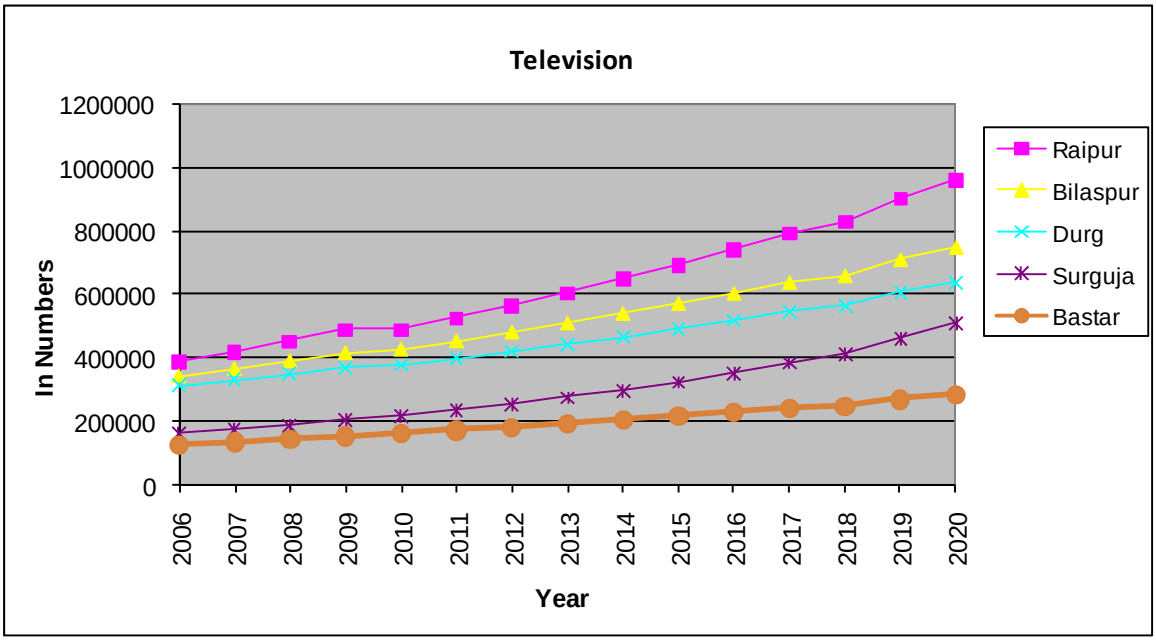


Figure 5.5: Installed base for TV in Study Area

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

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

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

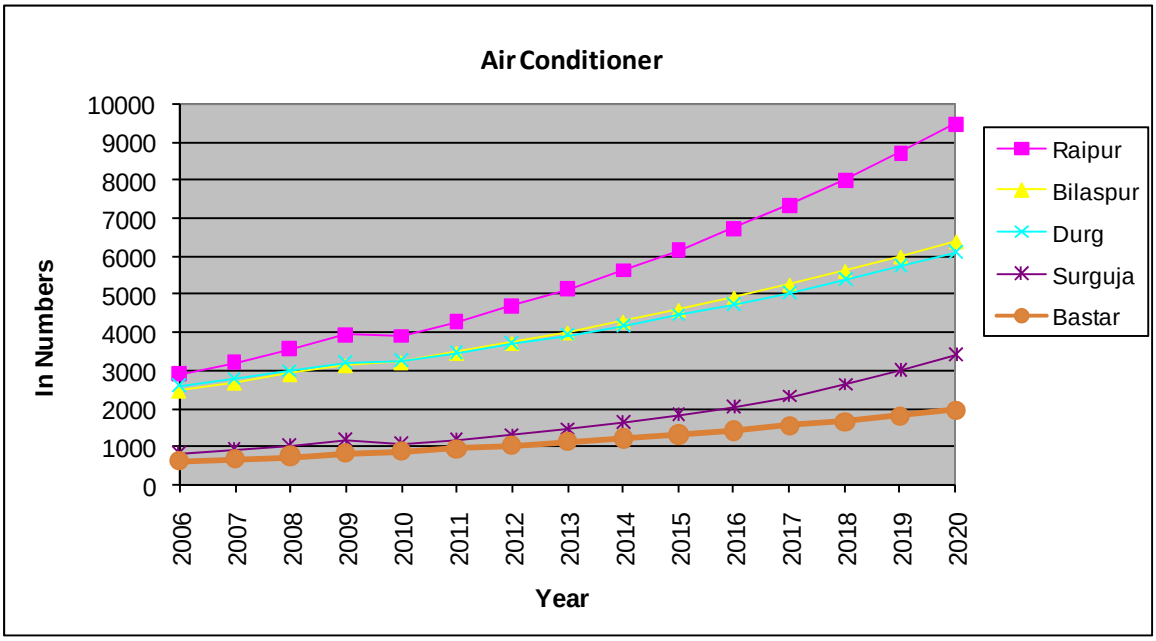


Figure 5.6: Installed base for AC in Study Area

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

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

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

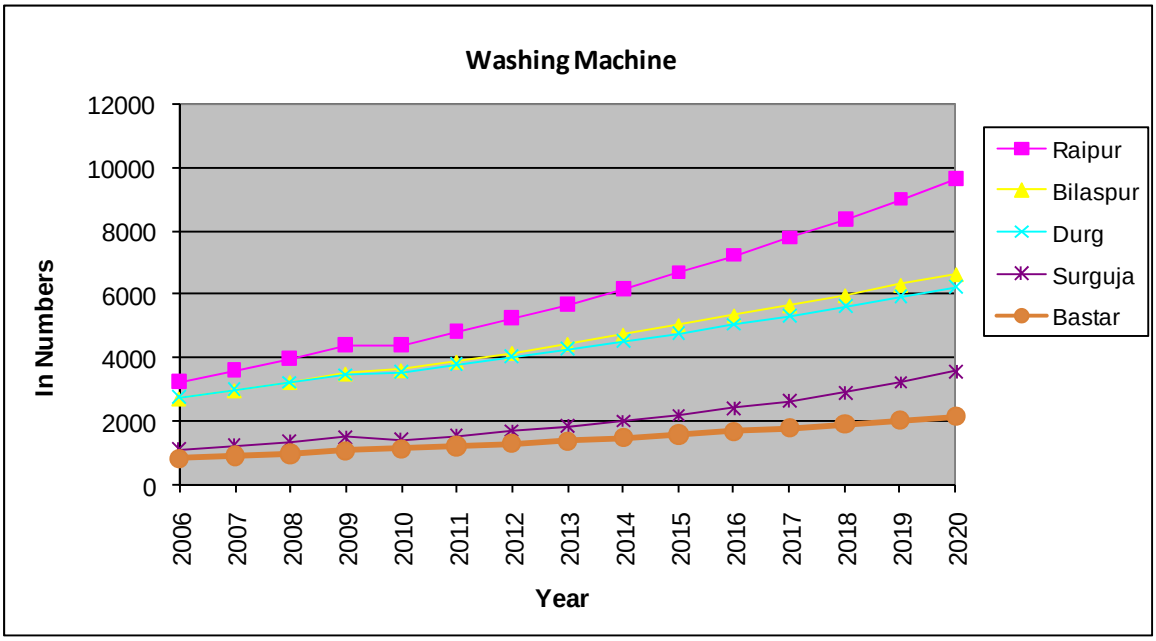


Figure 5.7: Installed base for Washing Machine in Study Area

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

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

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

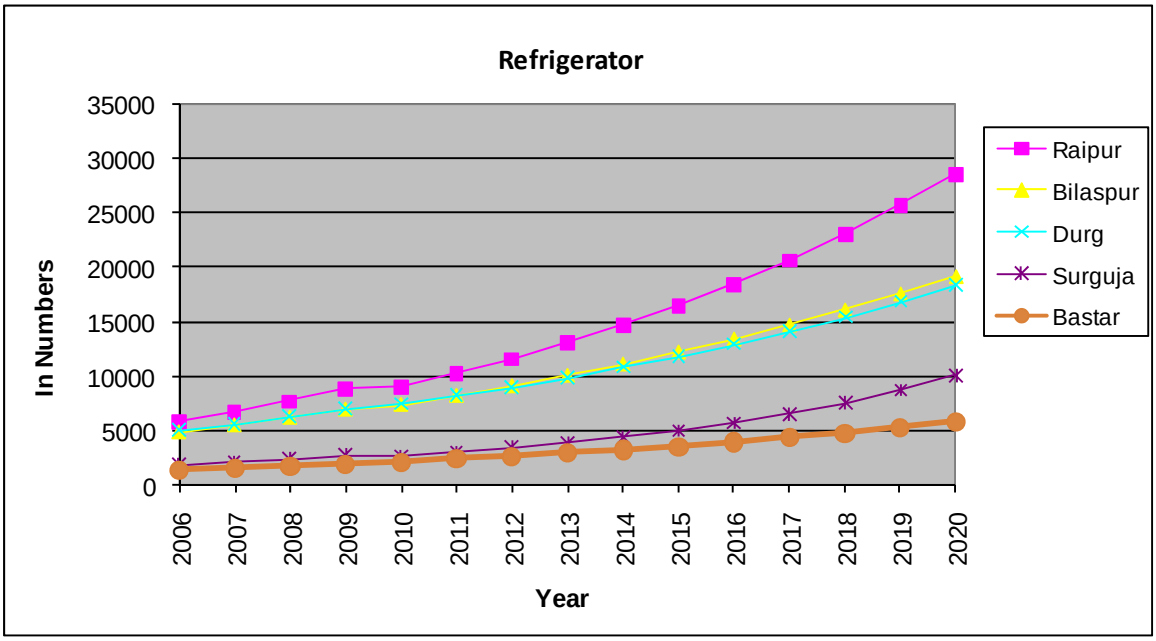


Figure 5.8: Installed base for Refrigerator in Study Area

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

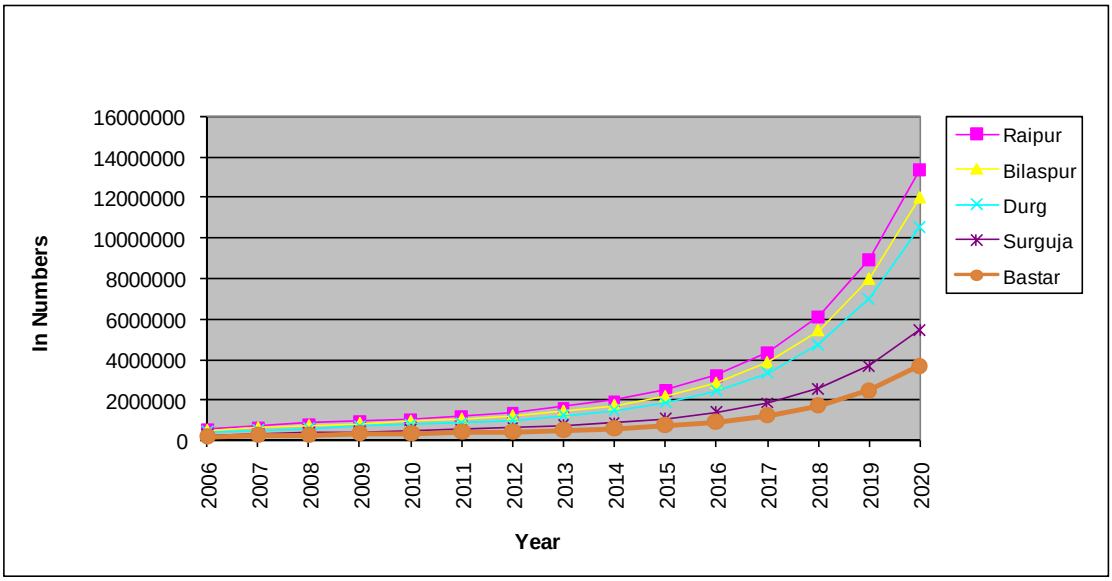


Figure 5.9: Division wise Installed base Projection for all Electronic items in Chhattisgarh

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**.

Table 5.11: Obsolescence 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

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

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 for Cellular Phones in Chhattisgarh (in Tons)

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

Source: Compiled by IRGSSA

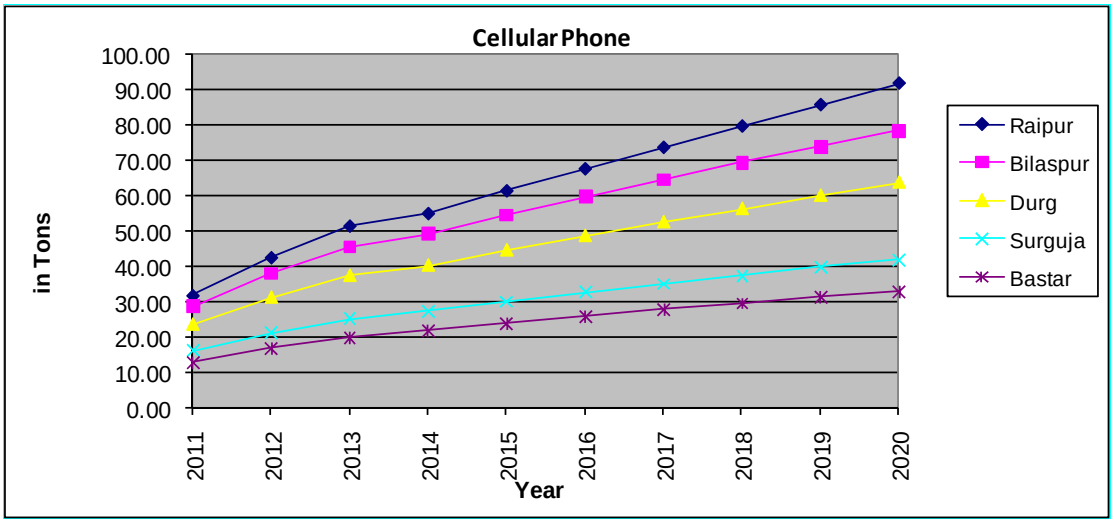


Figure 5.10: Division wise E-waste Inventory for Cellular Phones in Chhattisgarh

Table 5.14: Division wise E-waste Inventory for Fixed Line Phones in Chhattisgarh (in Tons)

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

Source: Compiled by IRGSSA

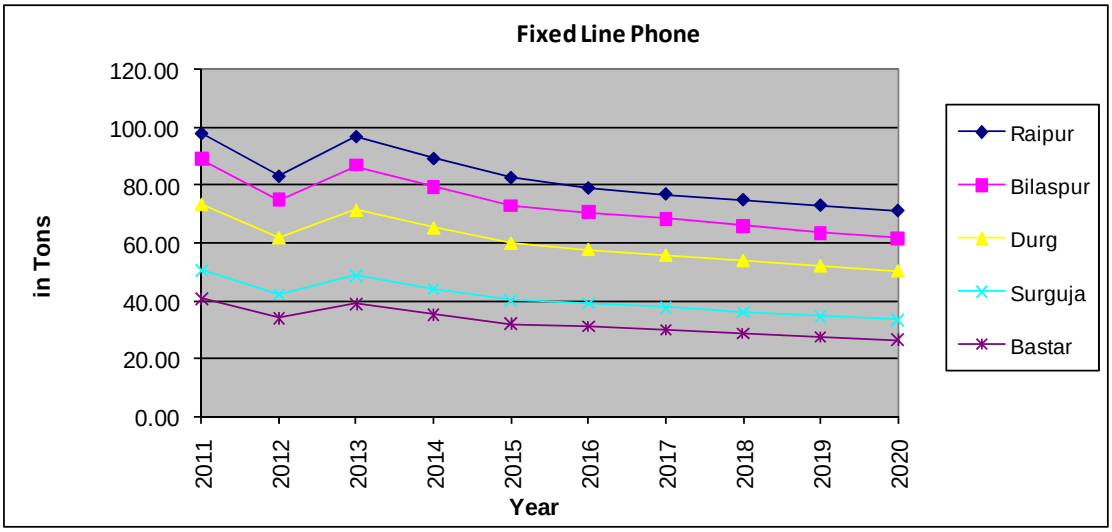


Figure 5.11: Division wise E-waste Inventory for Fixed Line Phones in Chhattisgarh

Table 5.15: Division wise E-waste Inventory for Computers in Chhattisgarh (in Tons)

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

Source: Compiled by IRGSSA

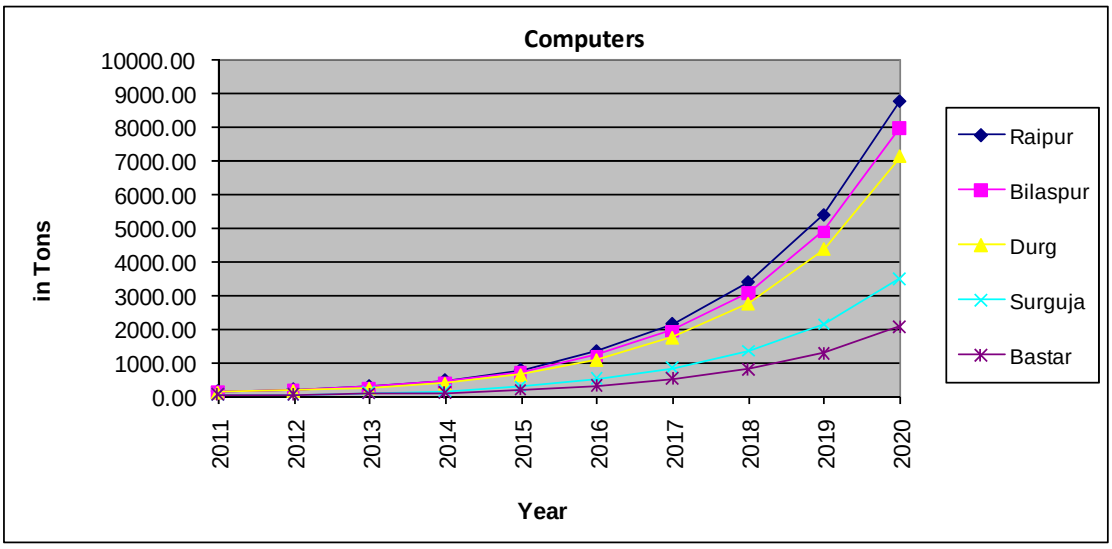


Figure 5.12: Division wise E-waste Inventory for Computers in Chhattisgarh

Table 5.16: Division wise E-waste Inventory for Printers in Chhattisgarh (in Tons)

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

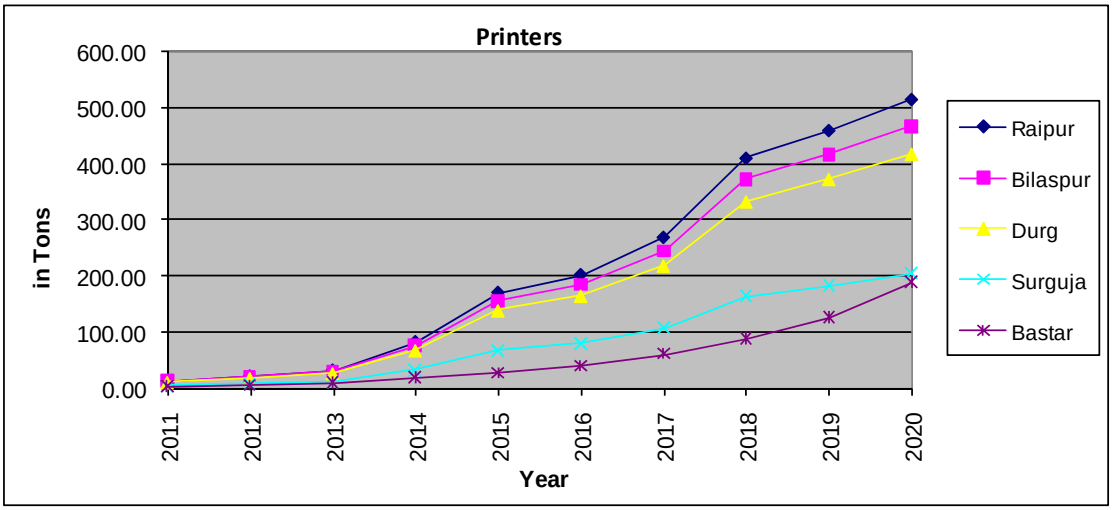


Figure 5.13: Division wise E-waste Inventory for Printers in Chhattisgarh

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

Source: Compiled by IRGSSA

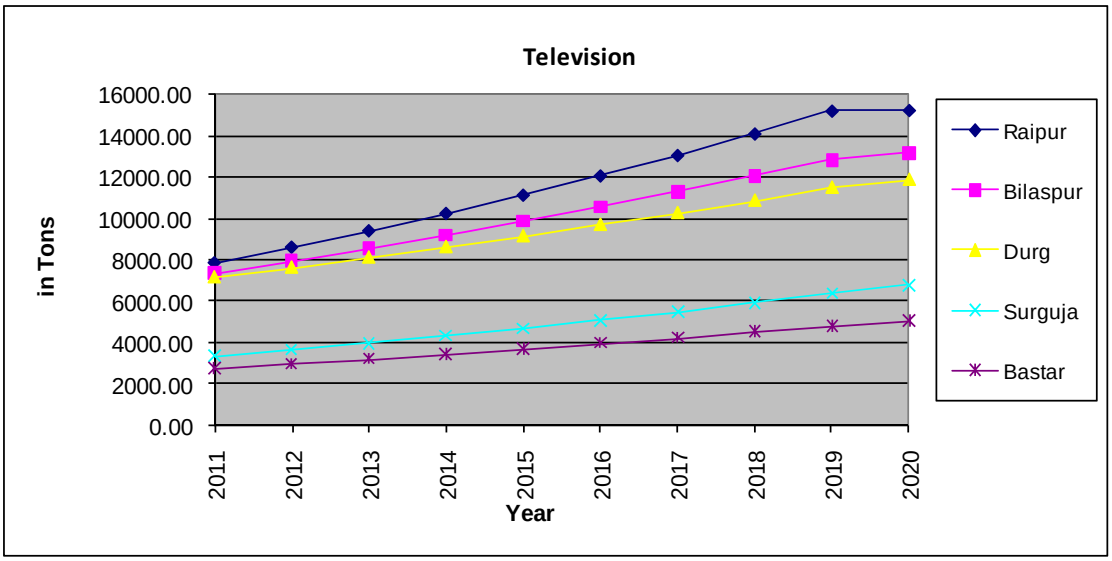


Figure 5.14: Division wise E-waste Inventory for Televisions in Chhattisgarh

Table 5.18: Division wise E-waste Inventory for Air Conditioners in Chhattisgarh (in Tons)

Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
2011	79.28	76.37	90.49	23.53	20.30	289.95
2012	85.63	82.61	94.17	24.74	20.72	307.87
2013	97.16	91.71	102.99	27.91	23.07	342.84
2014	109.65	101.27	112.10	31.39	25.56	379.97
2015	123.20	111.32	121.54	35.21	28.20	419.47
2016	129.54	114.58	123.33	37.10	29.47	434.02
2017	144.50	125.07	132.92	41.53	32.30	476.32
2018	160.72	136.13	142.94	46.47	35.32	521.58
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

Source: Compiled by IRGSSA

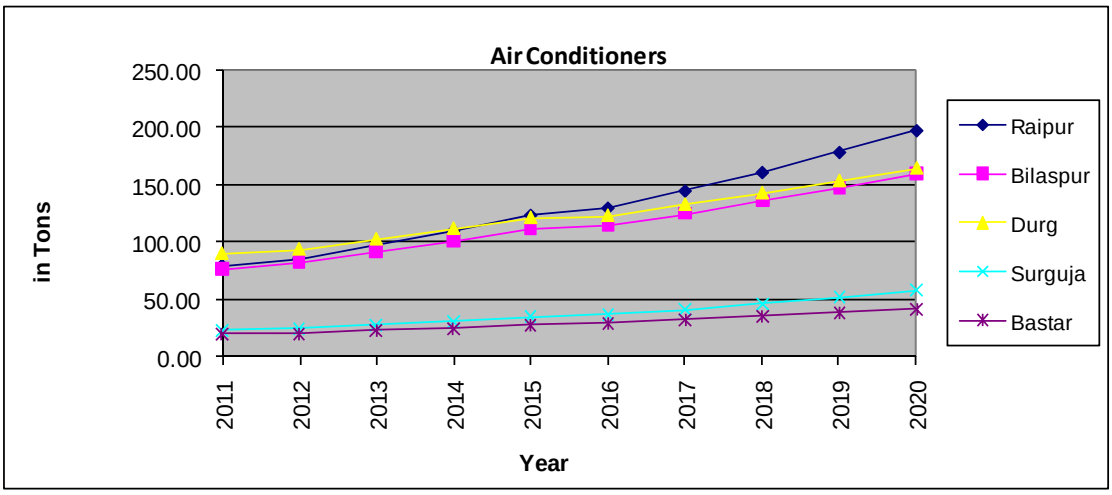


Figure 5.15: Division wise E-waste Inventory for Air Conditioners in Chhattisgarh

Table 5.19: Division wise E-waste Inventory for Washing Machines in Chhattisgarh (in Tons)

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

Source: Compiled by IRGSSA

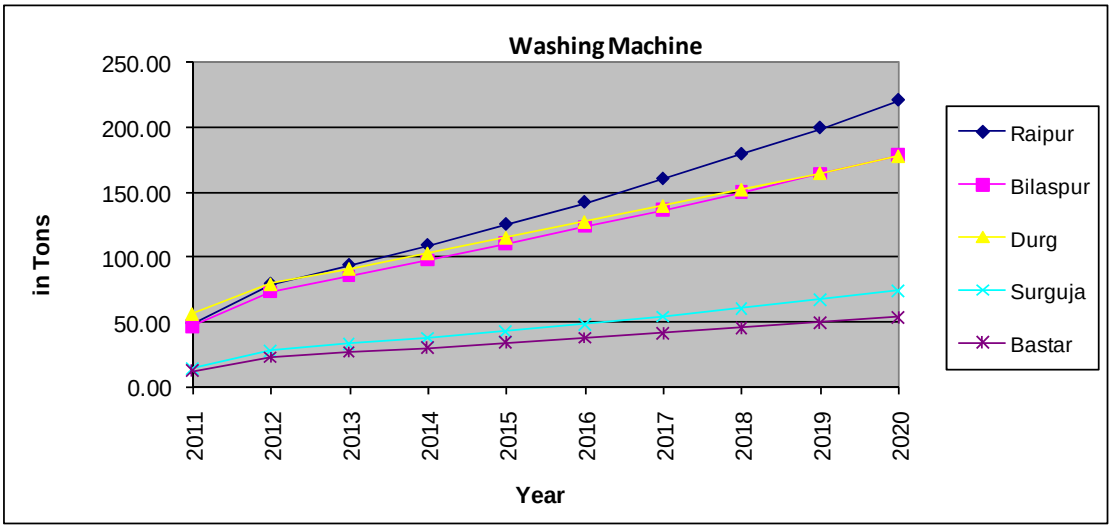


Figure 5.16: Division wise E-waste Inventory for Washing Machines in Chhattisgarh

Table 5.20: Division wise E-waste Inventory for Refrigerators in Chhattisgarh (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

Source: Compiled by IRGSSA

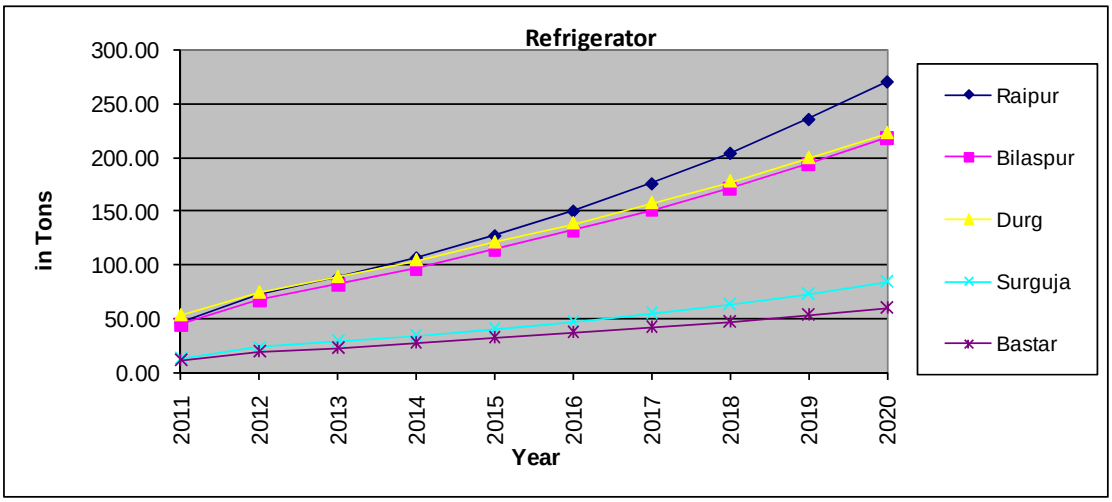


Figure 5.17: Division wise E-waste Inventory for Refrigerators in Chhattisgarh

Table 5.21: Division wise E-waste Inventory for All Electronic Items in Chhattisgarh (in Tons)

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

Source: Compiled by IRGSSA

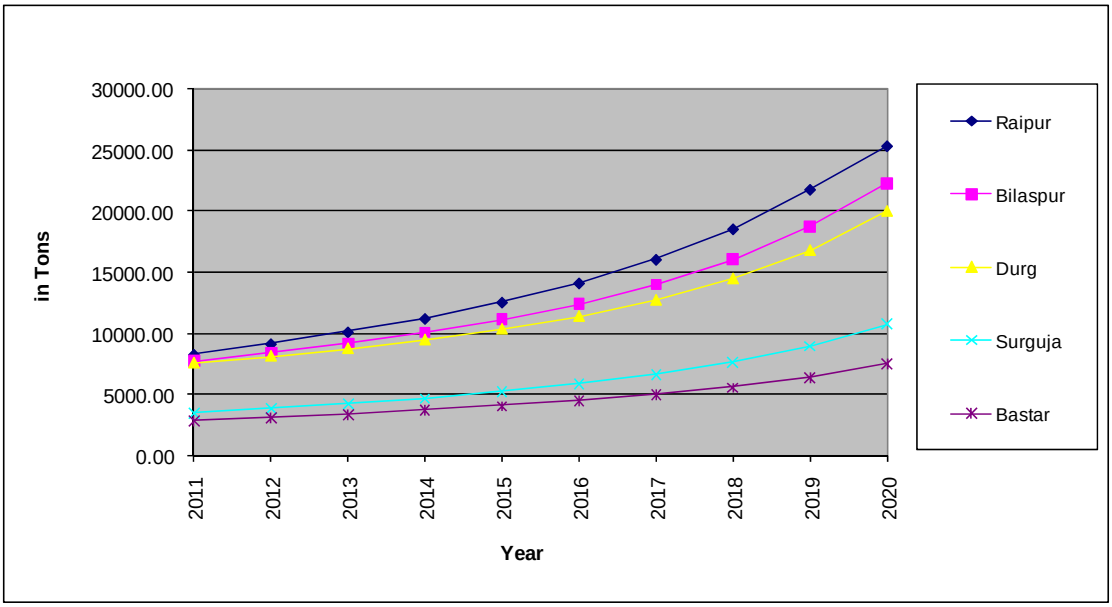


Figure 5.18: Division wise E-waste Inventory Projection for All Electronic Items in Chhattisgarh

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.
2. 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**.

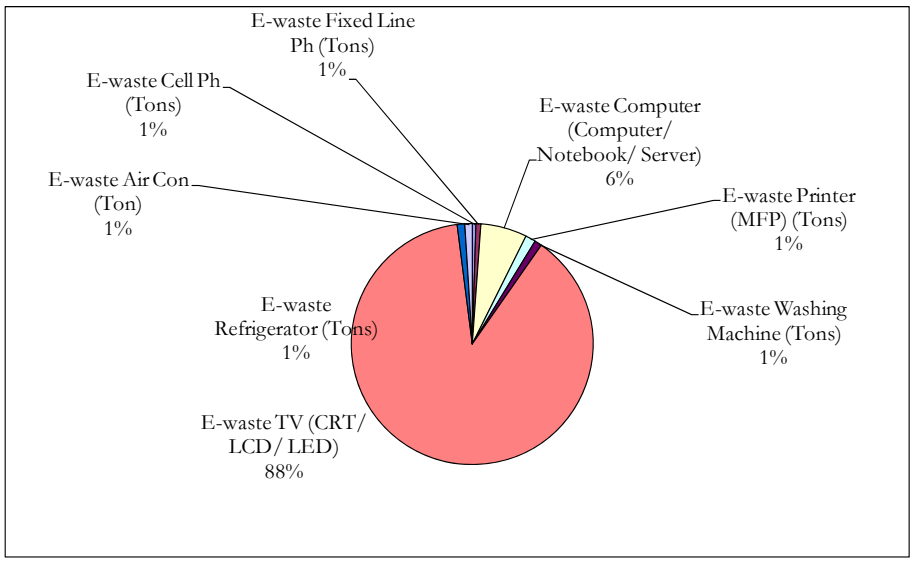


Figure 5.19: Item-wise E-waste in Percent for Raipur Division in 2015

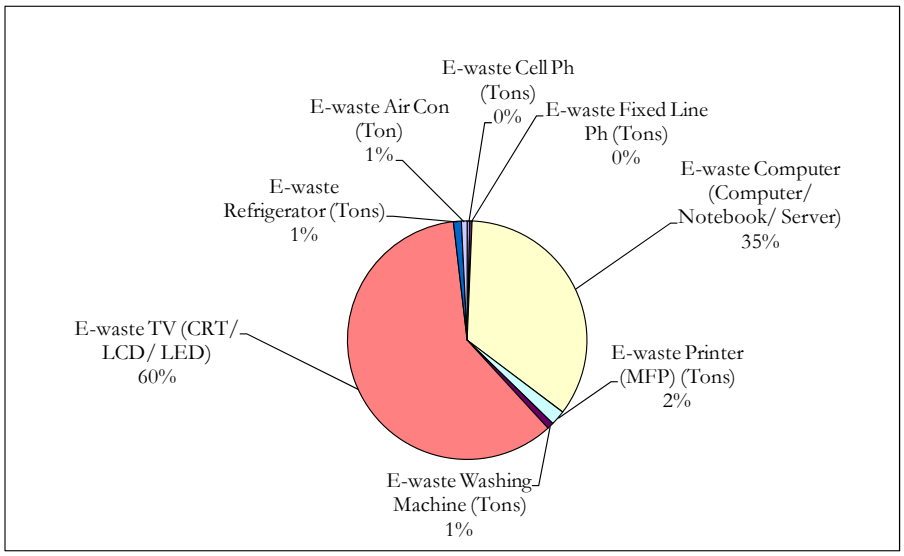


Figure 5.20: Item-wise E-waste in Percent for Raipur Division in 2020

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.
2. 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**.

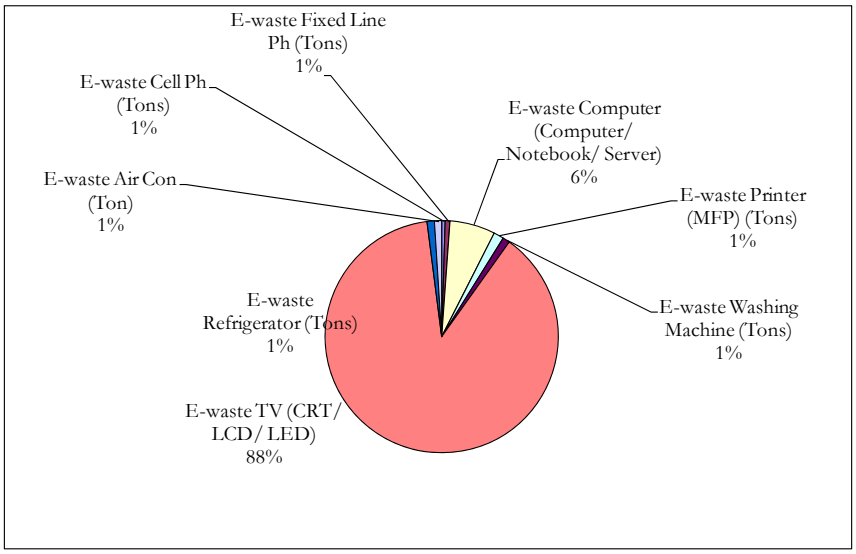


Figure 5.21: Item-wise E-waste in Percent for Bilaspur Division in 2015

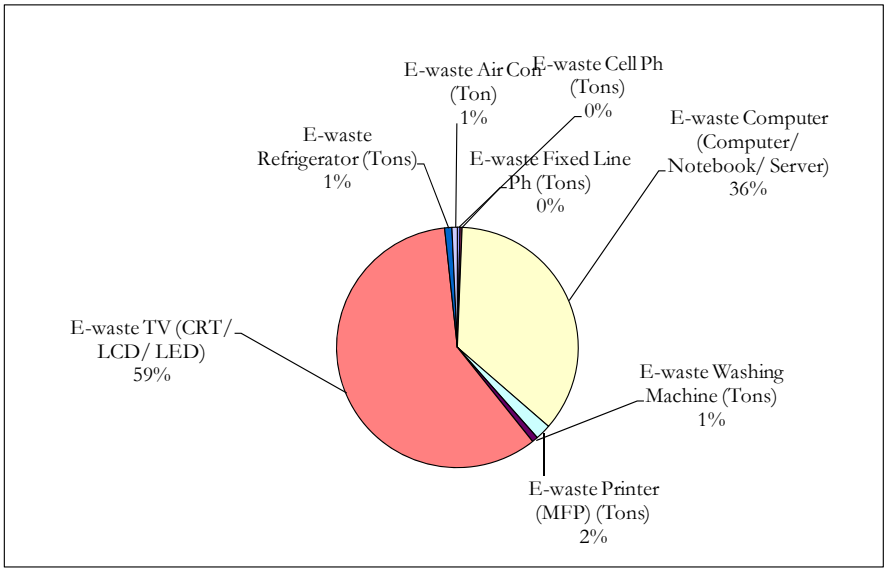


Figure 5.22: Item-wise E-waste in Percent for Bilaspur Division in 2020

Durg Division

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.
2. 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**.

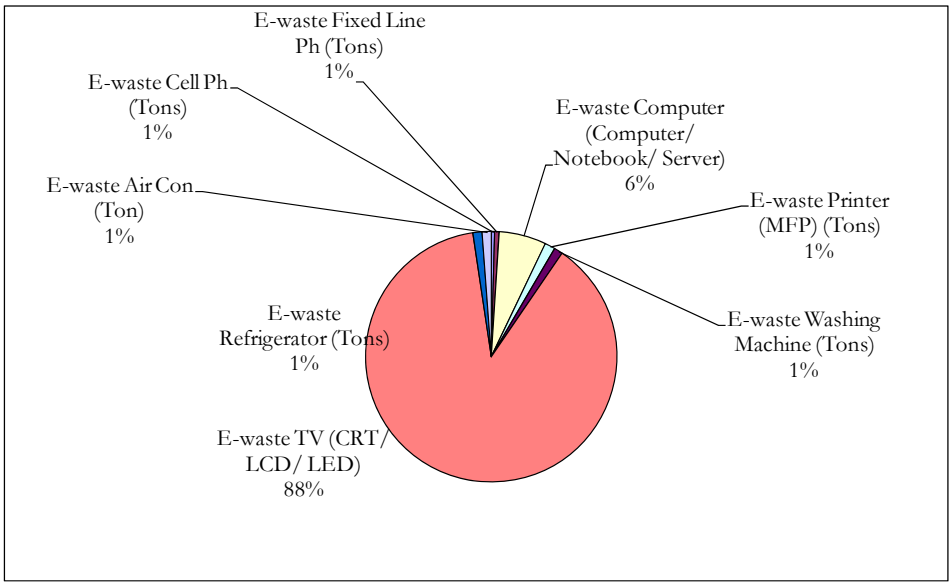


Figure 5.23: Item-wise Percentage of E-waste for Durg Division in 2015

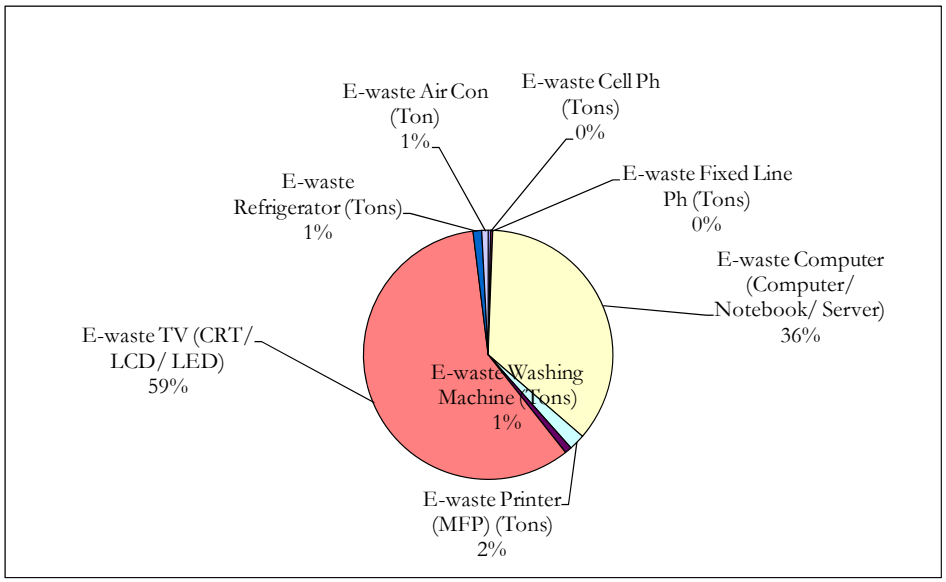


Figure 5.24: Item-wise Percentage of E-waste for Durg Division in 2020

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.
2. 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**.

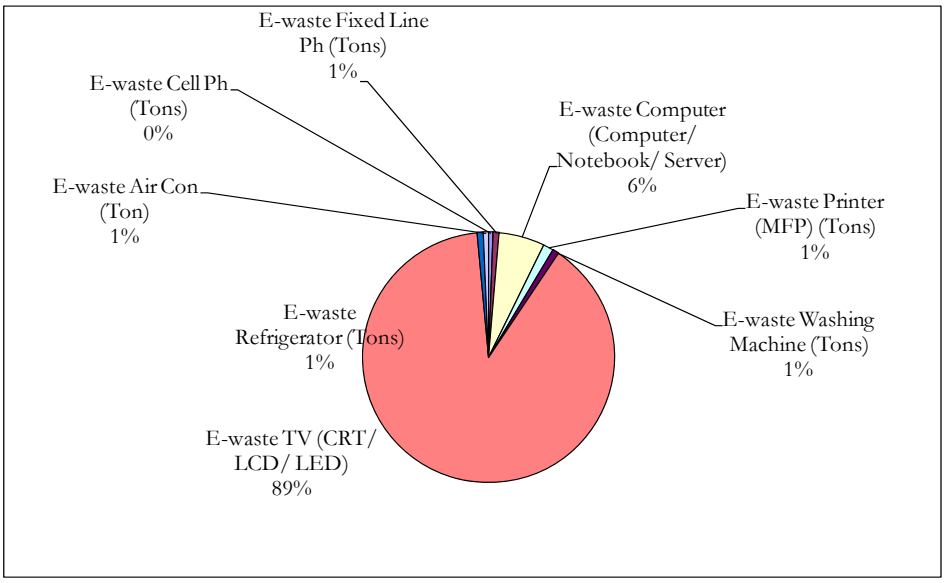


Figure 5.25: Item-wise E-waste in Percent for Surguja Division in 2015

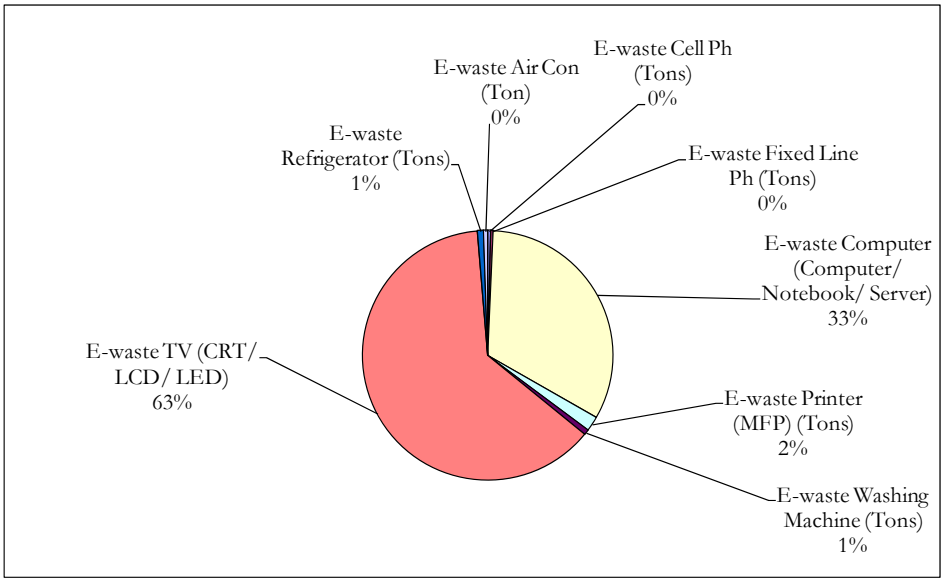


Figure 5.26: Item-wise E-waste in Percent for Surguja Division in 2020

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.
2. 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**.

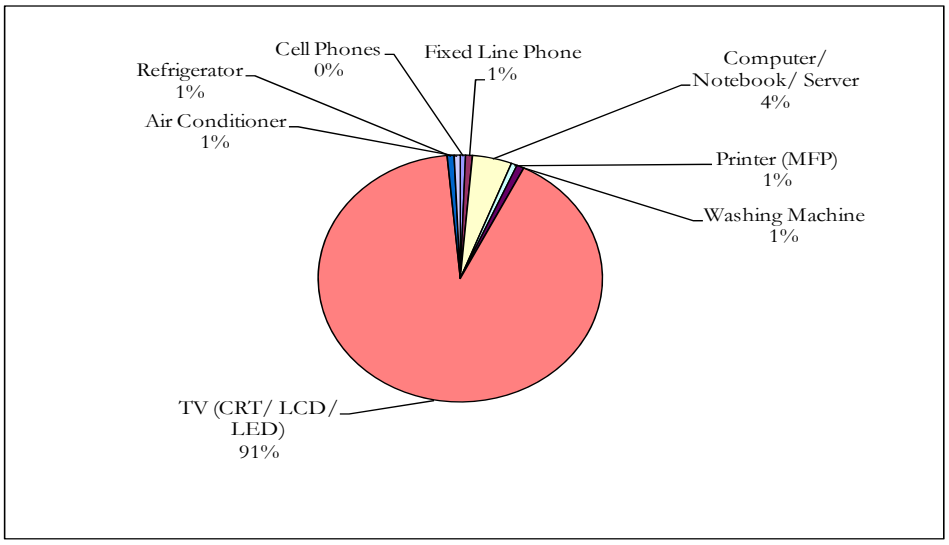


Figure 5.27: Item-wise E-waste in Percent for Bastar Division in 2015

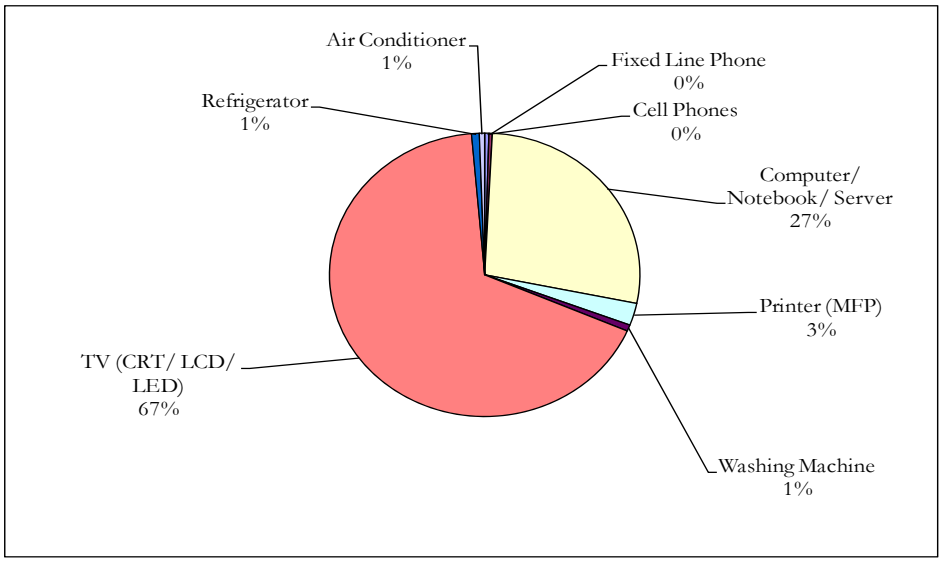


Figure 5.28: Item-wise E-waste in Percent for Bastar Division in 2020

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.

Table 5.22: E-waste dismantling process occurring 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 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 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.

Table 5.23: Trade economics of Chhattisgarh E-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

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.

Table 5.24: Market Risk Matrix

Risks/ intensities		High	Medium	Low
Risks of availability of raw material	Short term		✔	
	Long term		✔	
Risk associated with collection	Short term	✔		
	Long term		✔	
Risk associated with transportation	Short term			✔
	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 E-waste 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 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.
- 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 **Raipur 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. 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 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 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%).
- **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%).
- 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. 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, Bandra (East) Mumbai 400 098 Ph. No. +91+22-2650-0031
		Group Companies		**Allied JB Friction Private Limited** A-12, Site IV, Industrial Area, Sahibabad – 201010, Dist. Ghaziabad (UP), India. Ph. No. 0120 4539600 – 700

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 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, India Ph. 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, 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. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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, 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. 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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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	LG Electronics India Pvt. Ltd, Plot No. 51, Udyog Vihar, Surajpur Kasna Road, Greater Noida: 201306 Uttar Pradesh
		Manufacturing Facilities	Markson	**SGV Industries** Plot No.41 & 42, 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
				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
		Head Office		PLOT No. 378, F.I.E, PATPARGANJ, DEHLI -110092 Ph. No. +91-11-43086501-502, 22157662-63
		Corporate & Head Office	Moser Baer	43B, Okhla Industrial Estate, New Delhi - 110020. India. Tel +91 11 40594444, 91 11 26911570 - 74 Fax +91 11 41635211, 26911860

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
		Branch Offices		**Chennai** Moser Baer India Ltd. 81, IInd Floor 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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Pune Moser Baer Photo Voltaic Ltd. 311, IIIrd Floor Connaught Place 28 Bund Garden Road Pune - 411 001
		Representative & Distributor		**USA Distributor** **Media Masters LLC** #440, 2601 S. Minnesota Ave., Ste 105 Sioux Falls, SD 57105-4750 USA Phone: +1-(888)-243-4465 Fax: +1-(877) 835-2834 E-mail: sales@mediamastersdisc .com
		Manufacturing Facilities		**BOM & M& ES** 66, Udyog Vihar, 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
		Corporate Address	Onida	MIRC Electronics Ltd. Onida House, G-1, M.I.D.C, Mahakali Caves Road, Andheri (E), Mumbai - 400 093. 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	**Samsung India Electronics** 6th, 7th & 8th Floors, Ifci Tower, 61, Nehru Place, New Delhi, Tel: 011 3030 8282
				Samsung Corporation Room No 355, Hotel Taj Palace,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Chanakyapuri New Delhi, DL 011 2688 9817
			Philips	**Philips Electronics India Limited** 9th Floor, DLF 9-B, 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), 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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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, 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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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
				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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 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	**TCL India Holding Pvt. Ltd.** Sco 254, 2nd Floor, Sector 44 C 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
			T-Series	**Laxbro Manufacturing Company** W-53, MIDC Area, Bhosari Indl. Estate, PMC – 411026, Maharashtra
			Toshiba	**TOSHIBA INDIA PVT. LTD.** 3rd Floor, Building No. 10 Tower - B, Phase - II DLF Cyber City,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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	**Videocon Industries Ltd.** 14 Kms Stone, Aurangabad-Paithan 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
			Weston	**Westway Electronics Limited** B-102, Phase – II, Noida – 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
			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	Next Retail India Limited, 3rd Floor, Aadeshwar Arcade Above Loop Gallary, 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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
			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
			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,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 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 Fax:+91 80 30589611
			Kelvinator	
			LG	Given Above
			Kenstar	
			Onida	Given Above
			Panasonic	Given Above

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
			Samsung	Given Above
			Toshiba	Given Above
			Videocon	Given Above
			Whirlpool	Given Above
	Air Conditioner	Window	Blue star	**Corporate Headquarters** Kasturi Buildings, Mohan T Advani Chowk, Jamshedji Tata Road, 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 **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 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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 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**

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 / 2573670 / 2570024 **Fax:** (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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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
				Panjim (Goa) First Floor, Buddhaseth Apts, Tonca, Caranzalem,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 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
			Carrier	**INDIAN HEADQUARTERS :** **Carrier Airconditioning & Refrigeration Limited** Delhi - Jalpur Highway, Narsingpur, Gurgaon,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 7028 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/ 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,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 - 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 Appartments Opp. Laksmi Mills Papanaicken Palayam Coimbatore - 641 037 Tel. #:0422 - 2554732
				ETA General Pvt Ltd ETA House, Behind Green Park Hotel

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 Godown Opp. 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
				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 : 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 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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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
	Corporate Headquarters		Voltas	**Voltas Limited** Voltas House 'A' Block Dr. Babasaheb Ambedkar Road Chinchpokli Mumbai 400 033 Tel: 022-66656 666
	Factories			2nd, Pokhran Road, 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

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
			Mitsubishi	**Gurgaon Head Office** 2nd Floor, Tower A & B, DLF Cyber Greens, Dlf Cyber City, DLF Phase - 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.
				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,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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: +91 (44) 2847-7374
			Panasonic	Given Above
			Samsung	Given Above
			Sanyo	Given Above
			TCL	Given Above
			Toshiba	Given Above

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
			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
			Siemens	Registered & Corporate Office 130, Pandurang Budhkar Marg, Worli, Maharashtra, Mumbai 400 018. Tel: +91 22 3967 7000 Fax: +91 22 3967 7500
	Mobile Phones		Acer	Acer India Private Limited 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
				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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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	**Amazon Development Center India Pvt Ltd** Q-city, 2nd Floor-Block A & Block B Survey Number-109,110,111/2, 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
				#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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 Tel: (519) 888-7465 Fax: (519) 888-7884
				BlackBerry United States BlackBerry 5000 Riverside Drive, 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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				BlackBerry 4701 Tahoe Boulevard Mississauga, Ontario Canada L4W 0B5 Tel: (905) 629-4746 Fax: (905) 629-4869
			BLU	**BLU Products** 10814 NW 33rd St# 100 Doral, FL 33172 (305) 715 – 7171
			Bosch	Bosch Sicherheitssysteme GmbH Robert-Bosch-Ring 5 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
				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 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. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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
			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
				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,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 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 Block 1, G - 3F First Software Park, 110 Mount Poonamalle Road, Porur Chennai - 600 116

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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
				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, 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	**Huawei Telecommunication (INDIA) Co. Pvt Ltd.** 7th Floor, Tower A, Spaze I-Tech Park, Sohna Road, Sector-49 Gurgaon, Haryana-122001 India **Tel:** +91-124-4774700 **Fax:** +91-124-4774863
				Huawei 9th Floor, Tower 6, The Gateway,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				No. 9, Canton Road, Tsim Sha Tsui, Kowloon, Hongkong **Tel:** 00852-21253888 **Fax:** 00852-21253889
			Karbonn	Karbonn Mobiles #39/13, off 7th main, HAL 2nd stage Appareddy Palya, Indiranagar, Bangalore – 560038 Tel: 080 40894888
				Karbonn Mobiles D-170, Okhla Industrial Area, Phase-1 New Delhi – 110020 011 46604660
			Kyocera	**KYOCERA Corporation Cutting Tool Group** 6 Takeda, Tobadono-cho, Fushimi-ku, Kyoto 612-8501, Japan Phone: +81-75-604-3473 Fax: +81-75-604-3472
				KYOCERA Asia Pacific India 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 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),

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 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

Partial List of Distributers/Retailers/ Traders in Chhattisgarh – Annexure 2

Raipur Division

Sl. No.	Address	Latitude			Longitude		
		Deg.	Min.	Sec.	Deg.	Min.	Sec.
	Raipur						
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

Sl. No.	Address	Latitude			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						
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	Latitude			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						
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	Latitude			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						
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		
		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		
		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

Bilaspur Division

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
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

Sl. No.	Name	Address	Latitude			Longitude		
			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

Sl. No.	Name	Address	Latitude			Longitude		
			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, 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
98	**Narendra Electronics**	Haldi Bazar Chowk, Baloda, Janjgir	22	8	7.1	82	28	32.5

Sl. No.	Name	Address	Latitude			Longitude		
			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

Sl. No.	Name	Address	Latitude			Longitude		
			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

Sl. No.	Name	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
Durg								
1	**Coman India Electronic**	Ward No.-5, 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

Sl. No.	Name	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
11	**Rajesh Electronic**	Sabji Market, Nawagarh, Bemetara-491337	21	54	23.1	81	36	27.9
12	**Sir Sai Electronic**	Ward No.-11, Pathan Para, Than Khamarie, Bemetara - 491338	21	47	45.1	81	20	2.1
13	**Sandeep Furniture**	Purani Sabji Mandi, Ward No.-4, Than Khamarie, Bemetara - 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 No.-10, 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 No.-9, Pandariya, Kawardha	22	13	11.0	81	24	28.2
24	**Narkar Enterprices**	Ward No.-9, Pandariya, Kawardha	22	13	9.5	81	24	28.8
25	**Himesh Electronics**	Sahaspur, Ward No.-11, 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						
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

Sl. No.	Name	Address	Latitude			Longitude		
			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 No.-4, Gurur, Balod	20	41	1.6	81	24	12.9

Surguja Division

Sl. No.	Name	Address	Latitude			Longitude		
			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

Sl. No.	Name	Address	Latitude			Longitude		
			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

Sl. No.	Name	Address	Latitude			Longitude		
			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	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

Sl. No.	Name	Address	Latitude			Longitude		
			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

Sl. No.	Name	Address	Latitude			Longitude		
			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 No.-13, 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

Sl. No.	Name	Address	Latitude			Longitude		
			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						
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 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 No.-8, 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

Sl. No.	Name	Address	Latitude			Longitude		
			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

Raipur Division

Sl. No.	Name	Address	Latitude			Longitude		
			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

Sl. No.	Name	Address	Latitude			Longitude		
			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

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
2	**Tahsil 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								
17	**RTO Office**	Korba	22	22	4.7	82	44	44.9
18	**Tahsil office**	Korba	22	22	0.0	82	44	49.0

Sl. No.	Name	Address	Latitude			Longitude		
			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.	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 -	21	11	13.0	81	16	52.7

Sl. No.	Name	Address	Latitude			Longitude		
			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 No.-4. 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 No.-15, 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 No.-9, Kawardha	22	0	32.6	81	13	40.7
15	**Tahsil Office**	Ward No.-8, 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.\ No.-5, 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 No.-7, 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 No.-8, 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 No.-12, 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.	Name	Address	Latitude			Longitude		
			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 No.-8, 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

Sl. No.	Name	Address	Latitude			Longitude		
			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	49-.2

Sl. No.	Name	Address	Latitude			Longitude		
			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.	Name	Address	Latitude			Longitude		
			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

Sl. No.	Name	Address	Latitude			Longitude		
			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

Sl. No.	Name	Address	Latitude			Longitude		
			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

Partial List of Service centers in Chhattisgarh- Annexure-4

Raipur Division

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
Raipur								
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

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			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

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			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.	Name of Shops	Address	Latitude			Longitude		
			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**	Kharargani, 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

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			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

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			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

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			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

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			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 No.-23, 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

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			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

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
Durg								
1	**Coman India Electronic**	Ward No.-5, 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 No.-27, 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 No.-10, 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 No.-11, Pathan Para, Than Khamarie, Bemetara - 491338	21	41	45.1	81	20	2.1
11	**Nand Shakti TV Center**	Ward No.-8, 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 No.-9, 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

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			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 No.-10, 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 No.-1, 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 No.-8, 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

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			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

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			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

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			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

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			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

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			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

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			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

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			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

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			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
		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 & 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

Inventory of Physically 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**

Partial Inventory of Scrap Vendors/ Dismantler Annexure -6

Raipur Division

Sl. No.	Name	Address	Latitude			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								
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

Sl. No.	Name	Address	Latitude			Longitude		
			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

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**	Kharargani, Bilaspur	22	5	3.0	82	9	21.2
7	**Smyle**	Kharargani, Bilaspur	22	5	3.2	82	9	20.4
8	**Salim Quiraisi**	Kharargani, 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

Sl. No.	Name	Address	Latitude			Longitude		
			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, 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
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

Sl. No.	Name	Address	Latitude			Longitude		
			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.	Name	Address	Latitude			Lognitute		
			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 No.-9, 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 No.-8, 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

Sl. No.	Name	Address	Latitude			Lognitute		
			Dig.	Min.	Sec.	Dig.	Min.	Sec.
8	**Sanjay Sahu**	Ward No.-25, 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. No.-8, 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 No.-2, Bemetara - 491335	21	43	12.3	81	32	10.5
13	**Mohd. Salim**	Ward No.-17, Bajar Para, Bemetara - 491335	21	42	54.9	81	31	47.9
14	**Vijay Sharma**	Naya Para, Ward No.-16, Bemetara - 491335	21	42	32.7	81	31	50.7
15	**Arjun Nimalkar**	Ward No.-11, Shankar Nagar Nawagarh, Bemetara -491337	21	54	14.6	81	36	47.3
16	**Santosh Agarwal**	Ward No.-13,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 No.-2, Bharat Pur, Saja, Bemetara - 491993	21	40	3.0	81	19	8.6
		Kawardha - Kabirdham						
19	**Babbu Khan**	Jama Masjid, Wardn NO.-18, Kawardha	22	0	21.2	81	14	1.9
20	**Rakesh Kr. Gupta**	Ward No.-6, 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 No.-9, 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 No.-10, 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 No.-17, Khairagarh, Rajanndgaon	21	25	4.2	80	58	38.4

Sl. No.	Name	Address	Latitude			Lognitute		
			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 No.-17, 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 No.-11, 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

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

Sl. No.	Name	Address	Latitude			Longitude		
			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

Sl. No.	Name	Address	Latitude			Longitude		
			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

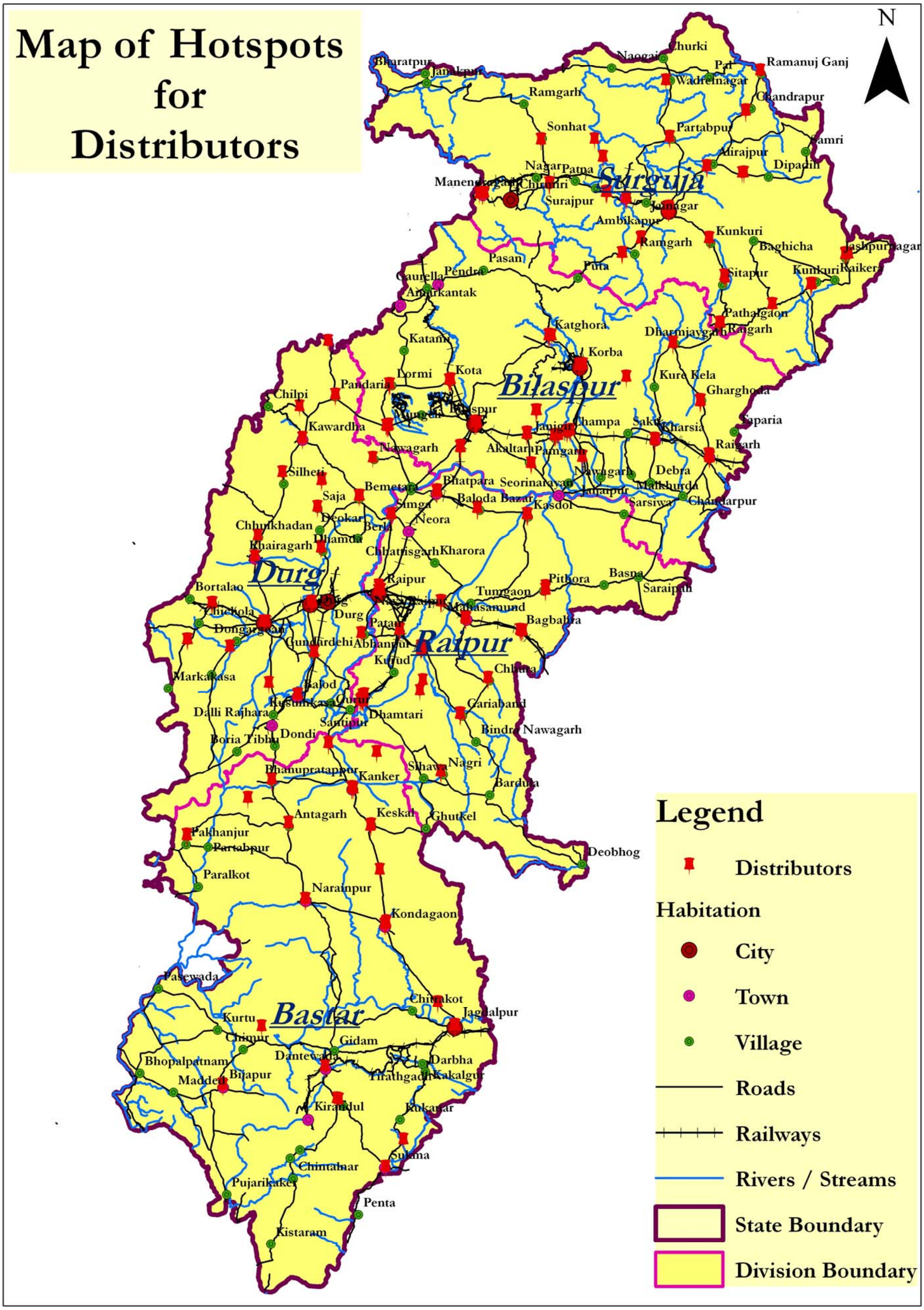
Bastar Division

Sl. No.	Name	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
Bastar								
1	**Saligram**	Dharampura No.-1, 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

Sl. No.	Name	Address	Latitude			Longitude		
			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 No.-6, Dantewada	18	54	22.6	81	20	49.1
15	**Navrang Devraj**	Ward No.-15, Dantewada	18	53	17.2	81	20	55.4
Bijapur								
16	**G. Subba Raw**	Ward No.-8, Rajender Prasad Ward, Bijapur	18	47	39.0	80	48	42.1
Narayanpur								
17	**Tapan Manjhi**	Ward No.-5, 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 No.-14, 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

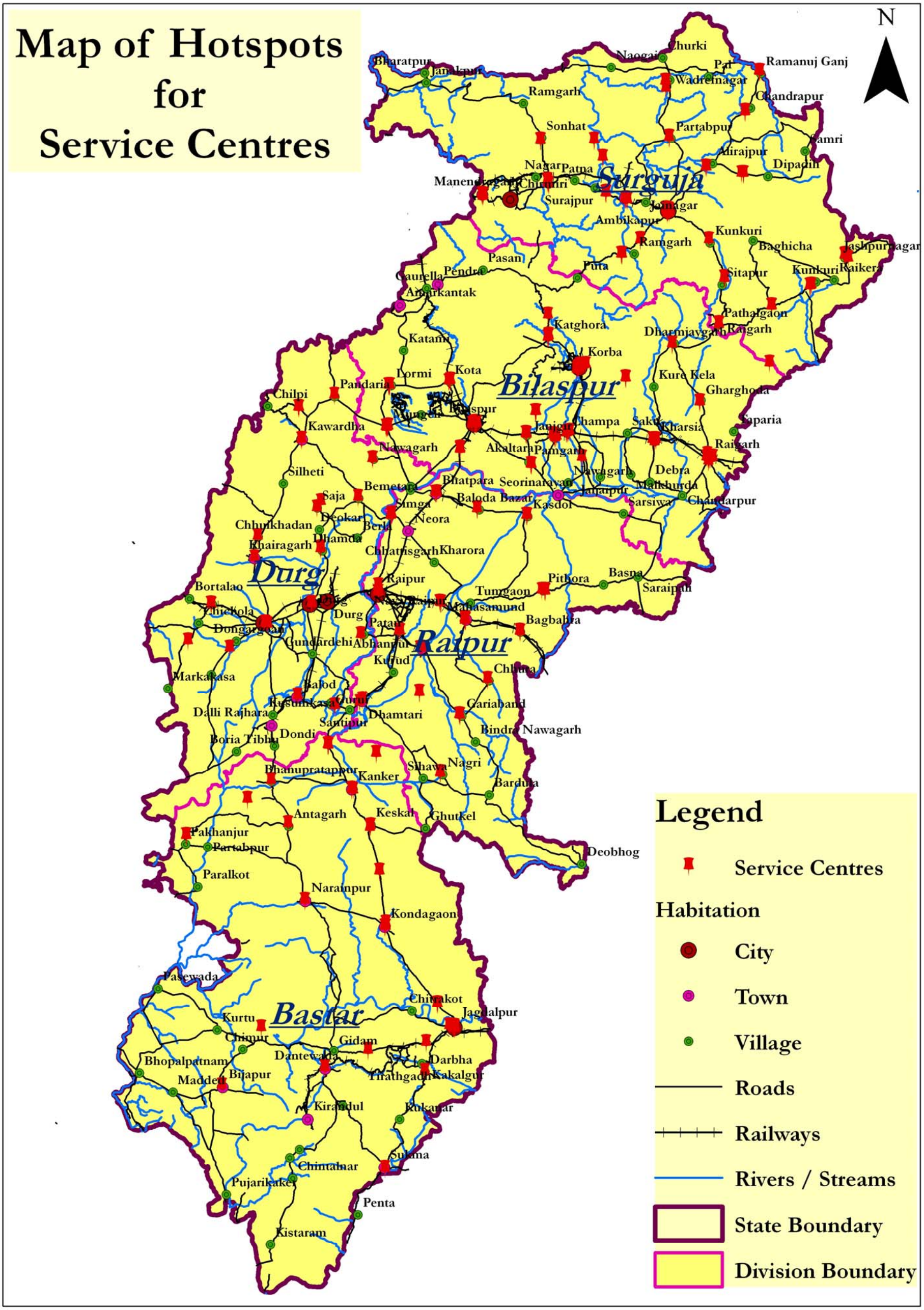
Annexure- 7

Map of Hotspots for Distributors



Map of Hotspots for Bulk Consumers

Map of Hotspots for Service Centers



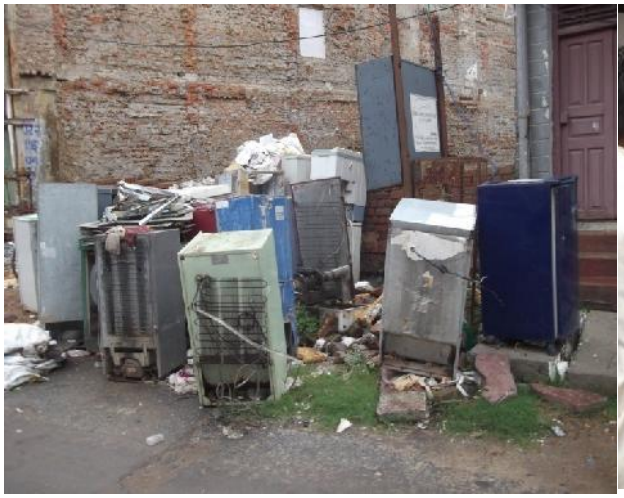
Map of Hotspots for Scrap Dealers

Sample Photo Documentation Annexure-8

Raipur Division


इलेक्ट्रानिक्स

Bilaspur Division




TE-LAX


शेवम रेडियो टीवी


Whirlpool Service Centre
A-1

Durg Division








Surguja Division









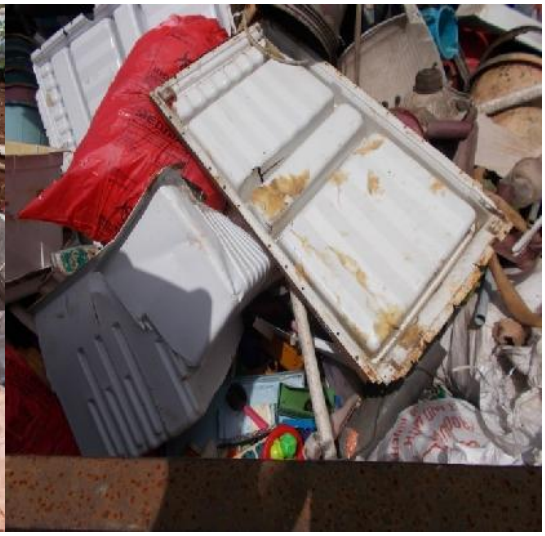


Bastar Division











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.

$$\text{WEEE generation (t)} = [\text{Stock (t1)} - \text{Stock (t)}]_{\text{private}} + [\text{Stock (t1)} - \text{Stock (t)}]_{\text{industry}} + \bullet \text{Sales (n)} - \bullet \text{WEEE (n)}$$

$n=t1+1$ to $t-1$ $\quad n=t1+1$ to t with $t1 < t$

$\text{Stock}_{\text{private}}$ = Number of households * (saturation level of households / 100)

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

$\text{Stock}_{\text{industry}}$ = 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

d_S - 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)

Features of the five inventory assessment methods

Methodology/Features	Requirements	Constraints	Advantages
The Time Step Method	1. Information about domestic sales. 2. Appliance stock levels for household. 3. Industrial stock levels.	1. Household saturation levels are based on predetermined stock levels 2. Industrial stock levels are assumed in the calculations because they are difficult to obtain and require assumptions. 3. Assumption that all the WEEE/E-waste generated is collected and transferred to treatment and disposal facility.	1. Calculations can be carried out very easily. 2. Method gives good results in a saturated market.
The market Supply Method	1. Information about domestic sales. 2. Average life of new and second hand items.	1. 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. 2. WEEE/ E-waste are often stored for years. 3. Assumed that all appliances produced in the same year will be in line for disposal after exactly the average life. 4. Assumption that the average variance in life of items of EEE does not change very much, whereas, in reality, lifetimes may	1. Necessary data need not be very wide-ranging 2. Calculations can be carried out very easily using a simple formula 3. 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.

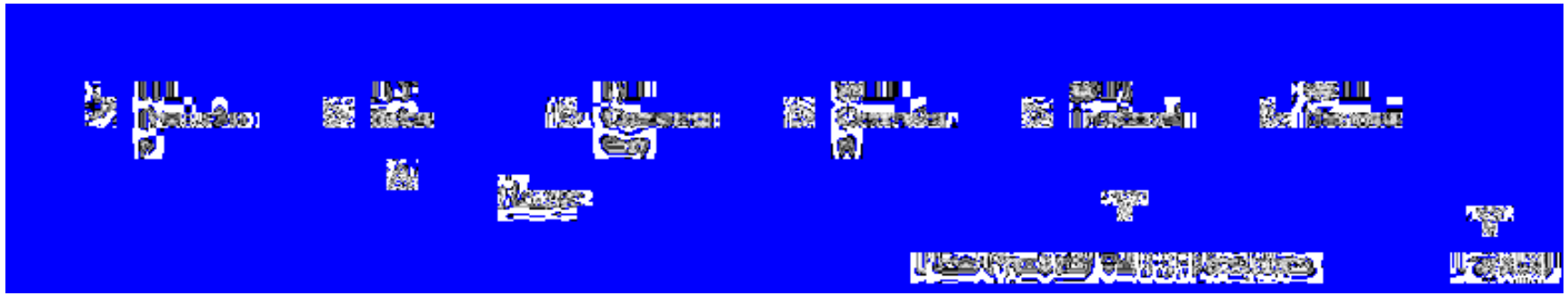
Methodology/Features	Requirements	Constraints	Advantages
		become shorter in the future. Therefore, this method is not especially useful in the calculation of WEEE for a dynamic market where technology and life are changing rapidly.	
The Carnegie Mellon Method	Sales data, date for typical life times, recycling & storage.	1. 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. 2. This model also requires a full coverage of sales data as early as possible in the WEEE/E-waste trade value chain.	1. The model allows for an electrical and electronic equipment to be purchased, reused, stored and finally recycled or landfilled representing "material flow" more precisely. 2. 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.	1. A product's constant mean lifespan is assumed in this method. 2. 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.	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 appliances plays a significant role in consumer behaviour.	1. This method is suitable for carrying 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.

Data Requirements for E-waste Inventory Assessment

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

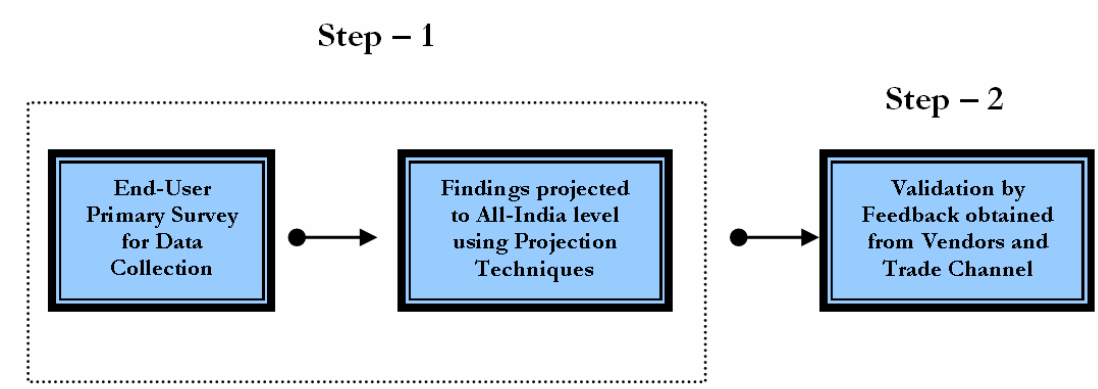
Note: √ **means 'Yes'**



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.

$$\sum_{i=1}^{n} \text{Last one year market size in employee band i} = \sum_{i=1}^{n} \left(\text{Acquisition rate in employee band i} \times \text{Universe of estab. in employee band i} \right)$$

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 1. Pure households 2. 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	

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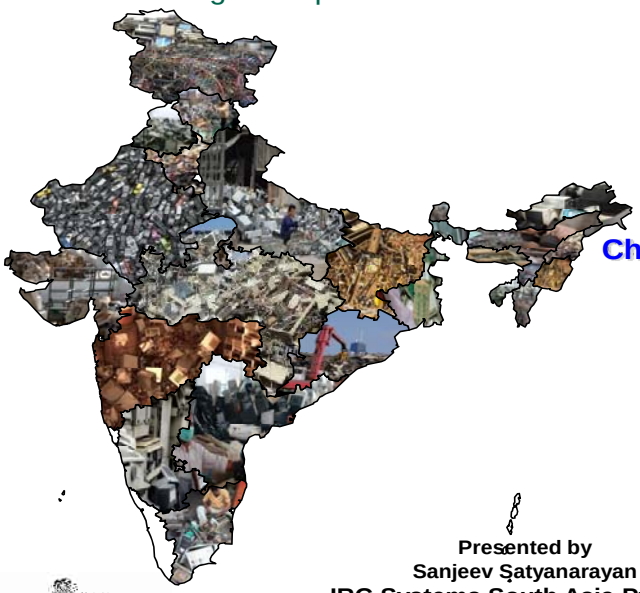
Conducting a Rapid e-waste inventorization Chhattisgarh



Presented to

Chhattisgarh Environment Conservation Board

Presented by
Sanjeev Satyanarayan
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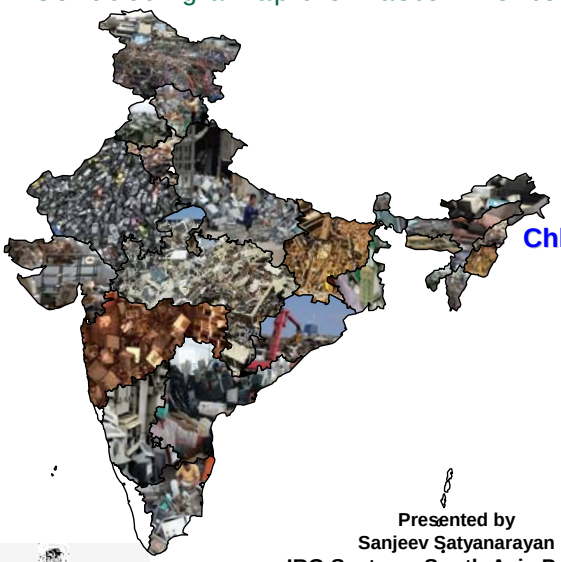

Presented to

Chhattisgarh Environment Conservation Board

Presented by
Sanjeev Satyanarayan
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Need for Study

CECB had taken an initiative to prepare an inventory of e-waste generated in the Raipur, Bilaspur, Durg, Surguja and Bastar Divisons of Chhattisgarh state so that an action plan for WEEE can be formulated for these Divisions.

CECB had invited IRGSSA to carry out this study

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Objectives

- To assess identify and quantify the WEEE generation
- To examine the existing WEEE recycling system
- To estimate the existing and future quantity of WEEE in the study area
- Preparation of directory of the stakeholders

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Scope of Work & Approach

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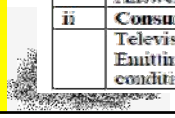
SOW: Items & Focused Steps

Schedule 1 Items as shown below

SCHEDULE-1

Categories of electrical and electronic equipment covered under the rules

Sl. 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
	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.



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SOW: Stakeholders

Stake Holders
1st Group
Importers / Manufacturers
Distributors / Traders / Retailers
Consumers – Business Sector / IT Sector / BPO / Teaching Institutions / Railways / Airlines / Defense Establishments / Transport Corporations, etc.
2nd Group
Collectors – Scrap Dealers / Big Bazars / Malls
Recyclers – Dissemblers / Dismantlers / Material Recoveries
Road-side Vendors
Authorized / Un-Authorized Auctioneers

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SOW: Coverage

- Identification of stakeholder & establish WEEE Trade chain (1st group & 2nd group)
- Identification of market systems
- Inventorization
- Analysis of existing WEEE recycling system & quantification of WEEE
- Environmental impacts of present recycling system
- WEEE Trade economics

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APPROACH & METHODOLOGY

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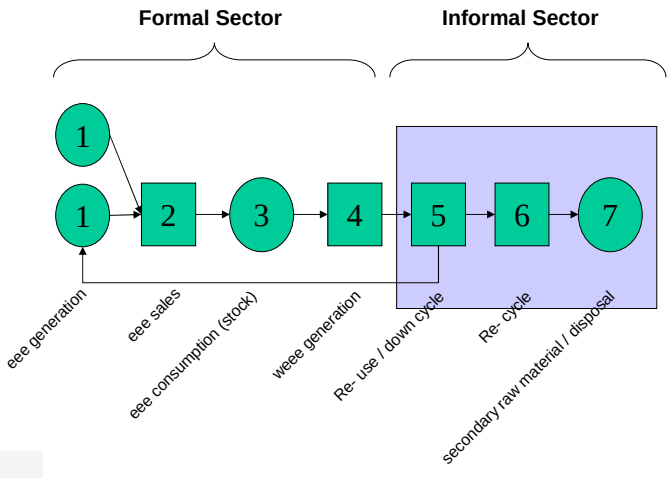
Approach: Adopted E-Waste Material Flow Chain



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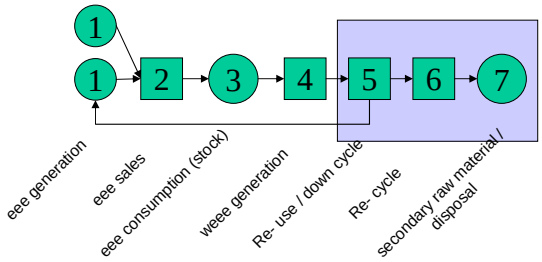
Approach: “Cradle to Grave” Model



1. EEE generation: Import & manufacturing of EEE
2. EEE sales
3. EEE consumption (stock)
4. WEEE generation
5. Re- use / down cycle
6. Re- cycle
7. Secondary raw material / disposal

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ASSESSMENT OF E-WASTE MARKET

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 the five divisions of Chhattisgarh.

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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 and TVs

- 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. The latest trends in these appliances include phasing out of the use of ODS and improvement of energy efficiency. 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.

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Mechanism of E-Waste Trade

- **“Material Flow” along the “Life Cycle” of electrical and electronic equipment within a “Geographical Boundary” of the five 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 the next slide. This is followed by customization of the conceptual E-waste trade value chain for Chhattisgarh.**

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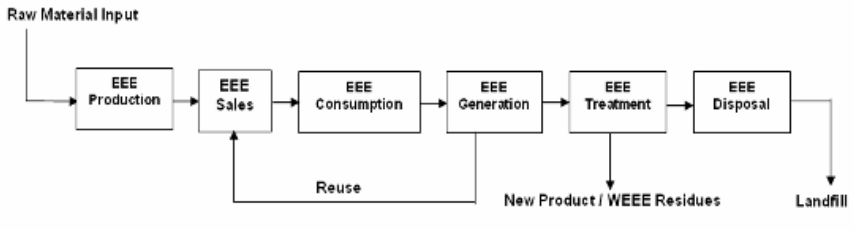

Conceptual E-waste trade value chain
Source: IRGSSA

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E-waste trade value chain in Study Area

- **A tentative E-waste trade value chain for study area which has emerged out of field work is shown in the next slide. Tracer technique, which was pilot tested in Chhattisgarh has been used in five divisions in Chhattisgarh to fix E-waste trade value chain.**

A geographical mapping of E-waste material flow chain is shown in **Figure.**

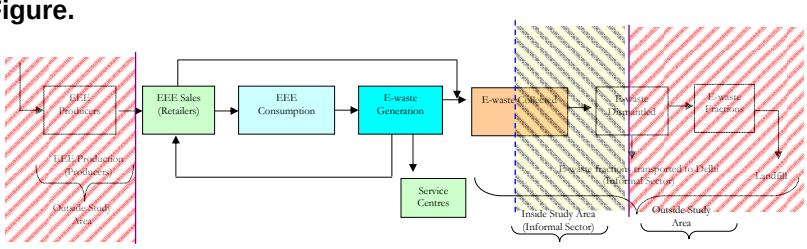

Figure: Tentative E-waste trade value chain in Study Area
Source: IRGSSA

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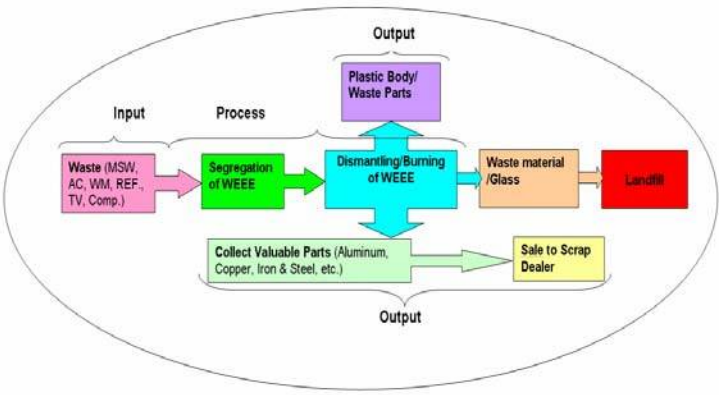
Processes observed at dumpsite



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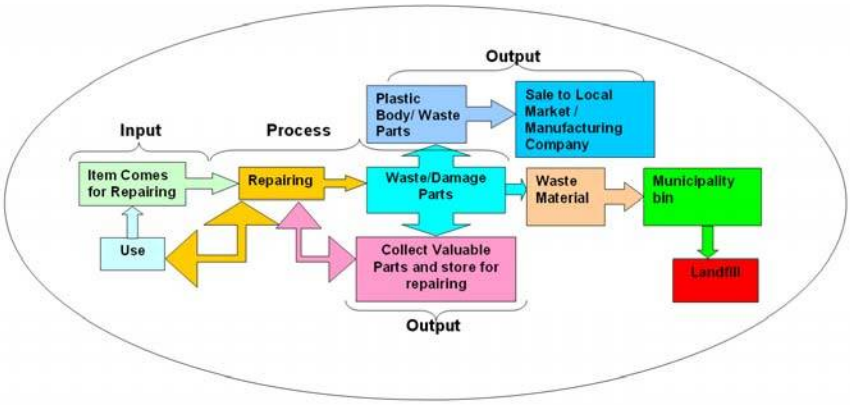
Processes observed at scrap dealers / junkyards



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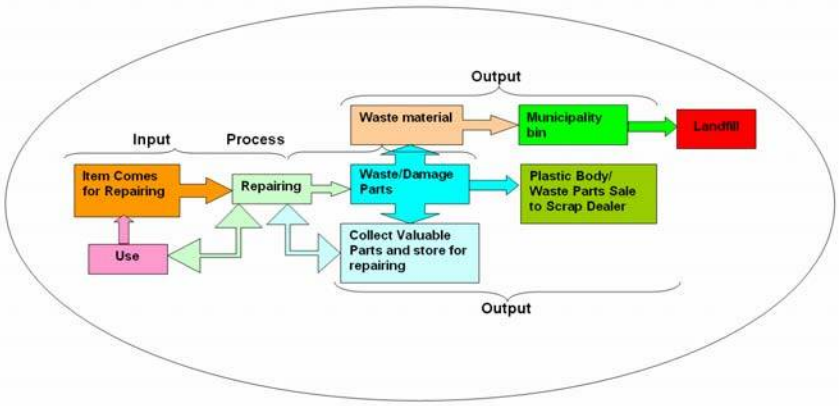
Processes observed at AC, Washing Machine, and Refrigerator Repair Shop



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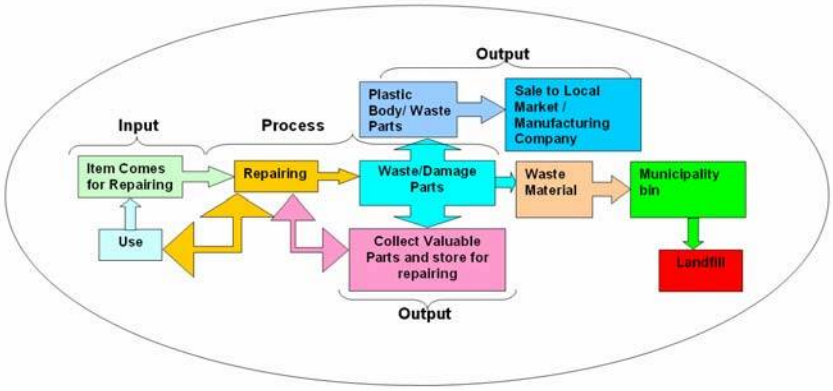
Processes observed at TV, Computer, and Mobile Phone Repair Shop



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Material Flow Chain, Data Sources and Data Gaps in Chhattisgarh

A list of sources of data in study area, which was required for application of inventory assessment methodology as per Annexure 8 has been prepared and summarized. Consultants visited the agencies identified 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).**
- **Number of Households – Available with national census data (1991, 2001 & 2011).**
- **Stock Data – Stock levels at private/households, industry, commercial & sectors with Industry Association.**
- **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 five divisions of Chhattisgarh.**

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E-WASTE INVENTORY ASSESSMENT

- **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 from 2011 to 2020 in five division 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.**
- **Installed Base of EEE Items in 2006 to 2020 (in numbers)**

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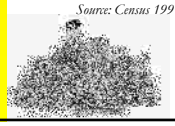
INSTALLED BASE OF CELLULAR PHONE FOR CHHATTISGARH

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

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



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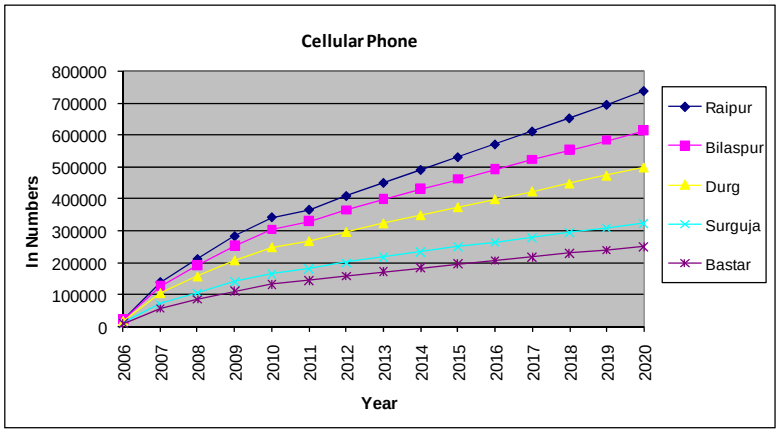
INSTALLED BASE OF CELLULAR PHONE FOR CHHATTISGARH



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INSTALLED BASE OF FIXED LINE PHONE FOR CHHATTISGARH

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

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

*** Inclusion of Private Operators in 2008**

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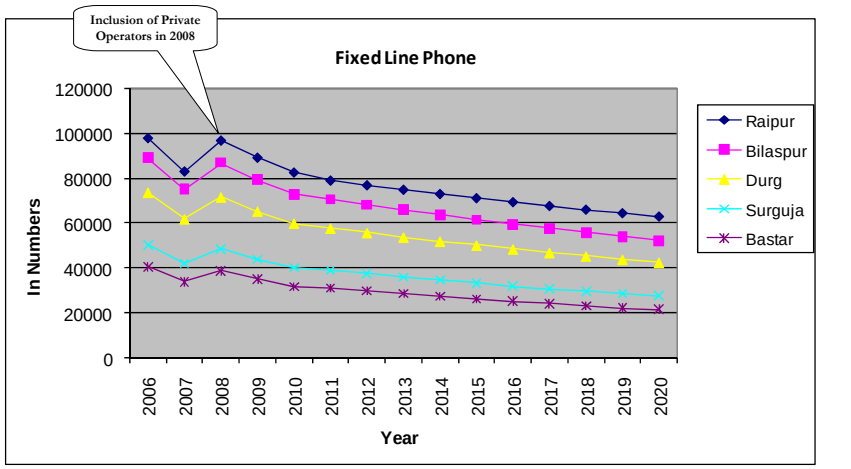
INSTALLED BASE OF FIXED LINE PHONE FOR CHHATTISGARH



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INSTALLED BASE OF COMPUTERS FOR CHHATTISGARH

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

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

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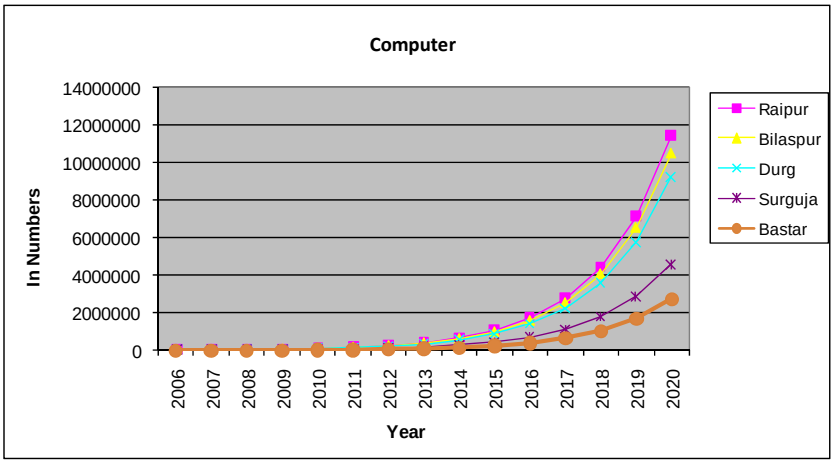
INSTALLED BASE OF COMPUTERS FOR CHHATTISGARH



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INSTALLED BASE OF PRINTERS FOR CHHATTISGARH

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

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

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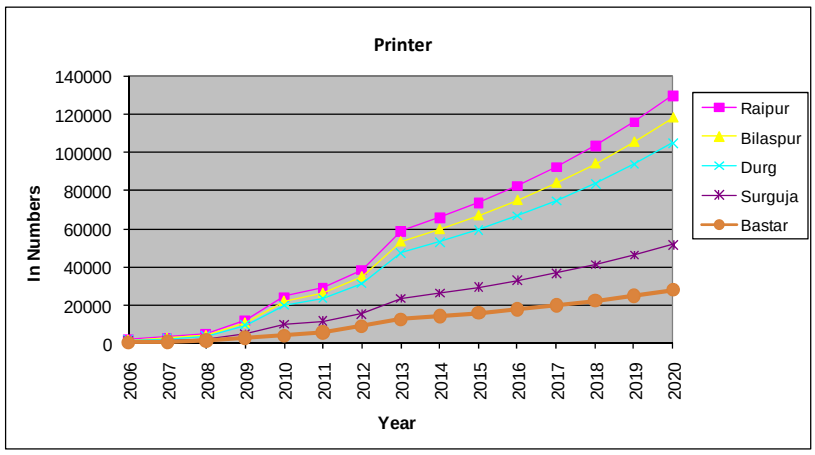
INSTALLED BASE OF PRINTERS FOR CHHATTISGARH



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INSTALLED BASE OF TELEVISION FOR CHHATTISGARH

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

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

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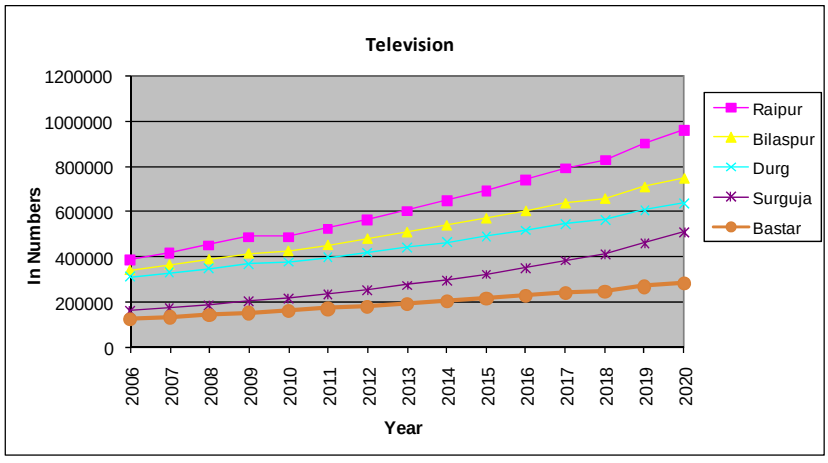
INSTALLED BASE OF TELEVISION FOR CHHATTISGARH



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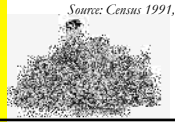
INSTALLED BASE OF AIRCONDITIONERS FOR CHHATTISGARH

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

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



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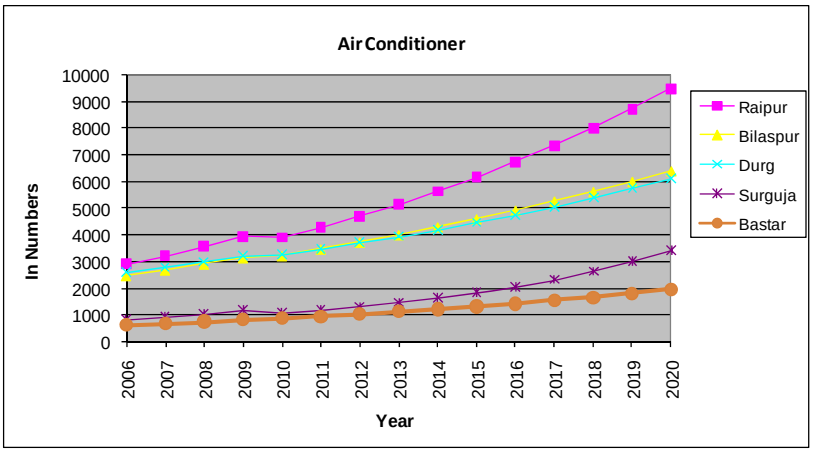
INSTALLED BASE OF AIRCONDITIONERS FOR CHHATTISGARH



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INSTALLED BASE OF WASHING MACHINES FOR CHHATTISGARH

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

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

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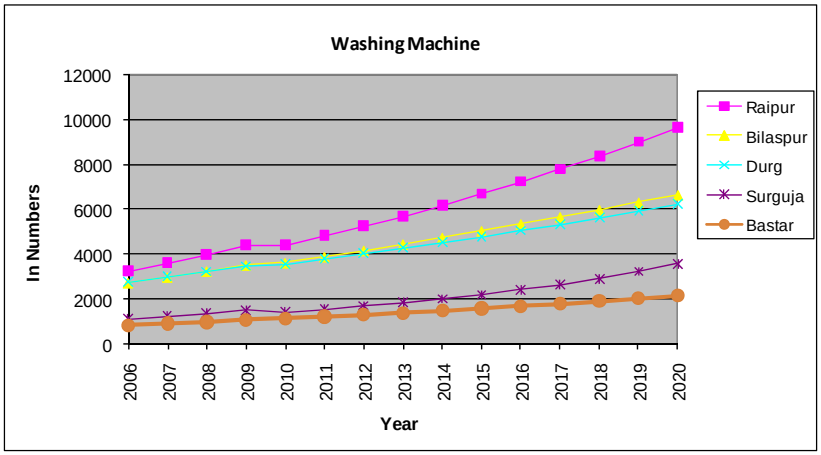
INSTALLED BASE OF WASHING MACHINES FOR CHHATTISGARH



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INSTALLED BASE OF REFRIGERATORS FOR CHHATTISGARH

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

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

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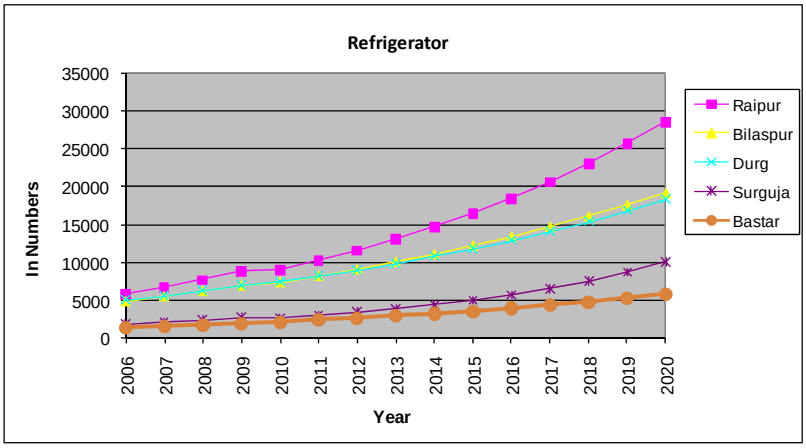
INSTALLED BASE OF REFRIGERATORS FOR CHHATTISGARH



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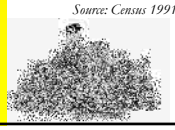
INSTALLED BASE OF ALL ELECTRONICS ITEM FOR CHHATTISGARH

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



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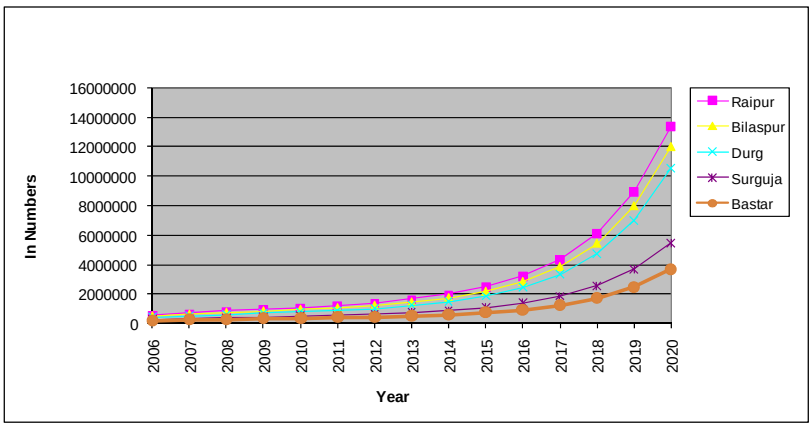
INSTALLED BASE OF ALL ELECTRONICS ITEM FOR CHHATTISGARH



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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" and summarized in Table below. The storage time takes into account storage at owner's premises, collection agency (scrap dealer) & dismantler's premises.**

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

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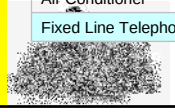
Obsolescence Rate of Tracer EEE

Sr. No.	EEE	Average Life (Years)
1	Cellular Phone	3
2	Computer	7
3	Printer	6
4	Washing Machine	12
5	TV	11
6	Refrigerator	12
7	Air Conditioner	12
8	Fixed Line Telephone	6

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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INVENTORY OF CELLULAR PHONE FOR CHHATTISGARH (in tons)

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

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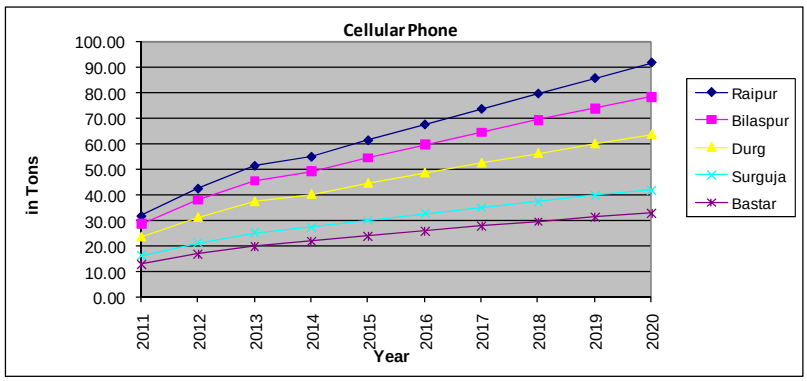
INVENTORY OF CELLULAR PHONE FOR CHHATTISGARH



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INVENTORY OF FIXED LINE PHONE FOR CHHATTISGARH (in tons)

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

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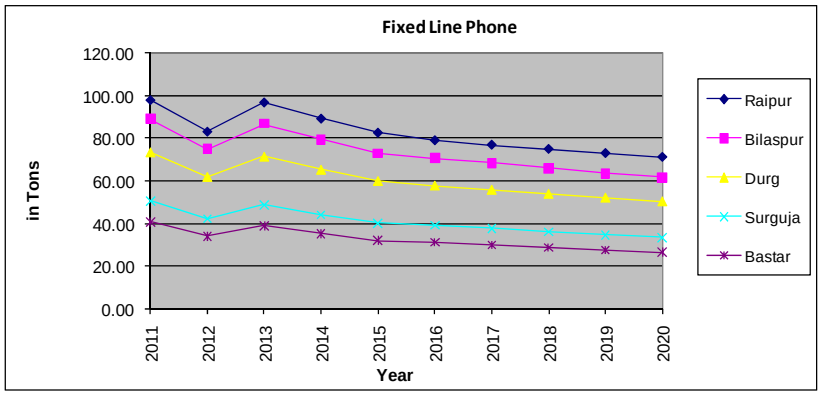
INVENTORY OF FIXED LINE PHONE FOR CHHATTISGARH



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INVENTORY OF COMPUTERS FOR CHHATTISGARH (in tons)

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

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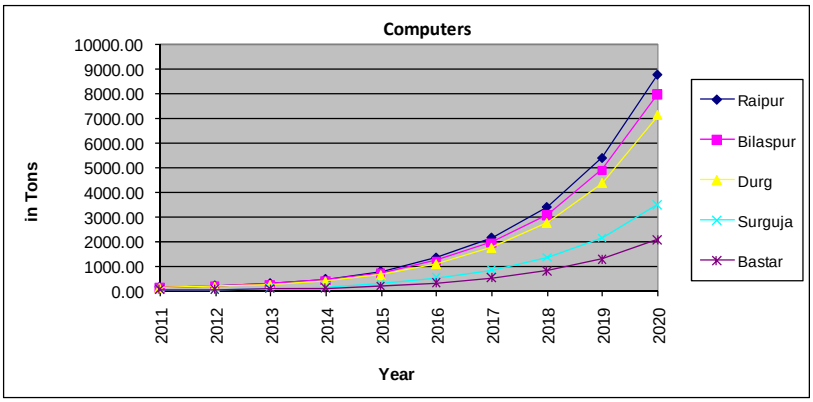
INVENTORY OF COMPUTERS FOR CHHATTISGARH



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INVENTORY OF PRINTERS FOR CHHATTISGARH (in tons)

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

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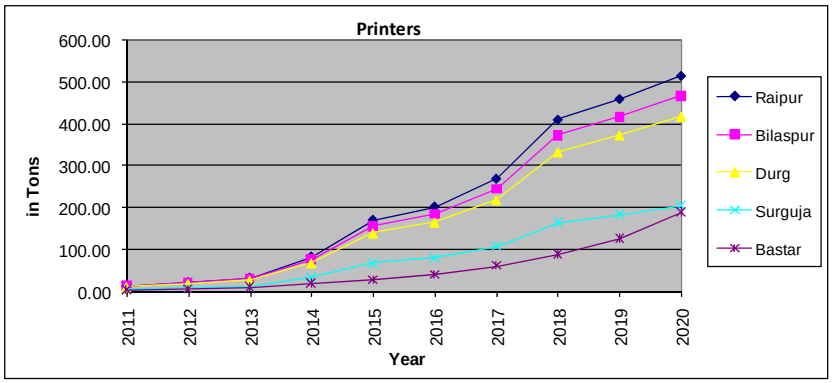
INVENTORY OF PRINTERS FOR CHHATTISGARH



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INVENTORY OF TELEVISION FOR 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

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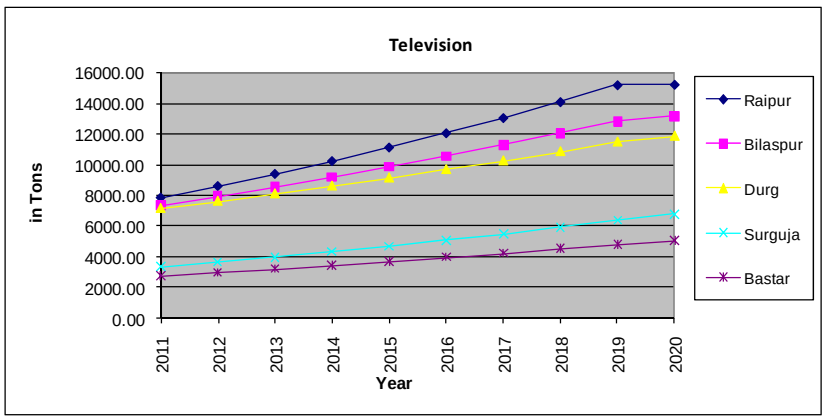
INVENTORY OF TELEVISION FOR CHHATTISGARH



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INVENTORY OF AIRCONDITIONERS FOR CHHATTISGARH(in tons)

Year	Raipur	Bilaspur	Durg	Surguja	Bastar	Chhattisgarh
2011	79.28	76.37	90.49	23.53	20.30	289.95
2012	85.63	82.61	94.17	24.74	20.72	307.87
2013	97.16	91.71	102.99	27.91	23.07	342.84
2014	109.65	101.27	112.10	31.39	25.56	379.97
2015	123.20	111.32	121.54	35.21	28.20	419.47
2016	129.54	114.58	123.33	37.10	29.47	434.02
2017	144.50	125.07	132.92	41.53	32.30	476.32
2018	160.72	136.13	142.94	46.47	35.32	521.58
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

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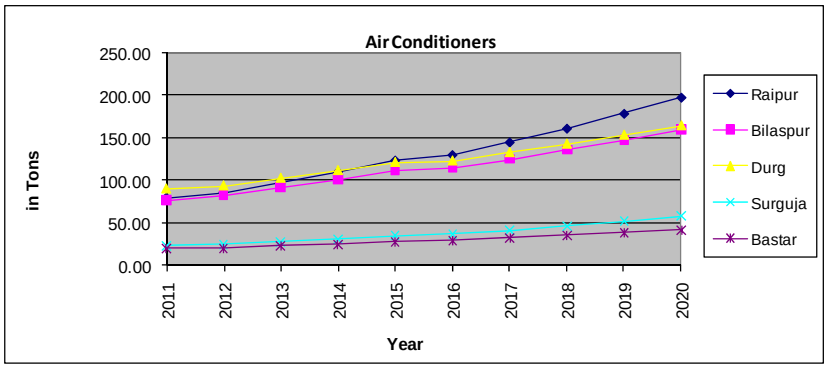
INVENTORY OF AIRCONDITIONERS FOR CHHATTISGARH



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INVENTORY OF WASHING MACHINES FOR CHHATTISGARH (in tons)

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

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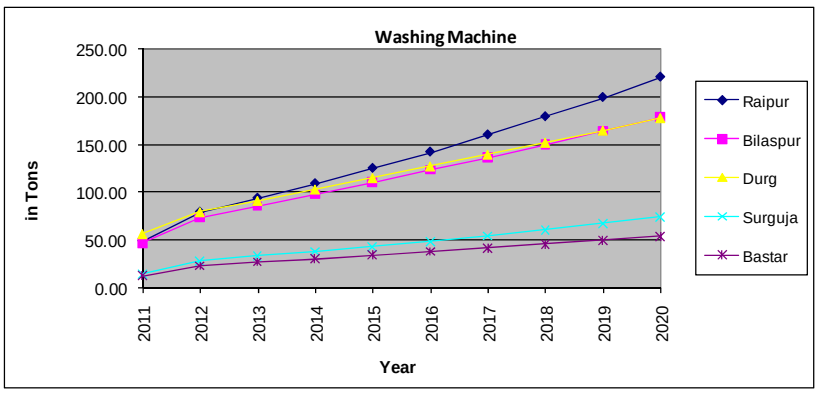
INVENTORY OF WASHING MACHINES FOR CHHATTISGARH



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INVENTORY OF REFRIGERATORS FOR CHHATTISGARH (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

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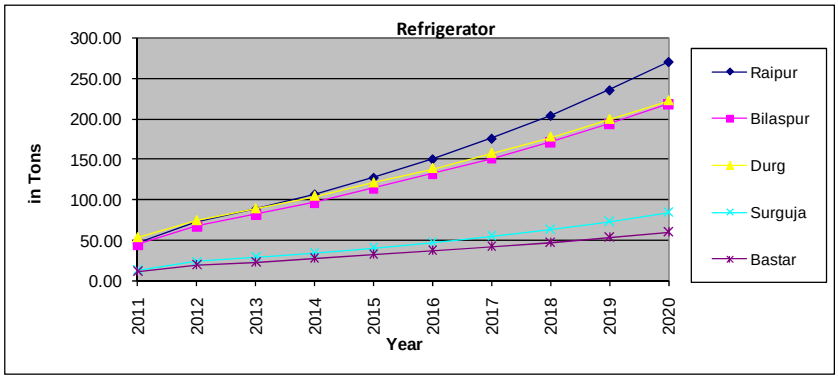
INVENTORY OF REFRIGERATORS FOR CHHATTISGARH



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INVENTORY OF ALL ELECTRONIC ITEMS FOR CHHATTISGARH (in tons)

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

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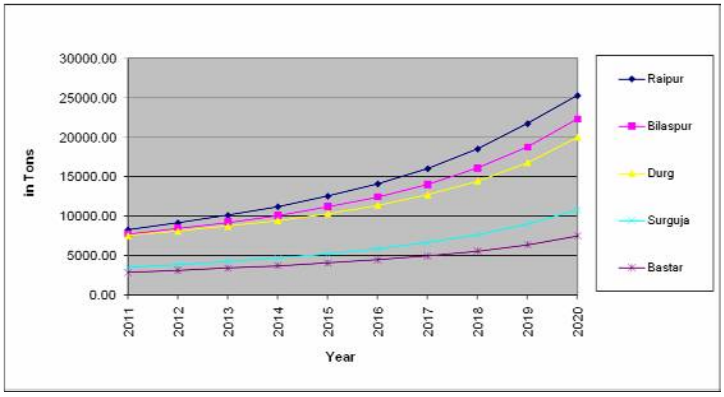
INVENTORY OF ALL ELECTRONIC ITEMS FOR CHHATTISGARH



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E-waste Inventory

The projected E-waste inventory estimates in metric tons for all Divisions starting from 2011 till 2020 have been computed, described and presented in report. Salient features of inventory estimates for each town are summarized below.

- 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 Computer (6%),Refrigerator (1%), Washing machine (1%), Air conditioner (1%), Cellular phone (1%), 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 Printer (2%), Refrigerator (1%), Air conditioner (1%), Washing machine (1%), Cellular phone (0%) & Fixed Line Phone (0%)

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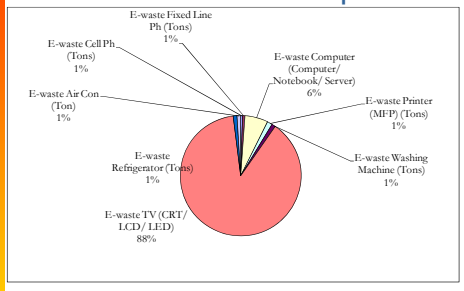
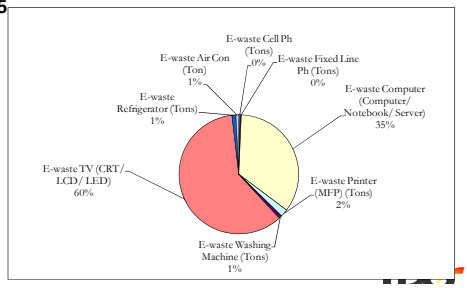
Percentage of E-waste Inventory Projection in Raipur Division from 2015 to 2020



E-waste in Percent for Raipur Division in 2015



E-waste in Percent for Raipur Division in 2020

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E-waste Inventory

- 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%) .

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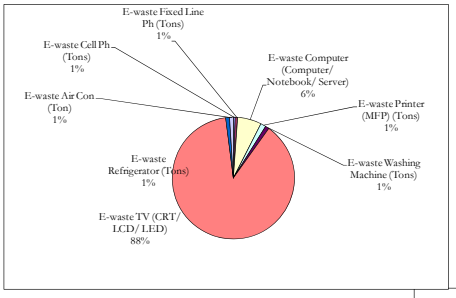
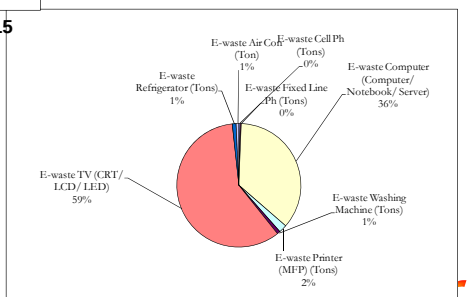
Percentage of E-waste Inventory Projection in Bilaspur Division from 2015 to 2020



E-waste in Percent for Bilaspur Division in 2015



E-waste in Percent for BilaspurDivision in 2020

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E-waste Inventory

- 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 Computer (6%), Refrigerator (1%), Washing machine (1%), Air conditioner (1%), Cellular phone (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%), Refrigerator (1%), Air conditioner (1%), Washing machine (1%), Cellular phone (0%) & Fixed Line Phone (0%) .

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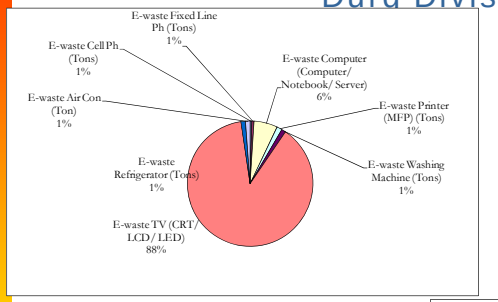
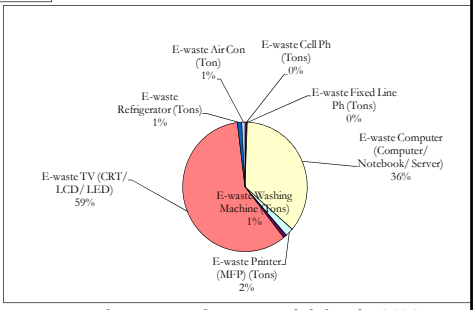
Percentage of E-waste Inventory Projection in Durg Division from 2015 to 2020



E-waste in Percent for Durg Division in 2015



E-waste in Percent for Durg Division in 2020

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E-waste Inventory

- 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(0)% .
- 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%) .

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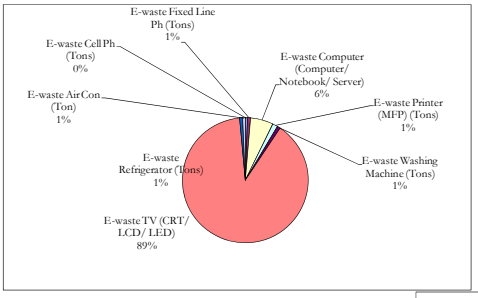
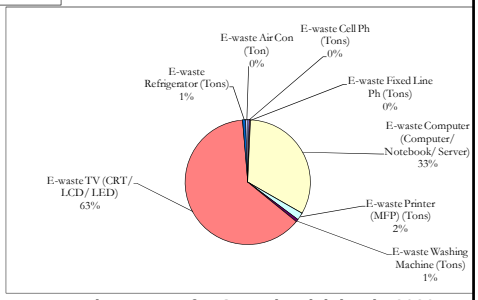
Percentage of E-waste Inventory Projection in Surguja Division from 2015 to 2020



E-waste in Percent for Surguja Division in 2015



E-waste in Percent for Surguja Division in 2020

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E-waste Inventory

- 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%)
- 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%).

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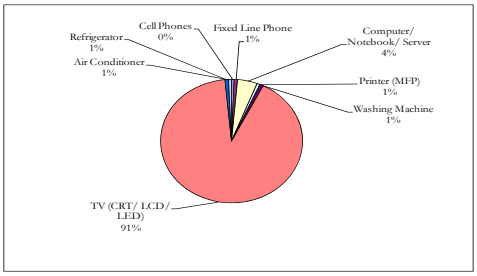
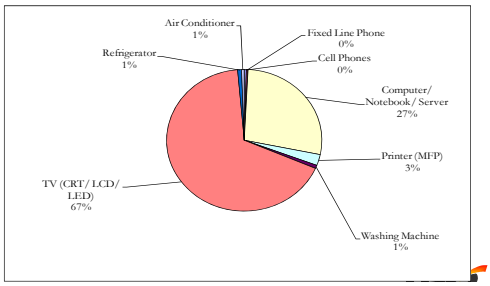
Percentage of E-waste Inventory Projection in Bastar Division from 2015 to 2020



E-waste in Percent for Bastar Division in 2015



E-waste in Percent for Bastar Division in 2020

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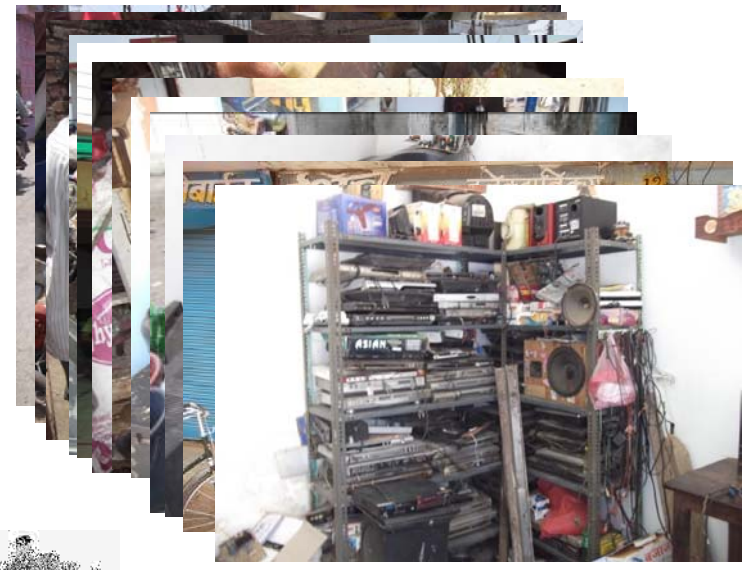
Sample Photo Documentation Raipur Division



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Sample Photo Documentation Bilaspur Division

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Sample Photo Documentation Durg Division

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Sample Photo Documentation Surguja Division

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Sample Photo Documentation - Bastar

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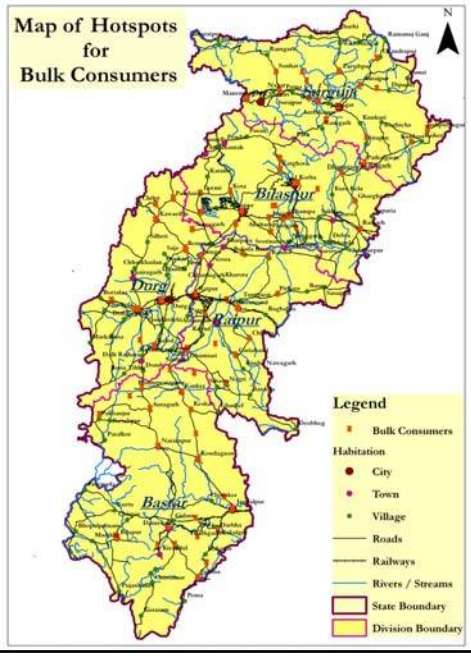
Inventory of Hotspots for Bulk Consumers of Chhattisgarh



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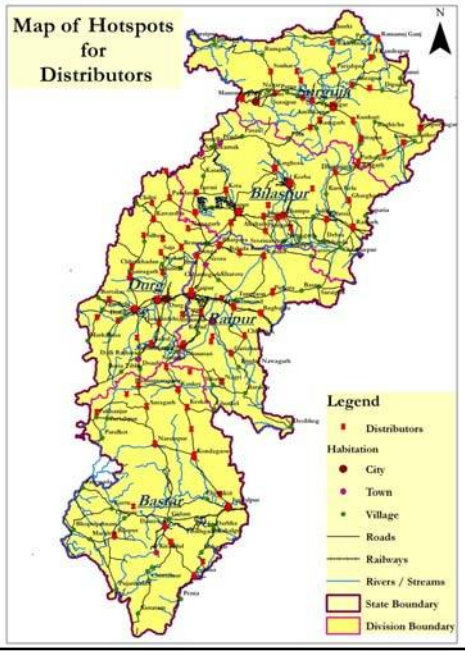
Inventory of Hotspots for Distributors of Chhattisgarh



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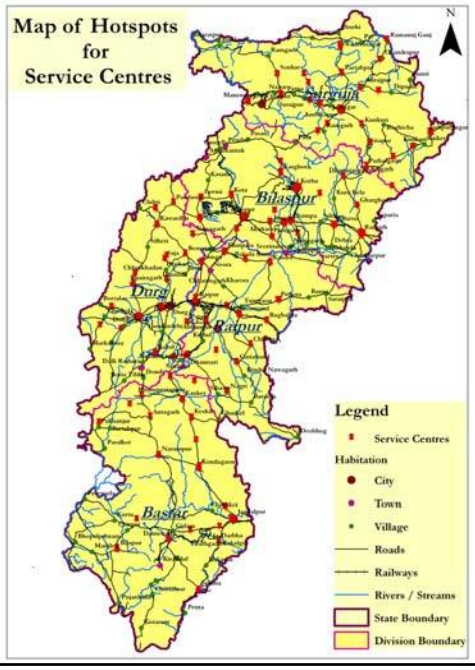
Inventory of Hotspots for Service Centers of Chhattisgarh



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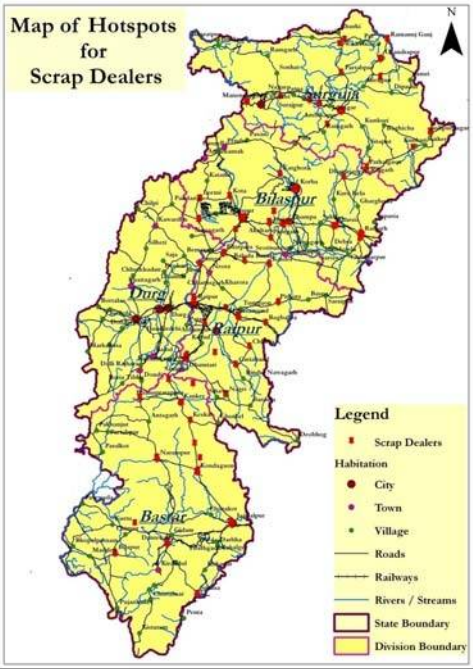
Inventory of Hotspots for Scrap Dealers of Chhattisgarh



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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, leading 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 E-waste.
- 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.

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CONCLUSIONS CONTD.

- 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.
- No mechanism exists in the state to monitor and track its inventory, collection, transportation and disposal.
- **A combination of Carnegie Mellon method & tracer tracking has been selected for inventory assessment since it covers all the aspects of material flow chain**.

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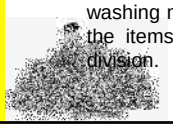
CONCLUSIONS CONTD.

- In **Raipur 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. 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 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.



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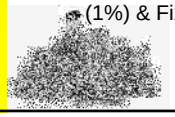
CONCLUSIONS CONTD.

- 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 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%).

- **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%).



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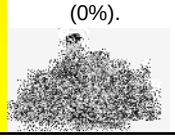
CONCLUSIONS CONTD.

- **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%).



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CONCLUSIONS CONTD.

- **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%).

- 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 implementation of regulations as well as financial instrument for diverting E-waste inventory into the formal sector.

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Thank You

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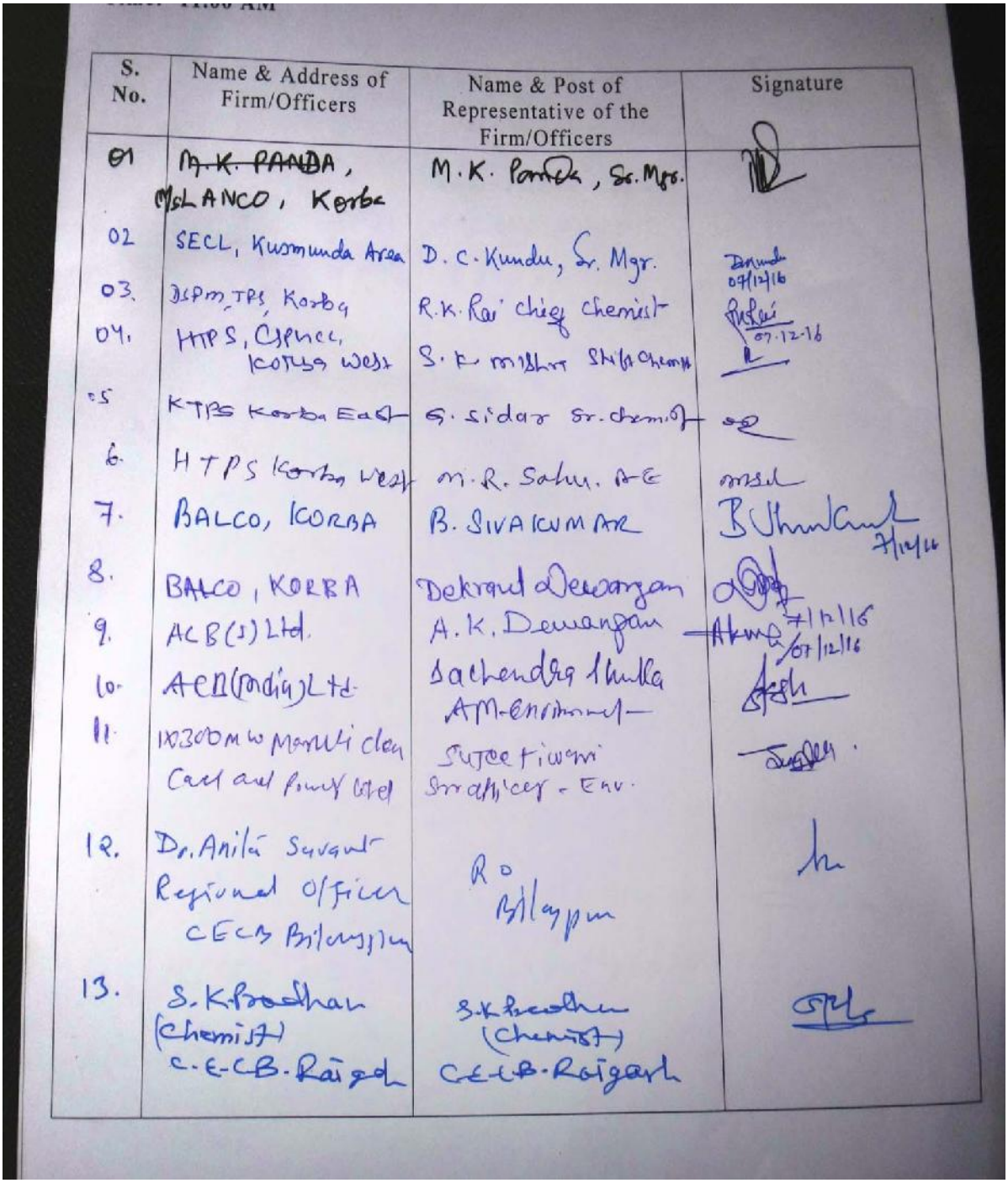
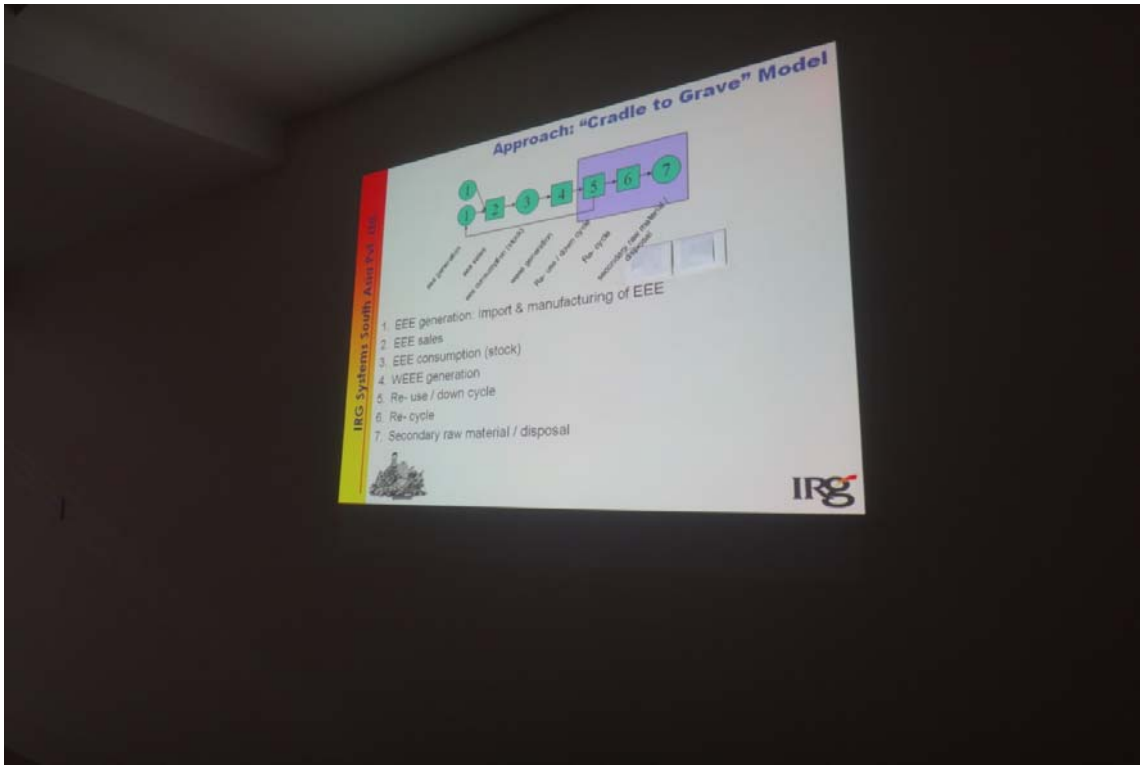
Annexure 12

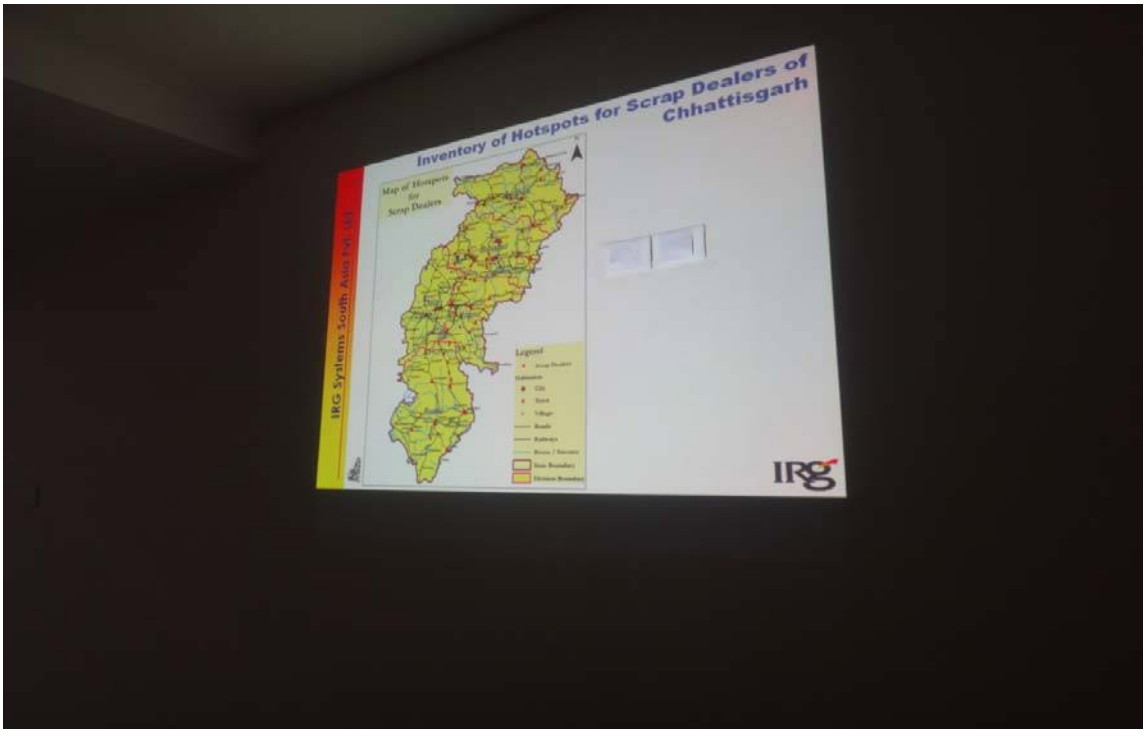
Sensitization and Stakeholders Workshop Photo Documentation



S. No.	Name & Address of Firm/Officers	Name & Post of Representative of the Firm/Officers	Signature
01	~~M.K. PANDA~~, MSLANCO, Korba	M.K. Panda, Sr. Mgr.	
02	SECL, Kusmunda Area	D.C. Kundu, Sr. Mgr.	07/12/16
03.	DSPM, TPS, Korba	R.K. Rai chief chemist	07.12.16
04.	HTPS, CSPGCL, Korba West	S.K. Mishra Shift Chemist	
05	KTPS Korba East	S. Sidar Sr. chemist	
6.	HTPS Korba West	M.R. Sahu. AE	
7.	BALCO, KORBA	B. SIVAKUMAR	7/12/16
8.	BALCO, KORBA	Debrajul Dewangan	
9.	ACB(I) Ltd.	A.K. Dewangan	7/12/16 07/12/16
10.	ACB(India)Ltd.	Jagendra Thakur AM-Environment	
11.	1X300MW Maruti clean Coal and Power Ltd	Sujeet Tiwari Sr. Officer - Env.	
12.	Dr. Anita Sarvate Regional Officer CECB Bilaspur	R.O Bilaspur	
13.	S.K. Pradhan (Chemist) C.E.C.B. Raigarh	S.K. Pradhan (Chemist) C.E.C.B. Raigarh	

S. No.	Name & Address of Firm/Officers	Name & Post of Representative of the Firm/Officers	Signature
14.	S.K. Verma ROCECB Ambikapur	Regional officer CECB. Ambikapur	
15.	Dr. Suresh Chandra R.O., C.E.C.B, Jdp.	R.O. Jdp.	
16	SHAILESH PISDA AE, CECB, RAIGARH	Regional office Raigarh.	Spisda 7/12/16
17.	Devvrat Mishra. Assistant Engg. H.O. CECB, Naya Raipur	Head office CECB, Raipur	Dmishra 07/12/16
18.	Abhishek Banjara Asst. engineer, H.O. CECB, Naya raipur	Head office, CECB Naya Raipur	07/12/16
19)	Manik chandel chemist CECB KORBA	Regional office korba	07/12
20	S.K. Sambad AGM (EMG & AU)	NTPC Korba	
21)	Sanjeev Satyanarayan IRGSSA, N.Delhi	General Manager IRGSSA. N.Delhi	Sanjeev
22)	Shashi Ranjan Chaudhary IRGSSA		

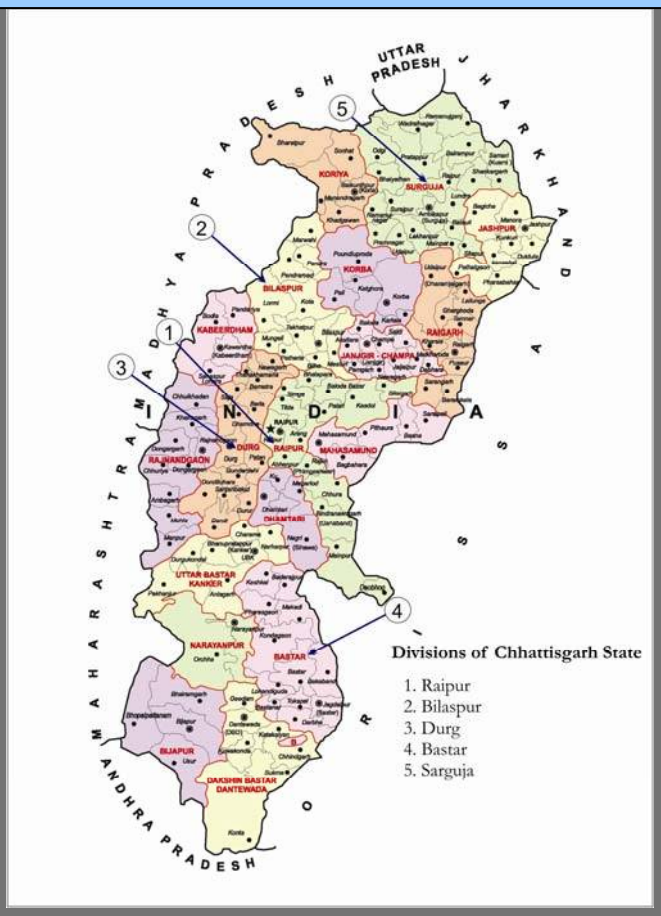

Approach: "Cradle to Grave" Model
IRG Systems South Asia Pvt. Ltd.
1. EEE generation: Import & manufacturing of EEE
2. EEE sales
3. EEE consumption (stock)
4. WEEE generation
5. Re- use / down cycle
6. Re- cycle
7. Secondary raw material / disposal
IRG


Inventory of Hotspots for Scrap Dealers of Chhattisgarh
IRG Systems South Asia Pvt. Ltd.
Map of Hotspots for Scrap Dealers
Legend
IRG

2016

FINAL REPORT

E-Waste Inventorization of Durg 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 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.

Producers: 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, 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.

Consumers: 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. 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.

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.

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. 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%), Air conditioner (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 E-waste 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 E-waste 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 E-waste 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, Bastar and Sarguja. The overall aim of this initiative is to assess the generators, quantity and present practices for handling of E-waste 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**.

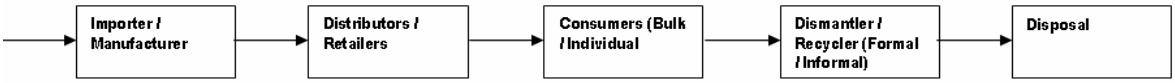


Figure 1.1: Conceptual WEEE business chain

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.

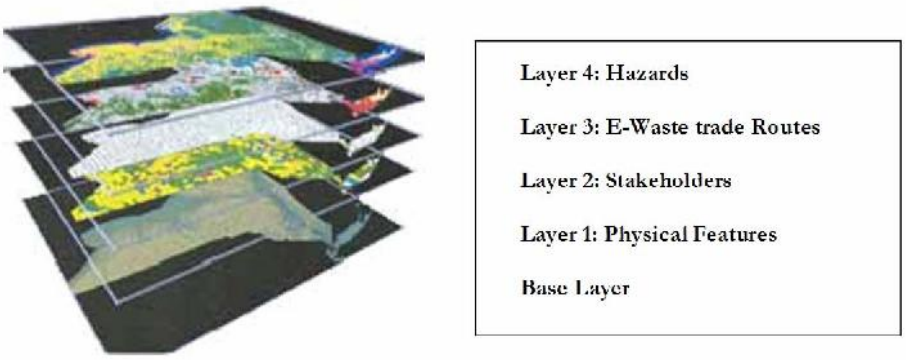


Figure 1.2: Geographical mapping of different attributes

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**.

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, 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

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

Regulations / Guidelines	E-waste Management		Export & Import of E-waste	
	Pre 1st May 2012	Post 1st May 2012	Pre 1st May 2012	Post 1st May 2012
E-waste (Management & Handling) Rules 2011		√		
Hazardous Waste (Management, Handling & Transboundary) Rules 2008	√		√	√
Guidelines for Environmentally Sound Management of E-waste 2008	√	√		
Guidelines for Implementation of E-waste Regulations 2012	√	√		

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.

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
Collection	**Manufacturing**	√					
	End of Life	√					
Take-back	**Individual**	√					
	Collectively	√					
Transportation to	**Producer**		√	√			
	Collection Centre	√	√	√			
	Dismantlers/ Recyclers	√	√	√	√	√	
	TSDF* Facility	√				√	√
Storage					√	√	√
Financing		√					
Registration		√			√	√	
Filing of Annual Returns		√			√	√	√
Return of Annual Inventory Handled		√		√	√	√	√

Note: √ 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, poly-brominated 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 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.

<u>Scope of EPR for the Producer:</u>

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**.

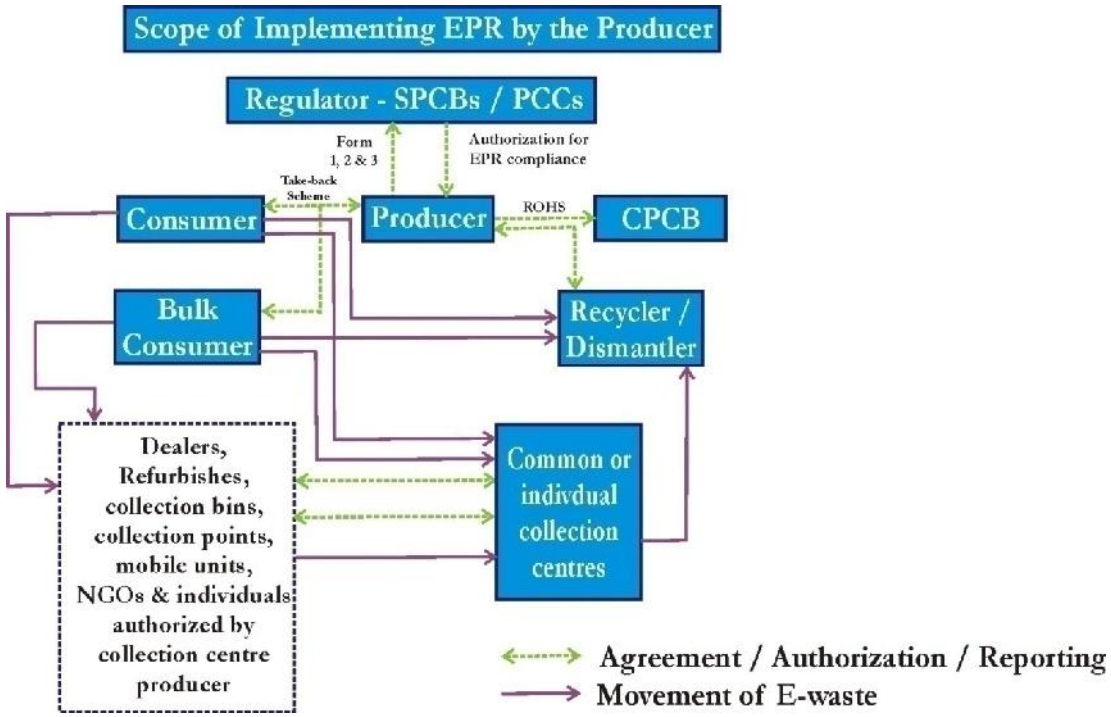


Figure 2.1: Scope of implementing EPR for Producers

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.

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.

    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**.

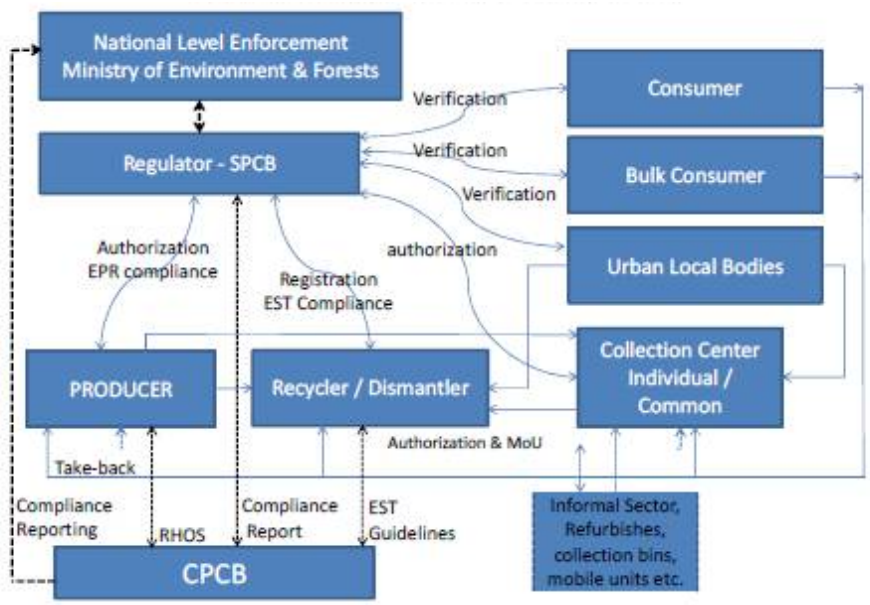


Figure 2.2: Implementation of E-Waste Rules 2011

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**.

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

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

Sr. No.	Authority/(ies)	Duties
		viii. Any other function delegated by the Ministry under these rules
3.	Urban Local Bodies (Municipal Committee/Council/Corporation)	(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**.

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
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 MoEF.
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	i. Grant licence for import of hazardous wastes ii. Refuse licence for hazardous wastes prohibited for imports and exports.

Sr. No.	Authority/(ies)	Duties and Corresponding Rule
5.	Port Authorities under Indian Port Act 1908 and Customs Authorities under the customs Act, 1962	i. Verify the documents ii. Inform the ministry of Environment and Forests, Govt. of India of any illegal traffic 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	X	X	X	X
2.	Bulk Consumer	√	√	X	X	X	X
3.	Urban Local Bodies	√	X	X	X	X	X
4.	Collection Centre	√	√	√	√	X	X
5.	Producer –offer to sell	√	√	√	√	X	√
6.	Producer - importer	√	√	√	√	X	√
7.	Producer - Manufacturing EEE	√	√	√	√	X	√
8.	Dismantler	√	√	√	√	√	X
9.	Recycler	√	√	√	√	√	X

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.

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 Telecommunication Equipment**																				
1.	Centralized Data Processing	√	√	√	√	√		√	√	√	√		√					√	√		√
2.	Mainframes	√	√	√	√	√		√	√	√	√		√					√	√		√
3.	Mini Computers	√	√	√	√	√	√	√	√	√	√		√					√	√		√
4.	Personal Computing	√	√	√	√		√	√	√	√	√		√								
5.	Personal Computers (Central processing unit with input and output devices)	√	√	√	√		√	√	√	√	√	√	√						√		√
6.	Laptop Computers (Central processing unit with input and output devices)		√	√	√	√		√	√	√	√		√	√				√	√		√
7.	Notebook Computers	√	√	√	√	√		√	√	√	√		√	√				√	√		√
8.	Notepad Computers	√	√	√	√	√		√	√	√	√		√	√				√	√		√
9.	Printers including cartridges	√	√	√	√	√			√	√	√		√					√			√
10.	Copying Equipment	√	√	√	√	√		√	√	√	√		√					√			√
11.	User Terminals and Systems	√		√	√	√	√		√	√	√	√	√					√			√
12.	Facsimile	√	√	√	√				√	√	√		√					√			√
13.	Telephones	√		√	√				√	√	√		√								√
14.	Pay Telephones	√		√	√			√	√	√	√		√					√	√		√
15.	Cordless Telephones	√		√	√			√	√	√			√					√	√		√
16.	Cellular Telephones	√	√	√	√	√		√	√	√			√					√	√		√
17.	Answering Systems	√	√	√	√			√	√	√			√					√	√		√
II.	**Consumer Electrical and Electronics**																				
18.	Cathode Ray Tube (CRT) TV	√		√		√				√	√	√	√					√			√
19.	Liquid Crystal Display (LCD) TV	√		√		√				√	√		√	√				√			√
20.	Light Emitting Diode (LED) TV	√		√		√				√	√		√	√				√			√
21.	Refrigerator	√	√	√	√	√			√	√					√		√	√		√	√
22.	Washing Machine	√	√	√		√			√	√			√			√	√				√
23.	Air Conditioners excluding centralized air conditioning plants	√	√	√	√				√	√			√				√	√		√	√
24.	Compact Fluorescent Lamp CFL																				

√ 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**.

Table 3.2: Possible Hazardous Substances in E-waste Components

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

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.

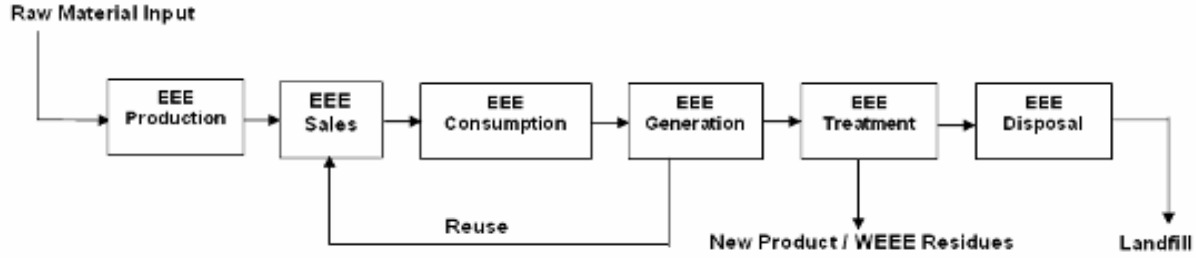


Figure 3.1: Conceptual E-waste trade value chain

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.

Table 3.3: Phases of material flow model

S.No.	Phase	Stakeholders
1.	Phase I: 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.	Phase II: 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.	Phase III: 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.	Phase IV: 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.

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.

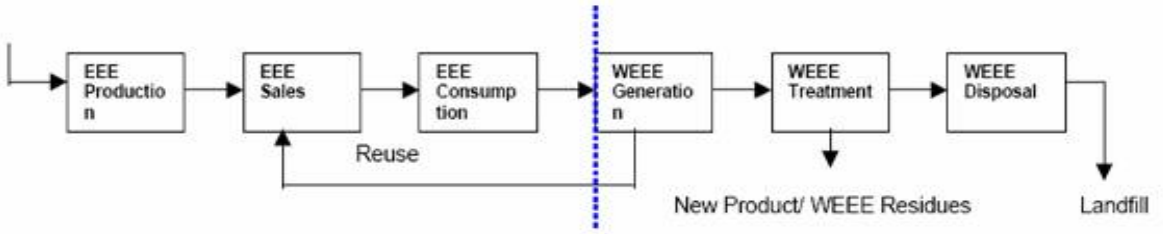


Figure 3.2: Generic E-waste trade value chain in a developing country

Source: UNEP Manual Vol. II; Inventory Assessment Manual

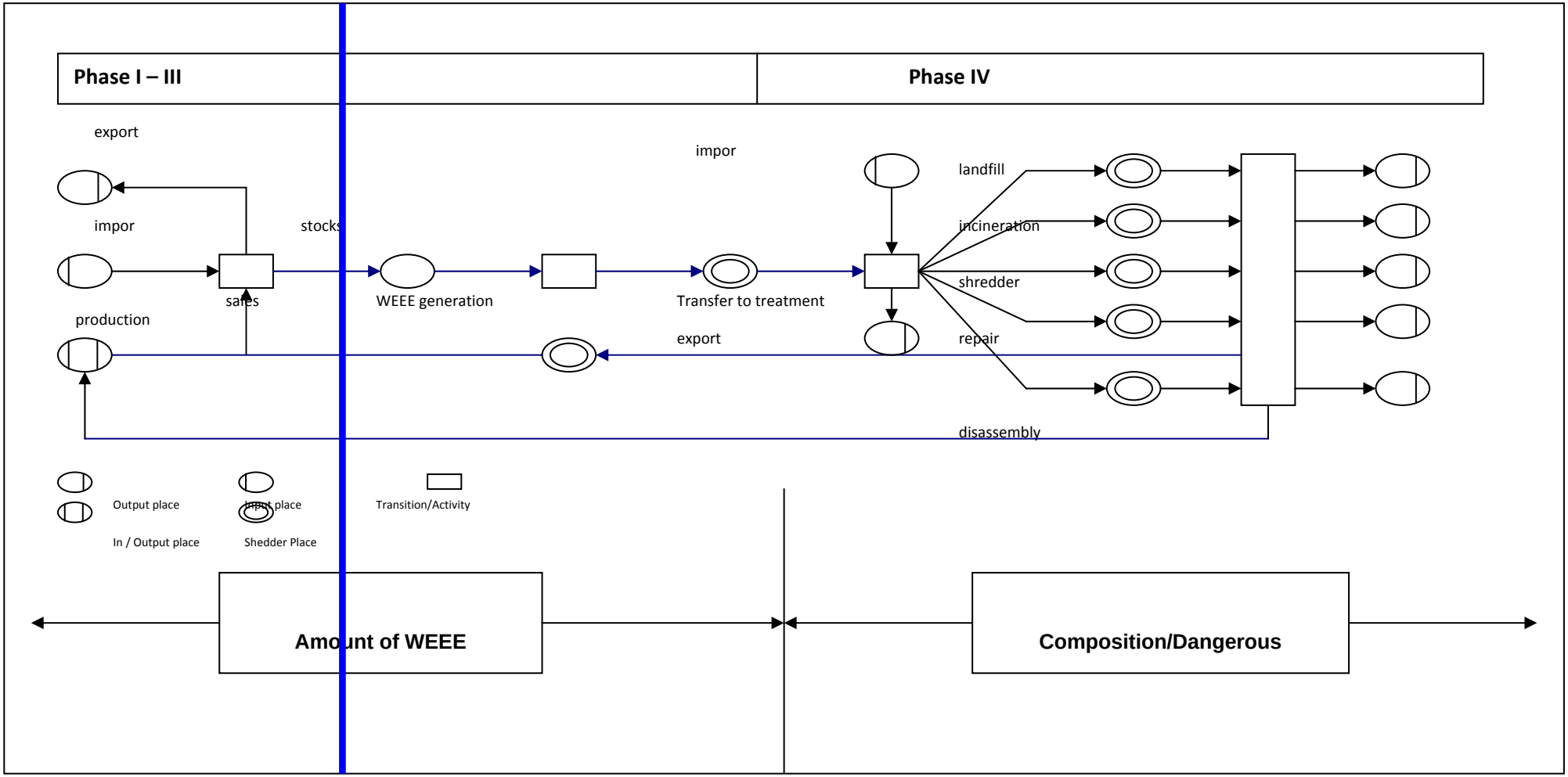


Figure 3.3: The 'Four-Phase-Model'

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.

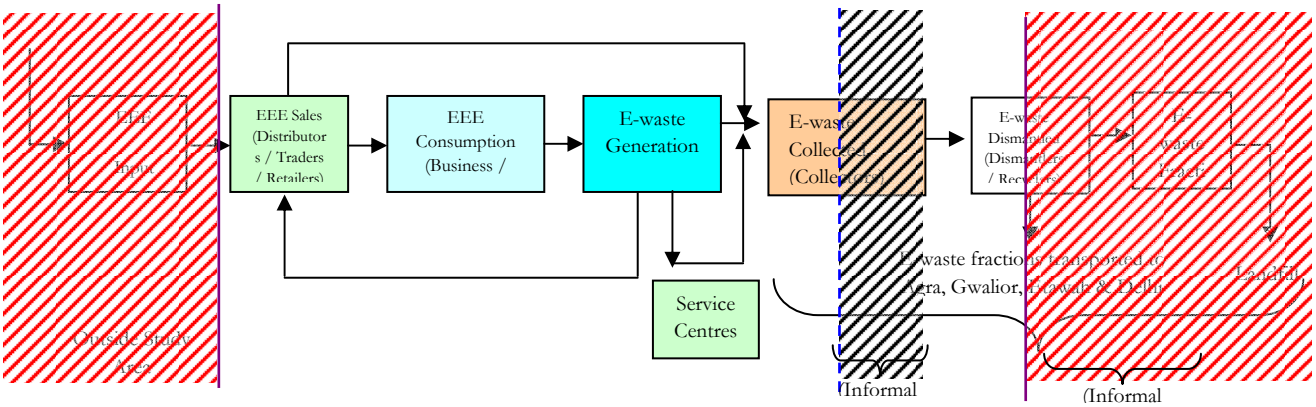


Figure 3.4: Tentative E-waste trade value chain in Study Area

Producers

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.

Consumers

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**.

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
LG	√		√	√	
Panasonic	√		√		
Samsung	√			√	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	√	√			Exchange your electronic item to your nearest dealer or where you buy the product
Electrolux	√	√			Exchange your electronic item to your nearest dealer or where you buy the product
Godrej	√	√			
Hitachi	√				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	√	√			E-waste Regarding no information Contact to nearest dealer
Philips	√			√	Call on customer care door to door collection of E-waste / discarded items of Philips
Whirlpool	√	√			To dealer he exchange your

Brands	Collection through Call Centre	Collection through Dealers / Retailer	Collection through Service Centre	Collection through Collection Centre / establishment	Remarks
					electronic item
Printers					
HP	√	√			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.

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.

Market Features

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**.

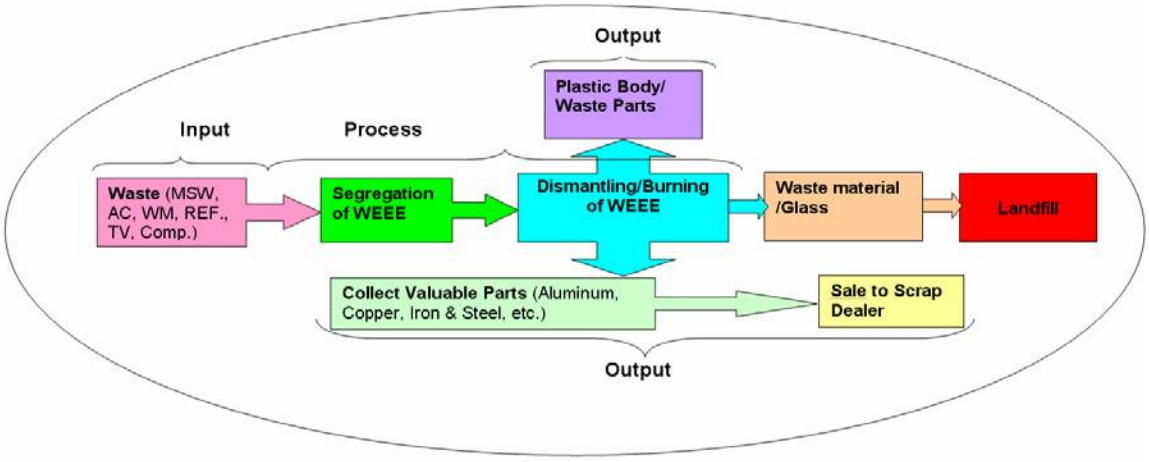


Figure 3.5: Processes observed at dumpsite

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**.

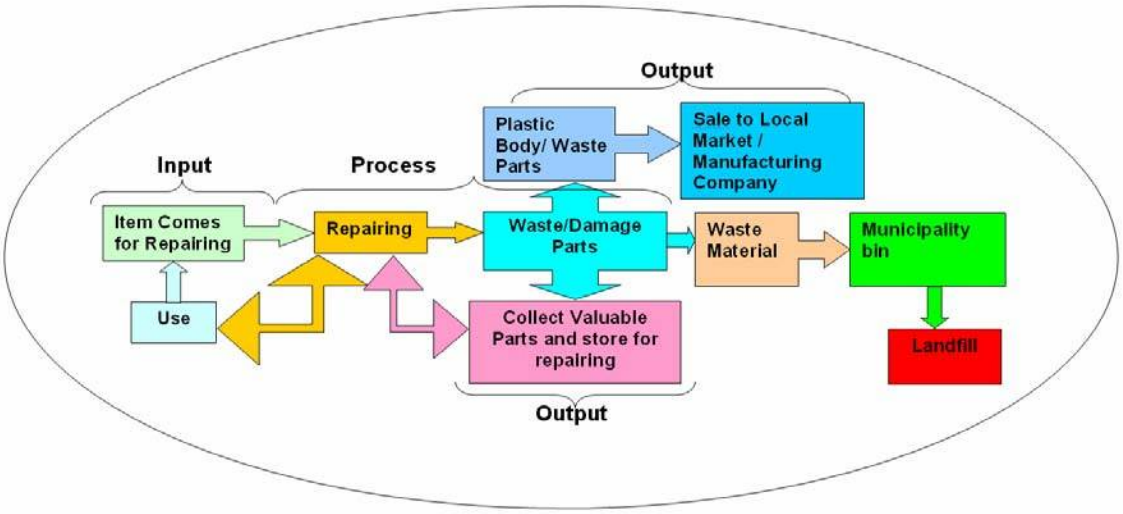


Figure 3.6: Processes observed at scrap dealers / junkyards

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**.

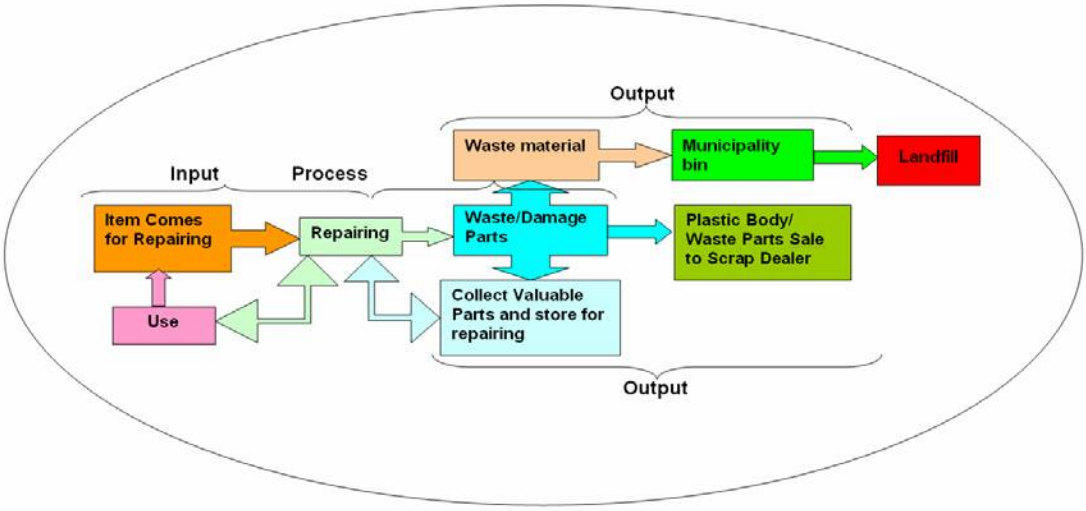


Figure 3.7: Processes observed at AC, Washing Machine, and Refrigerator Repair Shop

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**

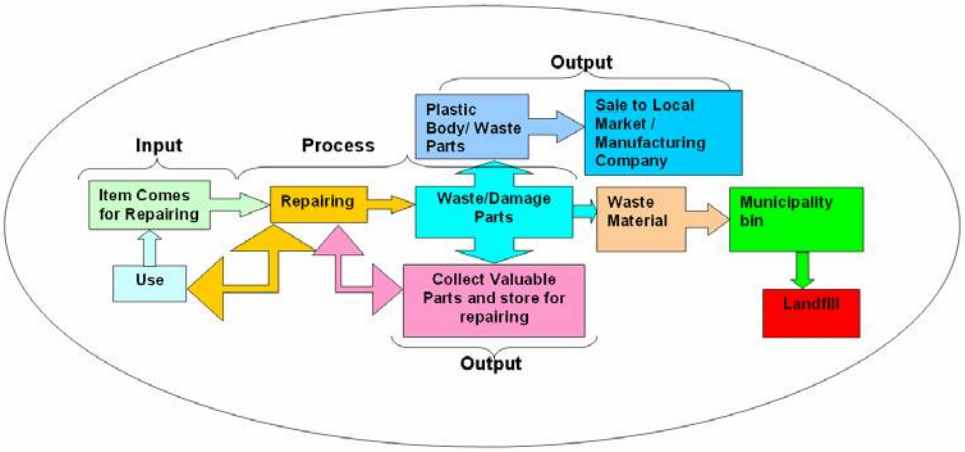


Figure 3.8: Processes observed at TV, Computer, and Mobile Phone Repair Shop

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**.

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

Sr. No.	Process name	Process Status				
		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

Sr. No.	Process name	Process Status				
		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.

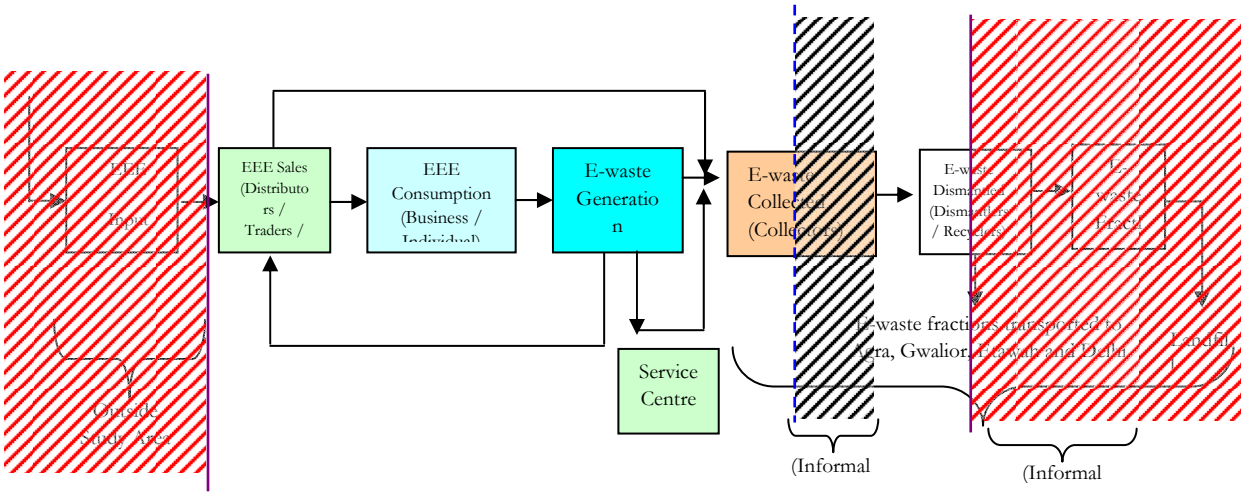


Figure 4.1: E-waste material flow chain in Study Area

Major observations related to data availability are given below.

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 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)
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)		

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.

Table 4.2: Data Matrix Vs Methodology

Methodology/ Data Requirement	Saturation Level		Number of Household	Calculated Sales			Stock Data		Average Lifetime	Storage data	Reuse	Recycle / dismantling	Land fill
	Household	Industry		Export Data	Import Data	Manufacturing / Production	Private	Industry					
Time Step Method	X		√	X	X	√	X	X					

Methodology/ Data Requirement	Saturation Level		Number of Household	Calculated Sales			Stock Data		Average Lifetime	Storage data	Reuse	Recycle / dismantling	Land fill
	Household	Industry		Export Data	Import Data	Manufacturing / Production	Private	Industry					
Market Supply Method				X	X	√			√				
Carnegie Mellon Method				X	X	√			√	√	√	√	√
Approximation 1	X	X	√			√	X	X	√				
Approximation 2				X	X	√							

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.

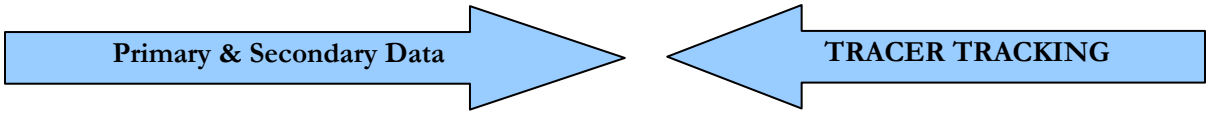


Figure 4.2: WEEE/E-waste data collection approach along the material flow chain in Durg Division

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 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**.

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

Year	Kabeerdham	Rajnandgaon	Durg	Balod	Bemtara
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

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 Area (in numbers)

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

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

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

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

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

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 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 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**.

Table 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

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 Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

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

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

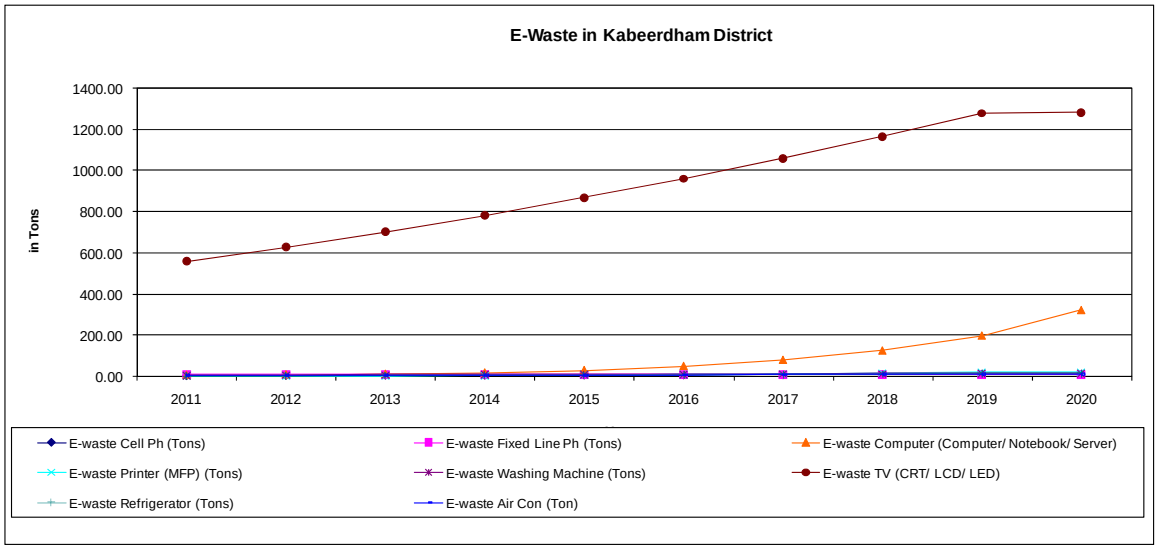


Figure 5.1: Item wise E-waste Projection of Kabeerdham District

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

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

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

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

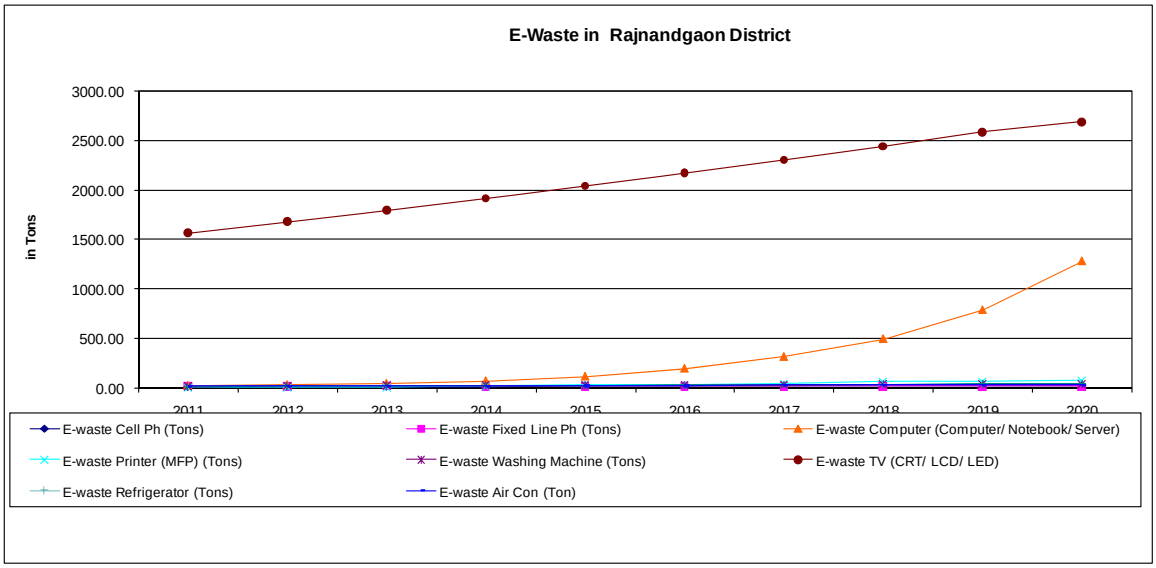


Figure 5.2: Item wise E-waste Projection of Rajnandgaon District

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

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

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

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

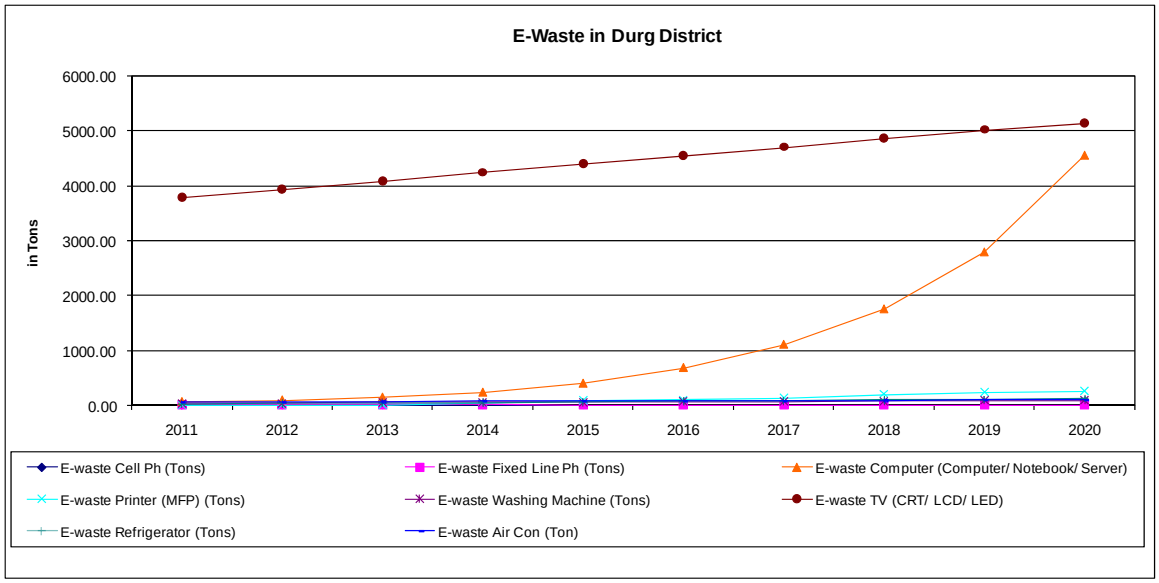


Figure 5.3: Item wise E-waste Projection of Durg District

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

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

2019	54128	7233	14450	3693	171	41496	340	192
2020	56640	6893	23553	4136	186	43198	383	207

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

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

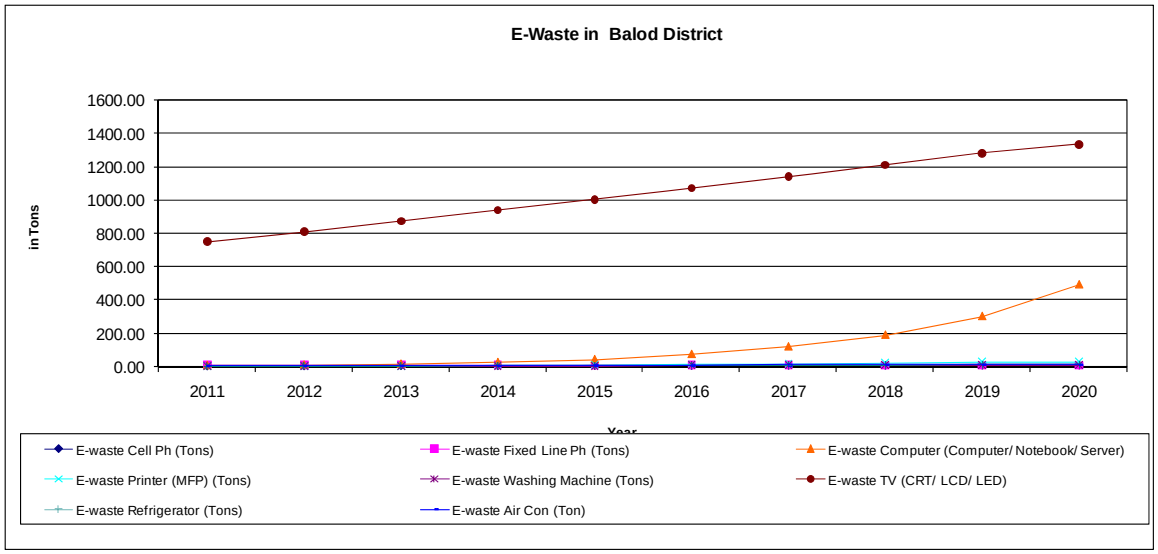


Figure 5.3: Item wise E-waste Projection of Balod District

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

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

2019	62750	7763	13315	3403	232	41670	366	148
2020	68365	7684	21703	3811	267	44981	440	176

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

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

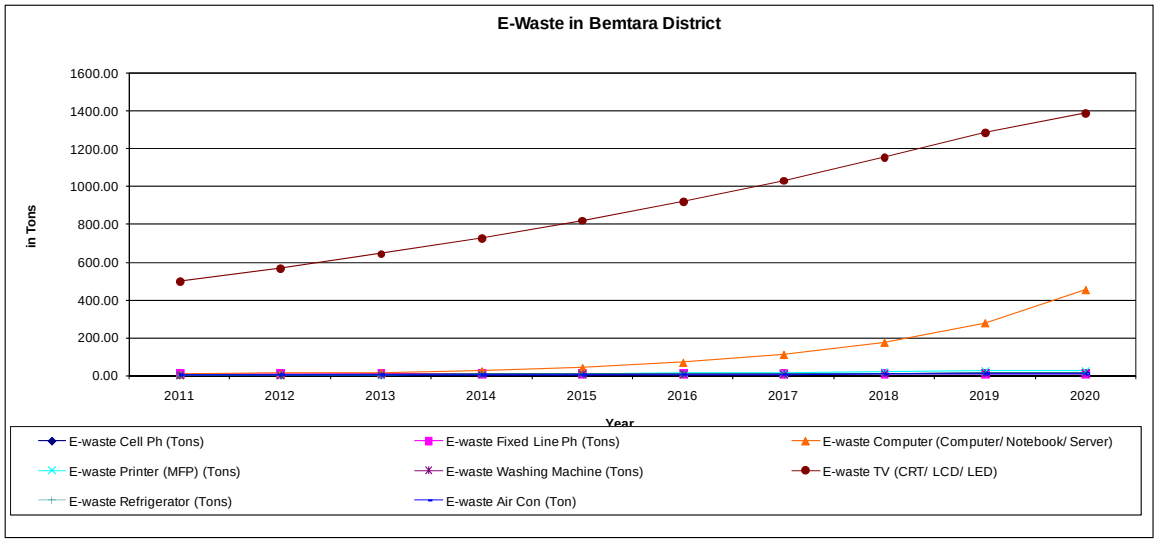


Figure 5.3: Item wise E-waste Projection of Bemtara District

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

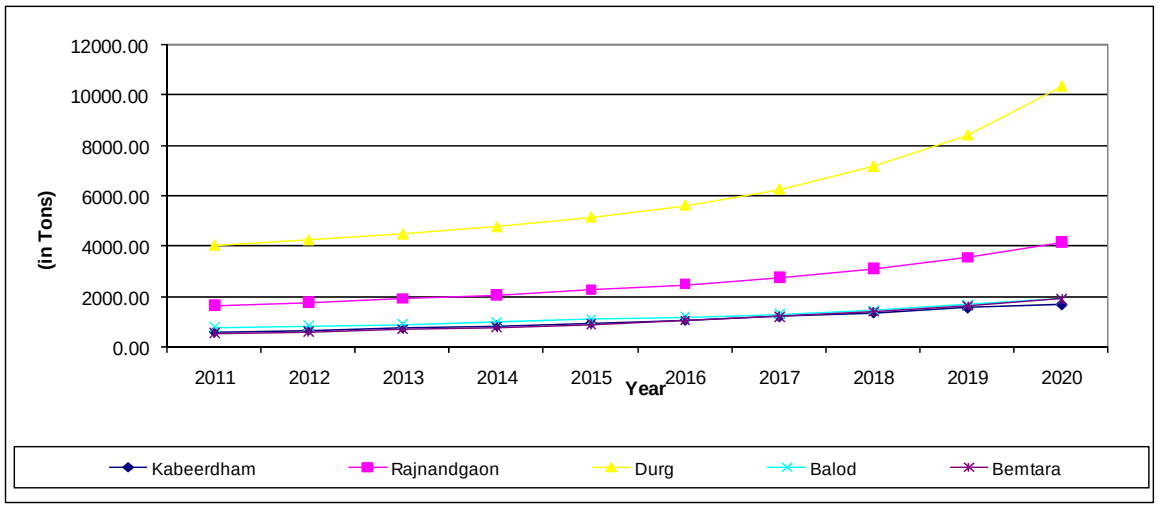


Figure 5.6: District wise Total E-waste Inventory Projection

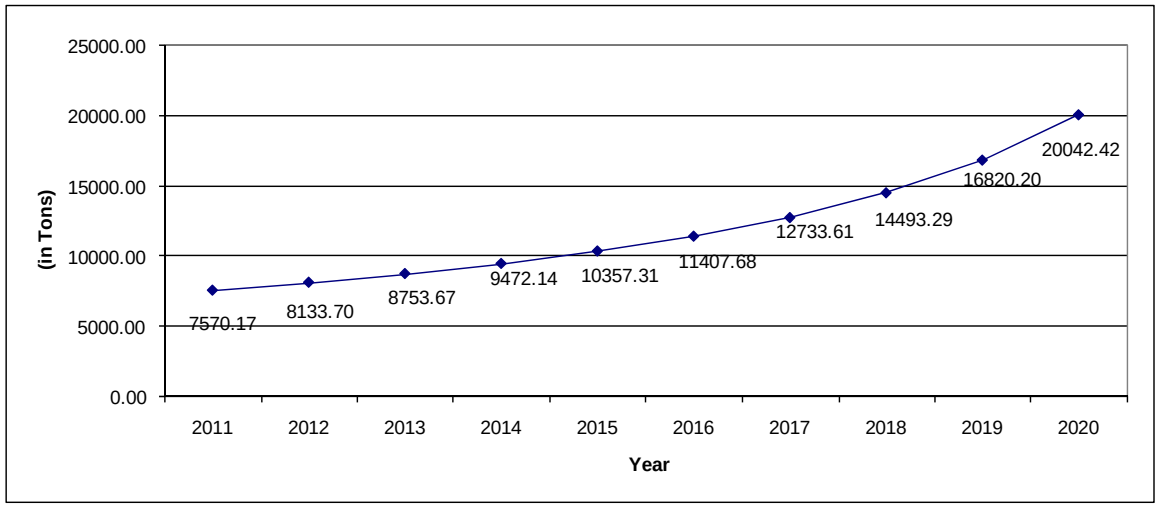


Figure 5.7: Total E-waste Inventory Projection in Durg Division from 2011 to 2020

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.
2. 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) (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**.

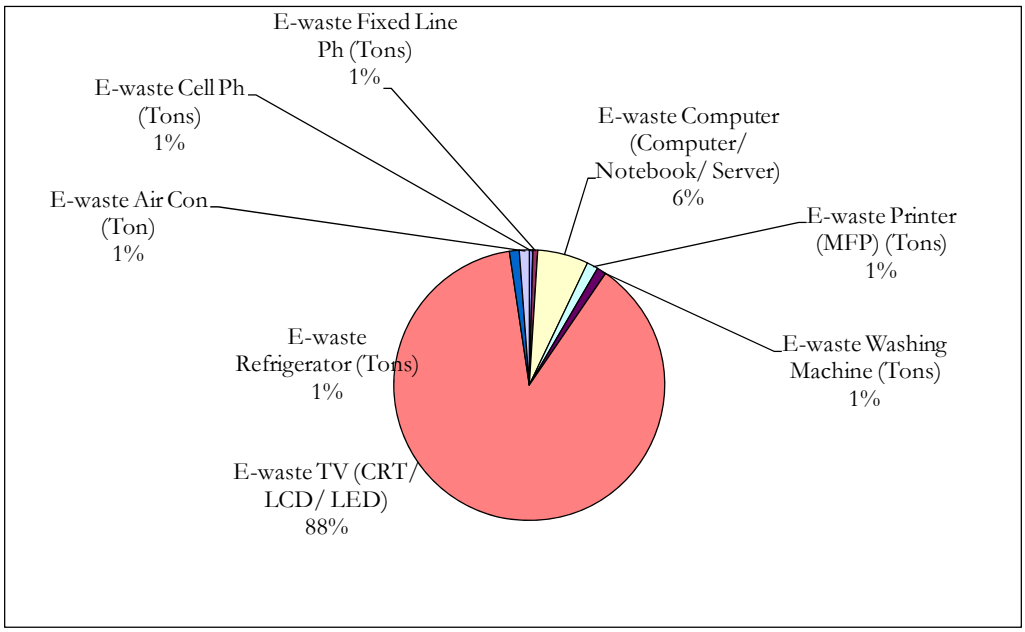


Figure 5.8: Item-wise E-waste in Percent for Durg Division in 2015

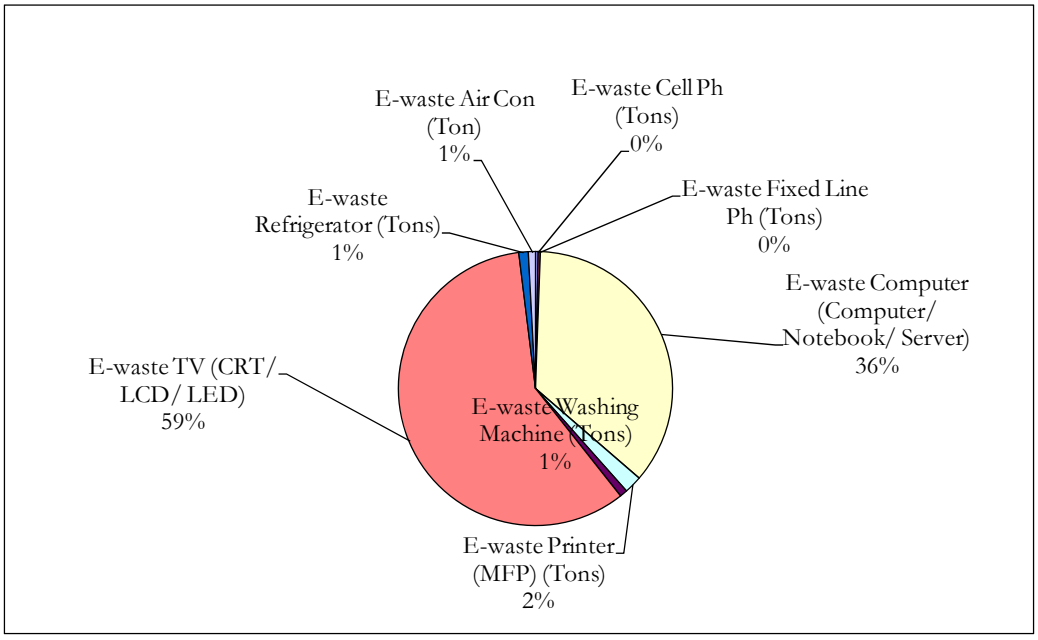


Figure 5.9: Item-wise E-waste in Percent for Durg Division in 2020

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 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.

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

Sr. No.	Process name	Process Status				
		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

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 economics of Durg Division E-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

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 Risk Matrix

Risks/ intensities		High	Medium	Low
Risks of availability of raw material	Short term		√	
	Long term		√	
Risk associated with collection	Short term	√		
	Long term		√	
Risk associated with transportation	Short term			√
	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 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,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Bandra (East) Mumbai 400 098 Ph. No. +91+22-2650-0031
		Group Companies		**Allied JB Friction Private Limited** A-12, Site IV, Industrial Area, 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 – 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 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 Category	Brand	Address / Contact Details
				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) 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, 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. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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	LG Electronics India Pvt. Ltd, Plot No. 51, Udyog Vihar, Surajpur Kasna Road, Greater Noida: 201306 Uttar Pradesh
		Manufacturing Facilities	Markson	**SGV Industries** Plot No.41 & 42, Sector-6A, Sidcul Indl Area, Haridwar (Uttrakhand) Pin Code - 249401 Ph. 01334-239662/63/64

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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, Baddi, Tehsil Nalagarh, Dist. Solan,(H.P.). Pin Code - 173205 Ph.01795- 244703 Fax - 01795- 244703 Contact - Mr. Alok Kumar (Facility Incharge) Mob. 9212669513
		Head Office		PLOT No. 378, F.I.E, PATPARGANJ, DEHLI - 110092 Ph. No. +91-11-43086501-502, 22157662-63
		Corporate & Head Office	Moser Baer	43B, Okhla Industrial Estate, New Delhi - 110020. India. Tel +91 11 40594444, 91 11 26911570 - 74 Fax +91 11 41635211, 26911860
		Branch Offices		**Chennai** Moser Baer India Ltd. 81, IInd Floor 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
		Representative & Distributor		**USA Distributor** **Media Masters LLC** #440, 2601 S. Minnesota Ave., Ste 105 Sioux Falls, SD 57105-4750 USA Phone: +1-(888)-243-4465 Fax: +1-(877) 835-2834 E-mail: sales@mediamastersdisc .com
		Manufacturing Facilities		**BOM & M& ES** 66, Udyog Vihar, 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
		Corporate Address	Onida	MIRC Electronics Ltd. Onida House, G-1, M.I.D.C, Mahakali Caves Road, Andheri (E), Mumbai - 400 093. 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	**Samsung India Electronics** 6th, 7th & 8th Floors, Ifci Tower, 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	**Philips Electronics India Limited** 9th Floor, DLF 9-B, 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, 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 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
				2nd Floor, Hameedia Centre, 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 Category	Brand	Address / Contact Details
				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	**TCL India Holding Pvt. Ltd.** Sco 254, 2nd Floor, Sector 44 C 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
			T-Series	**Laxbro Manufacturing Company** W-53, MIDC Area, Bhosari Indl. Estate, PMC – 411026, Maharashtra
			Toshiba	**TOSHIBA INDIA PVT. LTD.** 3rd Floor, Building No. 10 Tower - B, Phase - II 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, 100 Feet Road Indiranagar, Bangalore - 560038,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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	**Videocon Industries Ltd.** 14 Kms Stone, Aurangabad-Paithan 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
			Weston	**Westway Electronics Limited** B-102, Phase – II, Noida – 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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
			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
			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	Next Retail India Limited, 3rd Floor, Aadeshwar Arcade Above Loop Gallary, 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. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				'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
			Gem	**Gem Equipments Pvt. Ltd.** S.F. No. 103, Avanashi Road, Arasur

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 Fax: +91 33 30489230
				Bangalore Factory: IFB Industries Limited

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				16/17, Visveswaraiah 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
			Samsung	Given Above
			Toshiba	Given Above
			Videocon	Given Above
			Whirlpool	Given Above
	Air Conditioner	Window	Blue star	**Corporate Headquarters** Kasturi Buildings, Mohan T Advani Chowk, Jamshedji Tata Road, 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 **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. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 Himachal Pradesh 173030 **Tel :** (91) (01702) 238760 **Fax :** (91) (01702) 238461

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 / 2573670 / 2570024 **Fax:** (91) (674) 2570544
				Chandigarh Adarsh Mall, 4th Floor, Plot No. 50, Industrial & Business Park, Phase - II,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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
				Lucknow 177/4,Faizabad Road Lucknow 226 007

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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, Jivan Vihar Colony, G E Road, Raipur, Chattisgarh - 492 006

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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
			Carrier	**INDIAN HEADQUARTERS :** **Carrier Airconditioning & Refrigeration Limited** Delhi - Jalpur Highway, Narsingpur, Gurgaon, 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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 & 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 7028 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 &

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 Fax:- 0361 - 220 3508
				Carrier Airconditioning & Refrigeration Ltd 204, Adarshila Complex

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 Pondicherry – 605 001 Tel:- 0413 - 222 5853, 2226 676 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
			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
				ETA General Pvt. Ltd. 101-102, 1st Floor, Grotto Heritage, Opp.Orlem Church, Marve Road,

Sr. No.	Product Name	Product 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 : 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 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 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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
	Corporate Headquarters		Voltas	**Voltas Limited** Voltas House 'A' Block Dr. Babasaheb Ambedkar Road Chinchpokli Mumbai 400 033 Tel: 022-66656 666
	Factories			2nd, Pokhran Road, 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
			Mitsubishi	**Gurgaon Head Office** 2nd Floor, Tower A & B, DLF Cyber Greens, Dlf Cyber City, DLF Phase -III,Gurgaon-122002, India Phone: +91 (124) 463-0300 +91 (124) 673-9300 Fax: +91 (124) 463-0399 / 398
				Delhi Registered Office

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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: +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
				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: +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. No.	Product Name	Product Sub Category	Brand	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
			Siemens	Registered & Corporate Office 130, Pandurang Budhkar Marg, Worli, Maharashtra, Mumbai 400 018. Tel: +91 22 3967 7000 Fax: +91 22 3967 7500
	Mobile Phones		Acer	Acer India Private Limited 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
				Distributors Encon Impex Private Limited, Super Distributor Encon Impex Private Limited, No.45, 2nd Floor, Vinayaka

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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	**Amazon Development Center India Pvt Ltd** Q-city, 2nd Floor-Block A & Block B Survey Number-109,110,111/2, 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
				#40,3rd Floor, SP Infocity M G R Salai, Perungudi Kandanchavady Chennai-600096 Ph: 044 30883088
				2nd Floor, Safina Towers

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 Tel: (519) 888-7465 Fax: (519) 888-7884
				BlackBerry United States BlackBerry 5000 Riverside Drive, Irving, TX 75039 Tel: (972) 373-1700 Fax: (972) 650-2006

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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	**BLU Products** 10814 NW 33rd St# 100 Doral, FL 33172 (305) 715 – 7171
			Bosch	Bosch Sicherheitssysteme GmbH Robert-Bosch-Ring 5 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 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 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
				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
			Dell	Dell Computer Corporation One Dell Way 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
			HP	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. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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
				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, 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, Magarpatta City, Hadapsar Pune - 411 028
			HTC	1800 266 3566
			Huawei	**Huawei Telecommunication (INDIA) Co. Pvt Ltd.** 7th Floor, Tower A, Spaze I-Tech Park, Sohna Road, 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	Karbonn Mobiles #39/13, off 7th main, HAL 2nd stage Appareddy Palya, Indiranagar, Bangalore – 560038 Tel: 080 40894888
				Karbonn Mobiles D-170, Okhla Industrial Area, Phase-1 New Delhi – 110020 011 46604660
			Kyocera	**KYOCERA Corporation Cutting Tool Group** 6 Takeda, Tobadono-cho, Fushimi-ku, Kyoto 612-8501, Japan Phone: +81-75-604-3473 Fax: +81-75-604-3472
				KYOCERA Asia Pacific India 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 Pvt.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, 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 Plaza, 610 Nathan Road, Mongkok, Kowloon, Hong Kong Tel: (852) 2388 8022

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
			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

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

Sl. No.	Name	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
Durg								
1	**Coman India Electronic**	Ward No.-5, 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
11	**Rajesh Electronic**	Sabji Market, Nawagarh, Bemetara-491337	21	54	23.1	81	36	27.9
12	**Sir Sai Electronic**	Ward No.-11, Pathan Para, Than Khamarie, Bemetara - 491338	21	47	45.1	81	20	2.1
13	**Sandeep Furniture**	Purani Sabji Mandi, Ward No.-4, Than Khamarie, Bemetara - 491338	21	47	59.8	81	20	5.4

Sl. No.	Name	Address	Latitude			Longitude		
			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 No.-10, 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 No.-9, Pandariya, Kawardha	22	13	11.0	81	24	28.2
24	**Narkar Enterprices**	Ward No.-9, Pandariya, Kawardha	22	13	9.5	81	24	28.8
25	**Himesh Electronics**	Sahaspur, Ward No.-11, 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						
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

Sl. No.	Name	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
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
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

Sl. No.	Name	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
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 No.-4, 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								
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 No.-4. 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 No.-15, 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 No.-9, Kawardha	22	0	32.6	81	13	40.7

Sl. No.	Name	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
15	**Tahsil Office**	Ward No.-8, 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.\ No.-5, 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 No.-7, 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 No.-8, 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 No.-12, 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	Latitude			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 No.-8, 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	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
Durg								
1	**Coman India Electronic**	Ward No.-5, 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 No.-27, 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 No.-10, 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 No.-11, Pathan Para, Than Khamarie, Bemetara - 491338	21	41	45.1	81	20	2.1
11	**Nand Shakti TV Center**	Ward No.-8, 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 No.-9, Kondhi House,	22	9	49.4	81	12	55.2

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			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 No.-10, 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 No.-1, 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 No.-8, 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

Inventory of Physically 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**

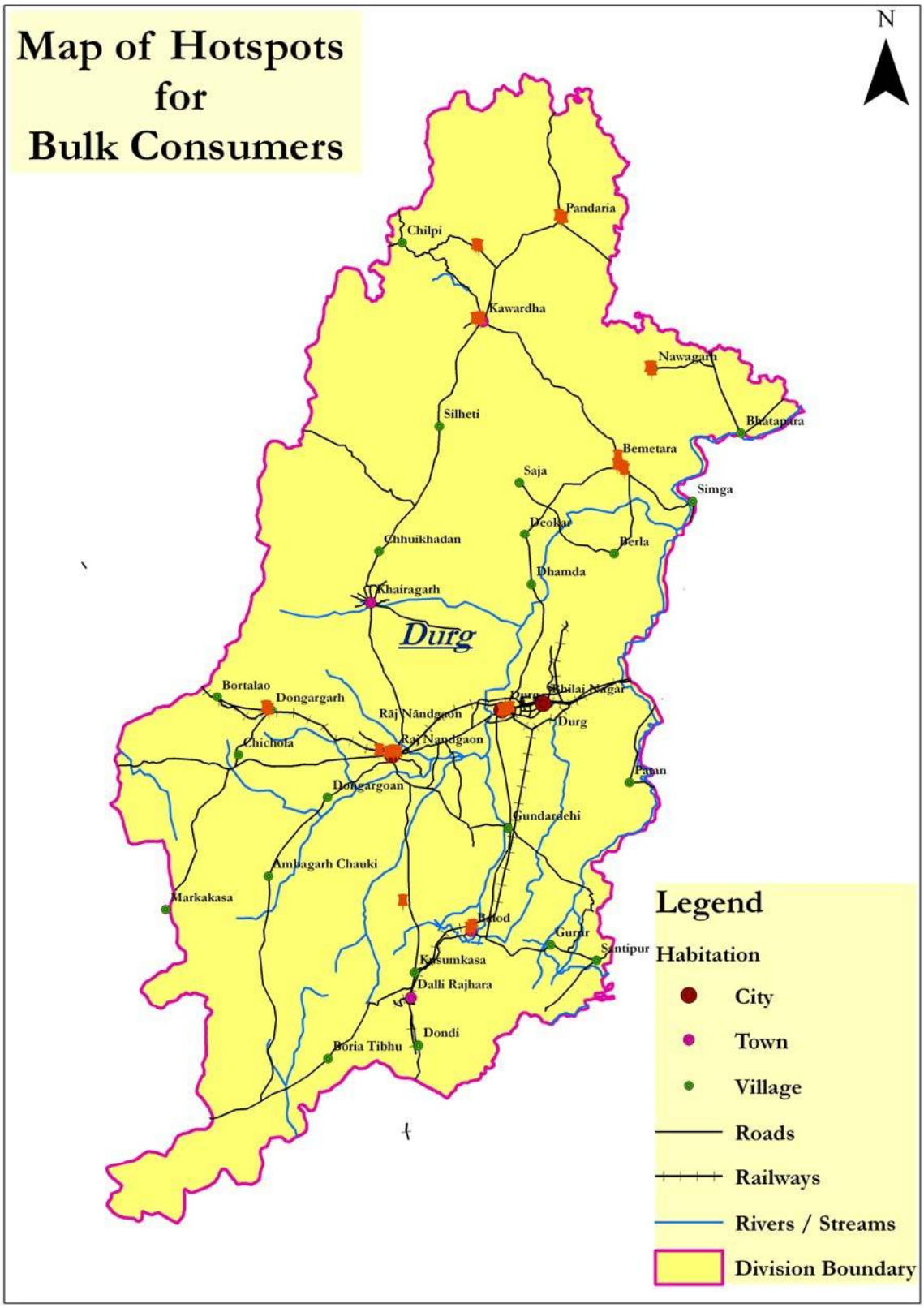
Partial inventory of Scrap Vendors/ Dismantler Annexure -6

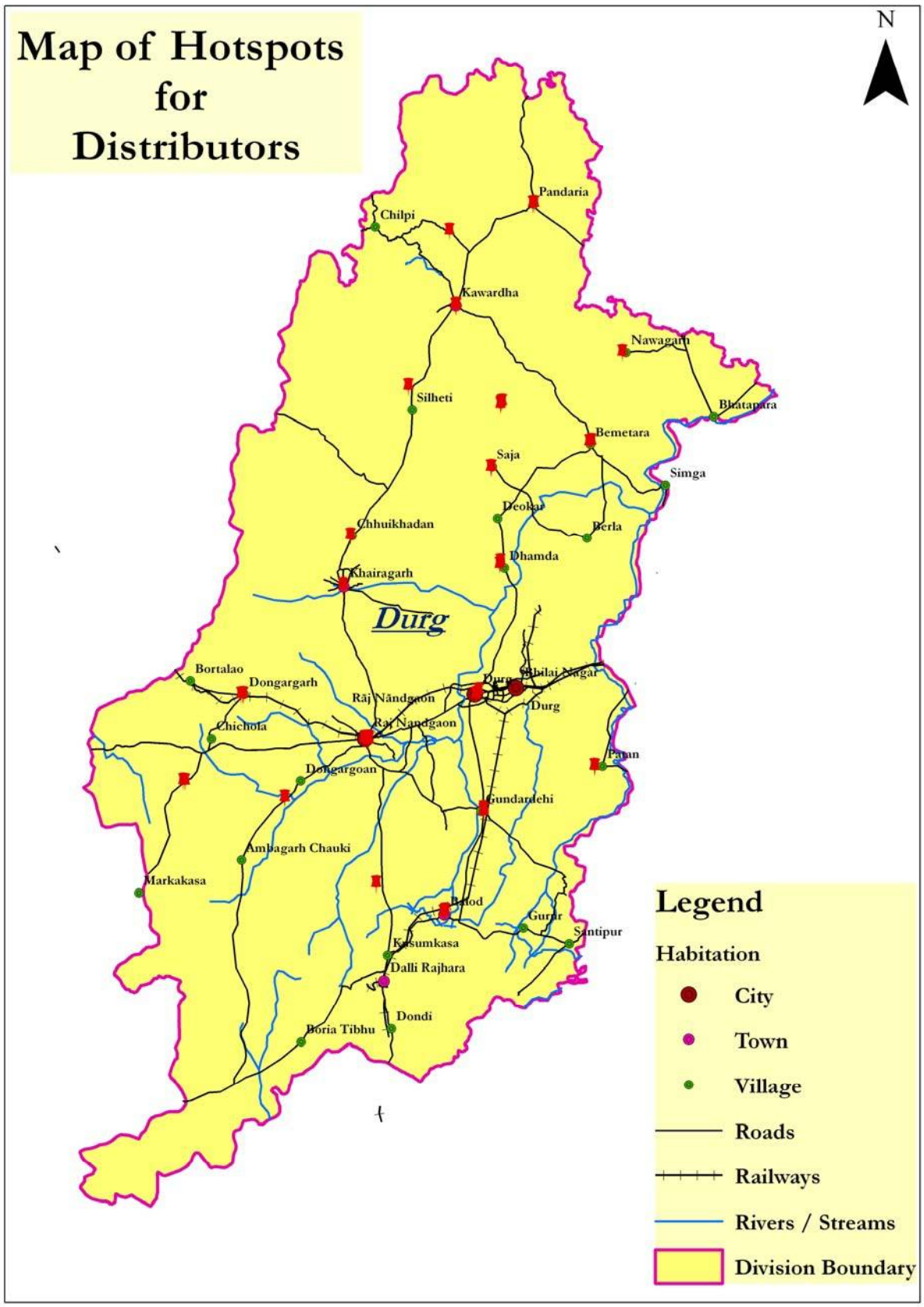
Sl. No.	Name	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
Durg								
1	**Pathan**	Motin Pur Road, Dhamdha, Durg - 491331	21	27	52.1	81	20	1.5
2	**Mr. Rafiq Menan**	Muslim Para, Ward No. - 2, Dhamdha, Durg - 491331	21	27	46.4	81	19	52.0
3	**Ramu Dhankar**	Satwani Mohalla, Pandar, Durg - 491111	21	2	45.1	81	31	14.1
4	**Neeraj Tiwari**	Ward No.-9, 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 No.-8, 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 No.-25, 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. No.-8, 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 No.-2, Bemetara - 491335	21	43	12.3	81	32	10.5
13	**Mohd. Salim**	Ward No.-17, Bajar Para, Bemetara -491335	21	42	54.9	81	31	47.9
14	**Vijay Sharma**	Naya Para, Ward No.-16, Bemetara -491335	21	42	32.7	81	31	50.7
15	**Arjun Nimalkar**	Ward No.-11, Shankar Nagar Nawagarh, Bemetara -491337	21	54	14.6	81	36	47.3
16	**Santosh Agarwal**	Ward No.-13,Rayan Bhata, Than Khamarie, Bemetara -	21	41	31.6	81	20	13.3

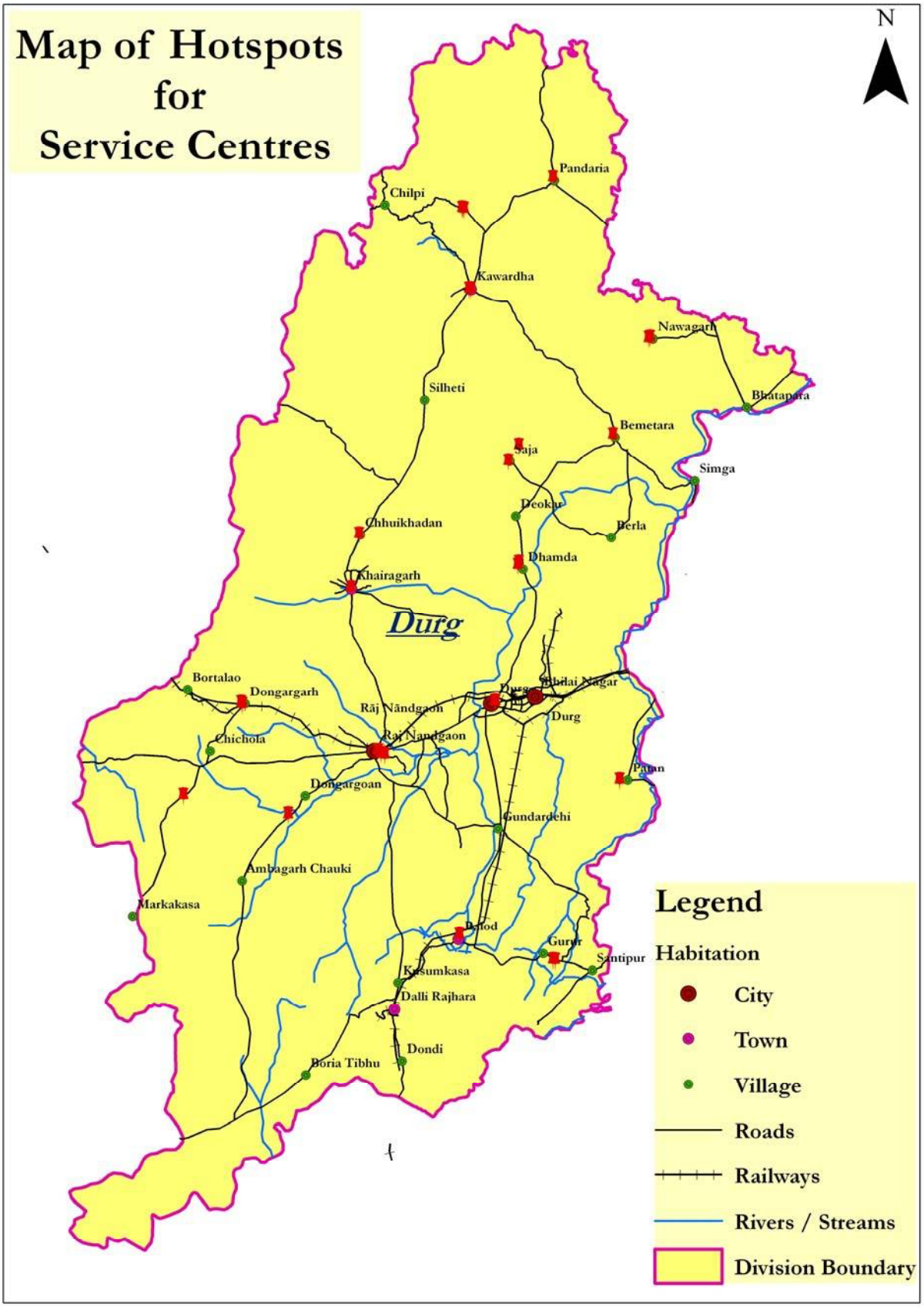
Sl. No.	Name	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
		491338						
17	**Mansur Ahmad Khan**	Naurani Chock, Than Khamarie, Bemetara - 491338	21	47	48.1	81	20	3.2
18	**Sitaram Netam**	Ward No.-2, Bharat Pur, Saja, Bemetara - 491993	21	40	3.0	81	19	8.6
		Kawardha - Kabirdham						
19	**Babbu Khan**	Jama Masjid, Wardn NO.-18, Kawardha	22	0	21.2	81	14	1.9
20	**Rakesh Kr. Gupta**	Ward No.-6, 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 No.-9, 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 No.-10, 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 No.-17, Khairagarh, Rajanndgaon	21	25	4.2	80	58	38.4

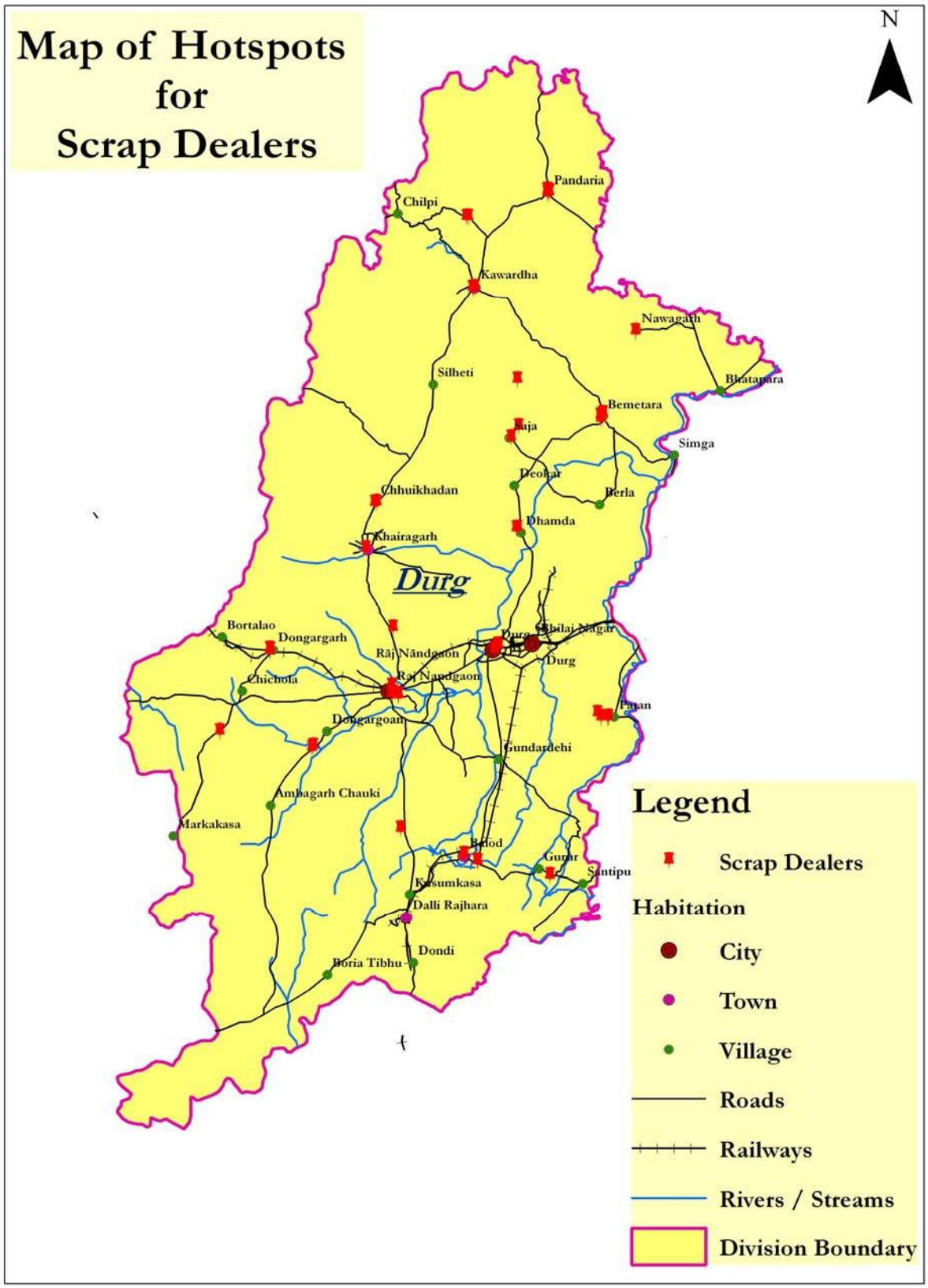
Sl. No.	Name	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
32	**Mohd. Jakaria**	Nikesh Yadav Ward, khairagarh, Rajnanndgaon	21	24	52.6	80	38	39.9
33	**Hira Lal Sahu**	Rani Durgavati Chock, Chhuriya, Rajnanndgaon	21	0	23.6	80	38	4.0
34	**Sagar Mahile**	Fuhara Chock, Dongargaon, Rajnanndgaon	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 No.-17, 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 No.-11, 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


Map of Hotspots for Bulk Consumers
N
Pandaria
Chilpi
Kawardha
Nawagarh
Silheti
Bhatapara
Bemetara
Saja
Simga
Deokar
Berla
Chhuikhadan
Dhamda
Khairagarh
Durg
Bortalao
Dongargarh
Rāj Nāndgaon
Durg
Bhilai Nagar
Durg
Chichola
Raj Nandgaon
Patan
Dongargoan
Gundardehi
Amlagarh Chauki
Markakasa
Balod
Gurur
Santipur
Kusumkasa
Dalli Rajhara
Dondi
Boria Tibhu
Legend
Habitation
City
Town
Village
Roads
Railways
Rivers / Streams
Division Boundary


Map of Hotspots for Distributors
N
Pandaria
Chilpi
Kawardha
Nawagarh
Silheti
Bhatapara
Bemetara
Saja
Simga
Deokar
Berla
Chhuikhadan
Dhamda
Khairagarh
Durg
Bortalao
Dongargarh
Bhilai Nagar
Durg
Rāj Nāndgaon
Durg
Chichola
Raj Nandgaon
Patan
Dongargoan
Gundardehi
Amlagarh Chauki
Markakasa
Balod
Gurur
Santipur
Kusumkasa
Dalli Rajhara
Dondi
Boria Tibhu
Legend
Habitation
City
Town
Village
Roads
Railways
Rivers / Streams
Division Boundary


Map of Hotspots for Service Centres
N
Pandaria
Chilpi
Kawardha
Nawagarh
Silheti
Bhatapara
Bemetara
Saja
Simga
Deokar
Berla
Chhuikhadan
Dhamda
Khairagarh
Durg
Bortalao
Dongargarh
Bhilai Nagar
Rāj Nāndgaon
Durg
Chichola
Raj Nandgaon
Patan
Dongargoan
Gundardehi
Ambagarh Chauki
Markakasa
Gurur
Santipur
Kusumkasa
Dalli Rajhara
Dondi
Boria Tibhu
Legend
Habitation
City
Town
Village
Roads
Railways
Rivers / Streams
Division Boundary


Map of Hotspots for Scrap Dealers
N
Pandaria
Chilpi
Kawardha
Nawagarh
Silheti
Bhatapara
Bemetara
Raja
Simga
Deokar
Berla
Chhuikhadan
Dhamda
Khairagarh
Durg
Bortalao
Dongargarh
Bhilai Nagar
Durg
Rāj Nāndgaon
Durg
Chichola
Raj Nandgaon
Patan
Dongargoan
Gundardehi
Ambagarh Chauki
Markakasa
Bemod
Gurur
Santipu
Kusumkasa
Dalli Rajhara
Dondi
Boria Tibhu
Legend
Scrap Dealers
Habitation
City
Town
Village
Roads
Railways
Rivers / Streams
Division Boundary

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) $= [\text{Stock}(t_1) - \text{Stock}(t)]_{\text{private}} + [\text{Stock}(t_1) - \text{Stock}(t)]_{\text{industry}} + \bullet \text{Sales}(n) - \bullet \text{WEEE}(n)$ $\quad n=t1+1 \text{ to } t-1 \quad n=t1+1 \text{ to } t \text{ with } t_1 < t$

$\text{Stock}_{\text{private}}$ = Number of households * (saturation level of households / 100)

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

$\text{Stock}_{\text{industry}}$ = 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

d_S - 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)

Features of the five inventory assessment methods

Methodology/Features	Requirements	Constraints	Advantages
The Time Step Method	1. Information about domestic sales. 2. Appliance stock levels for household. 3. Industrial stock levels.	1. Household saturation levels are based on predetermined stock levels 2. Industrial stock levels are assumed in the calculations because they are difficult to obtain and require assumptions. 3. Assumption that all the WEEE/E-waste generated is collected and transferred to treatment and disposal facility.	1. Calculations can be carried out very easily. 2. Method gives good results in a saturated market.
The market Supply Method	1. Information about domestic sales. 2. Average life of new and second hand items.	1. 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. 2. WEEE/ E-waste are often stored for years. 3. Assumed that all appliances produced in the same year will be in line for disposal after exactly the average life. 4. Assumption that the average variance in life of items of EEE does not change very much, whereas, in reality, lifetimes may	1. Necessary data need not be very wide-ranging 2. Calculations can be carried out very easily using a simple formula 3. 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.

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.	1. 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. 2. This model also requires a full coverage of sales data as early as possible in the WEEE/E-waste trade value chain.	1. The model allows for an electrical and electronic equipment to be purchased, reused, stored and finally recycled or landfilled representing "material flow" more precisely. 2. 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.	1. A product's constant mean lifespan is assumed in this method. 2. 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.	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 appliances plays a significant role in consumer behaviour.	1. This method is suitable for carrying 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.

Data Requirements for E-waste Inventory Assessment

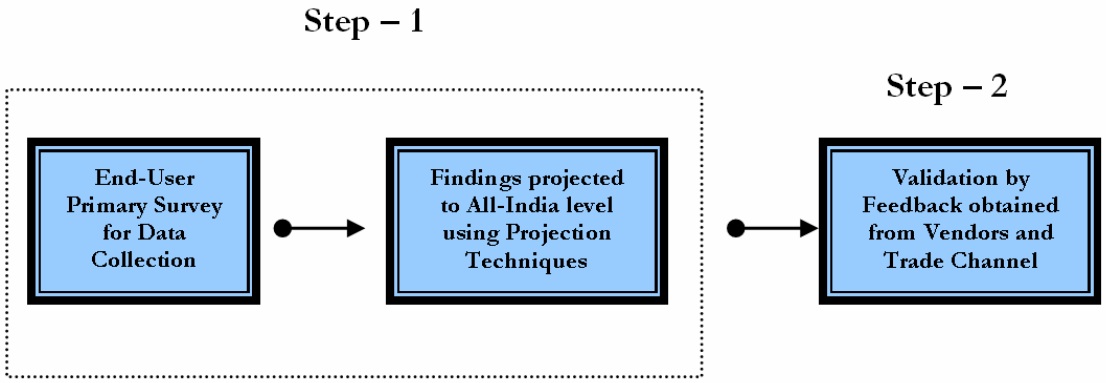
Methodology/ Data Requirement	Saturation Level		Number of Household	Calculated Sales			Stock Data		Average Lifetime	Storage data	Reuse	Recycle	Landfill
	Household	Industry		Export Data	Import Data	Manufacturing /Production	Private	Industry					
Time Step Method	√	√	√	√	√	√	√	√					
Market Supply Method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

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.

$$\sum_{i=1}^{n} \text{Last one year market size in employee band i} = \sum_{i=1}^{n} \left(\text{Acquisition rate in employee band i} \times \text{Universe of estab. in employee band i} \right)$$

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 1. Pure households 2. 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.

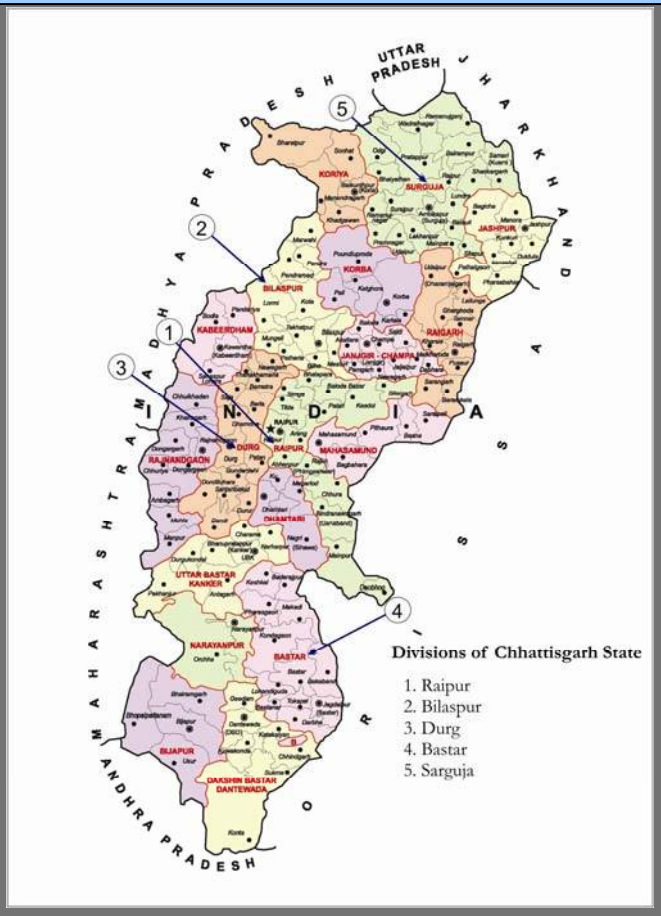
List of Sources of Data in the Study Area- Annexure 10

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	

2016

FINAL REPORT

E-Waste Inventorization of Raipur 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 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.

Producers: 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.

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.

Consumers: 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. 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.

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.

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. 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%), Air conditioner (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 E-waste 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 E-waste 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 E-waste 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, Bastar and Sarguja. The overall aim of this initiative is to assess the generators, quantity and present practices for handling of E-waste 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
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**.

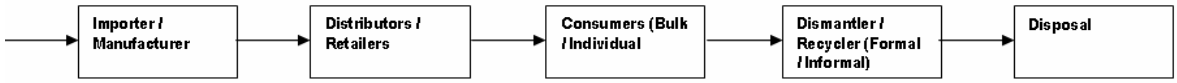


Figure 1.1: Conceptual WEEE business chain

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. 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.

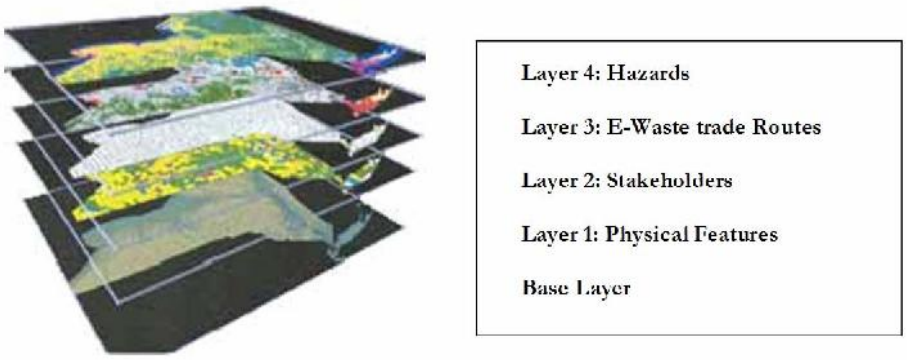


Figure 1.2: Geographical mapping of different attributes

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.

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**.

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, 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

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

Regulations / Guidelines	E-waste Management		Export & Import of E-waste	
	Pre 1st May 2012	Post 1st May 2012	Pre 1st May 2012	Post 1st May 2012
E-waste (Management & Handling) Rules 2011		√		
Hazardous Waste (Management, Handling & Transboundary) Rules 2008	√		√	√
Guidelines for Environmentally Sound Management of E-waste 2008	√	√		
Guidelines for Implementation of E-waste Regulations 2012	√	√		

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.

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
Collection	Manufacturing	√					
	End of Life	√					
Take-back	Individual	√					
	Collectively	√					
Transportation to	Producer		√	√			
	Collection Centre	√	√	√			
	Dismantlers/ Recyclers	√	√	√	√	√	
	TSDF* Facility	√				√	√
Storage					√	√	√
Financing		√					
Registration		√			√	√	
Filing of Annual Returns		√			√	√	√
Return of Annual Inventory Handled		√		√	√	√	√

Note: √ 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, poly-brominated 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 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.

<u>Scope of EPR for the Producer:</u>

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**.

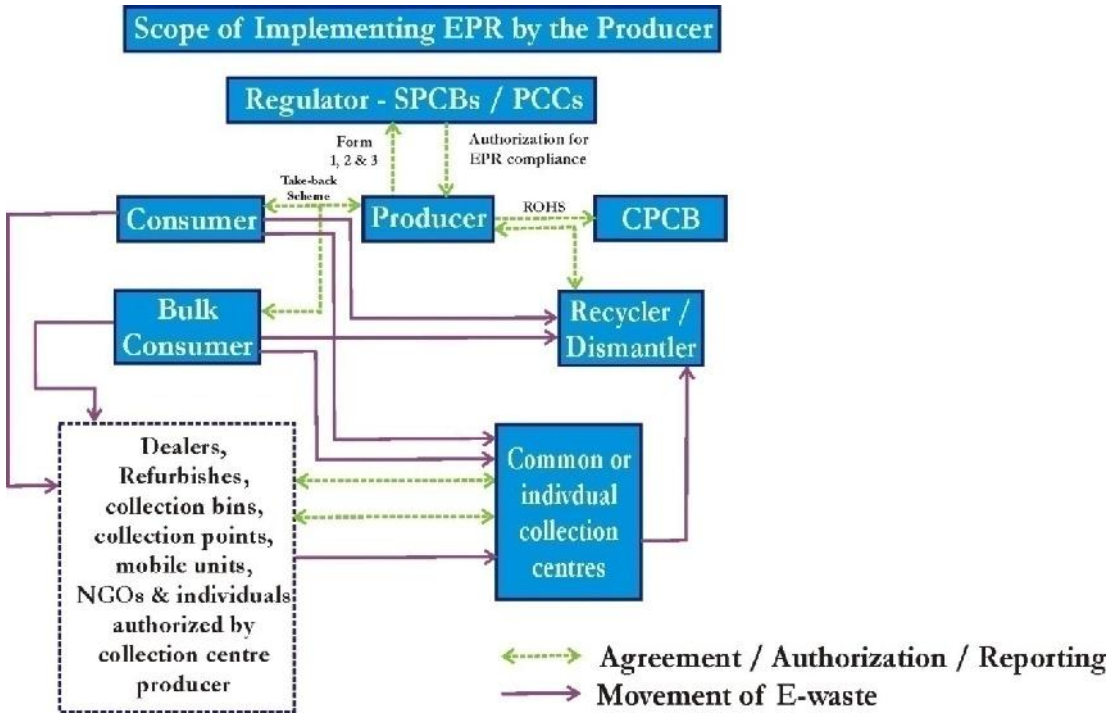


Figure 2.1: Scope of implementing EPR for Producers

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.

<u>The criteria for setting up collection centres are</u>

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.

    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**.

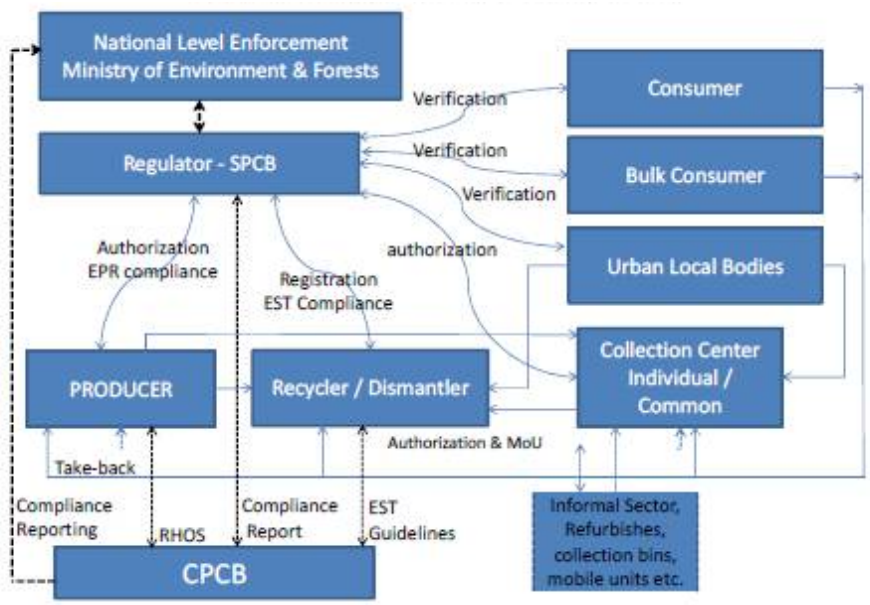


Figure 2.2: Implementation of E-Waste Rules 2011

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**.

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

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

Sr. No.	Authority/(ies)	Duties
		viii. Any other function delegated by the Ministry under these rules
3.	Urban Local Bodies (Municipal Committee/Council/Corporation)	(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**.

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
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 MoEF.
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	i. Grant licence for import of hazardous wastes ii. Refuse licence for hazardous wastes prohibited for imports and exports.

Sr. No.	Authority/(ies)	Duties and Corresponding Rule
5.	Port Authorities under Indian Port Act 1908 and Customs Authorities under the customs Act, 1962	i. Verify the documents ii. Inform the ministry of Environment and Forests, Govt. of India of any illegal traffic 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	X	X	X	X
2.	Bulk Consumer	√	√	X	X	X	X
3.	Urban Local Bodies	√	X	X	X	X	X
4.	Collection Centre	√	√	√	√	X	X
5.	Producer –offer to sell	√	√	√	√	X	√
6.	Producer - importer	√	√	√	√	X	√
7.	Producer - Manufacturing EEE	√	√	√	√	X	√
8.	Dismantler	√	√	√	√	√	X
9.	Recycler	√	√	√	√	√	X

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 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 Telecommunication Equipment**																				
1.	Centralized Data Processing	√	√	√	√	√		√	√	√	√		√					√	√		√
2.	Mainframes	√	√	√	√	√		√	√	√	√		√					√	√		√
3.	Mini Computers	√	√	√	√	√	√	√	√	√	√		√					√	√		√
4.	Personal Computing	√	√	√	√		√	√	√	√	√		√								
5.	Personal Computers (Central processing unit with input and output devices)	√	√	√	√		√	√	√	√	√	√	√						√		√
6.	Laptop Computers (Central processing unit with input and output devices)		√	√	√	√		√	√	√	√		√	√				√	√		√
7.	Notebook Computers	√	√	√	√	√		√	√	√	√		√	√				√	√		√
8.	Notepad Computers	√	√	√	√	√		√	√	√	√		√	√				√	√		√
9.	Printers including cartridges	√	√	√	√	√			√	√	√		√					√			√
10.	Copying Equipment	√	√	√	√	√		√	√	√	√		√					√			√
11.	User Terminals and Systems	√		√	√	√	√		√	√	√	√	√					√			√
12.	Facsimile	√	√	√	√				√	√	√		√					√			√
13.	Telephones	√		√	√				√	√	√		√								√
14.	Pay Telephones	√		√	√			√	√	√	√		√					√	√		√
15.	Cordless Telephones	√		√	√			√	√	√			√					√	√		√
16.	Cellular Telephones	√	√	√	√	√		√	√	√			√					√	√		√
17.	Answering Systems	√	√	√	√			√	√	√			√					√	√		√
II.	**Consumer Electrical and Electronics**																				
18.	Cathode Ray Tube (CRT) TV	√		√		√				√	√	√	√					√			√
19.	Liquid Crystal Display (LCD) TV	√		√		√				√	√		√	√				√			√
20.	Light Emitting Diode (LED) TV	√		√		√				√	√		√	√				√			√
21.	Refrigerator	√	√	√	√	√			√	√					√		√	√		√	√
22.	Washing Machine	√	√	√		√			√	√			√			√	√				√
23.	Air Conditioners excluding centralized air conditioning plants	√	√	√	√				√	√			√				√	√		√	√
24.	Compact Fluorescent Lamp CFL																				

√ 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**.

Table 3.2: Possible Hazardous Substances in E-waste Components

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

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.

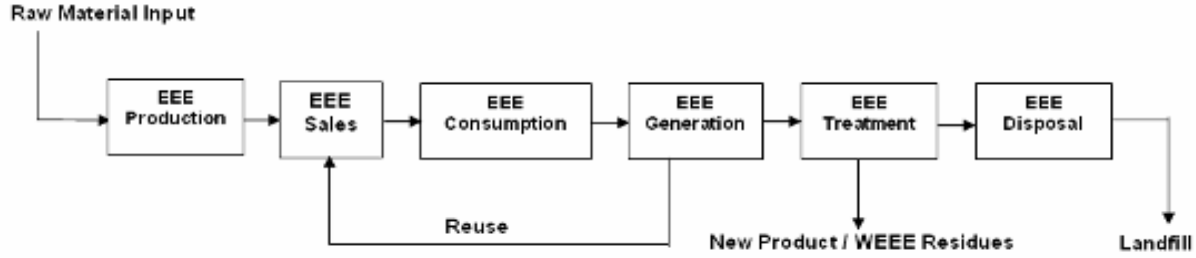


Figure 3.1: Conceptual E-waste trade value chain

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.

Table 3.3: Phases of material flow model

S.No.	Phase	Stakeholders
1.	Phase I: 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.	Phase II: 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.	Phase III: 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.	Phase IV: 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.

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.

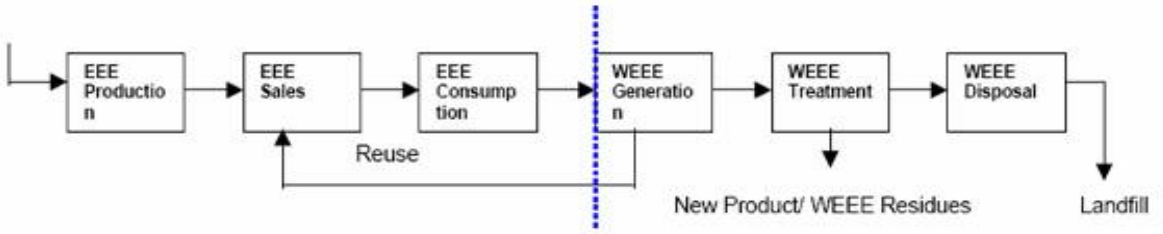


Figure 3.2: Generic E-waste trade value chain in a developing country

Source: UNEP Manual Vol. II; Inventory Assessment Manual

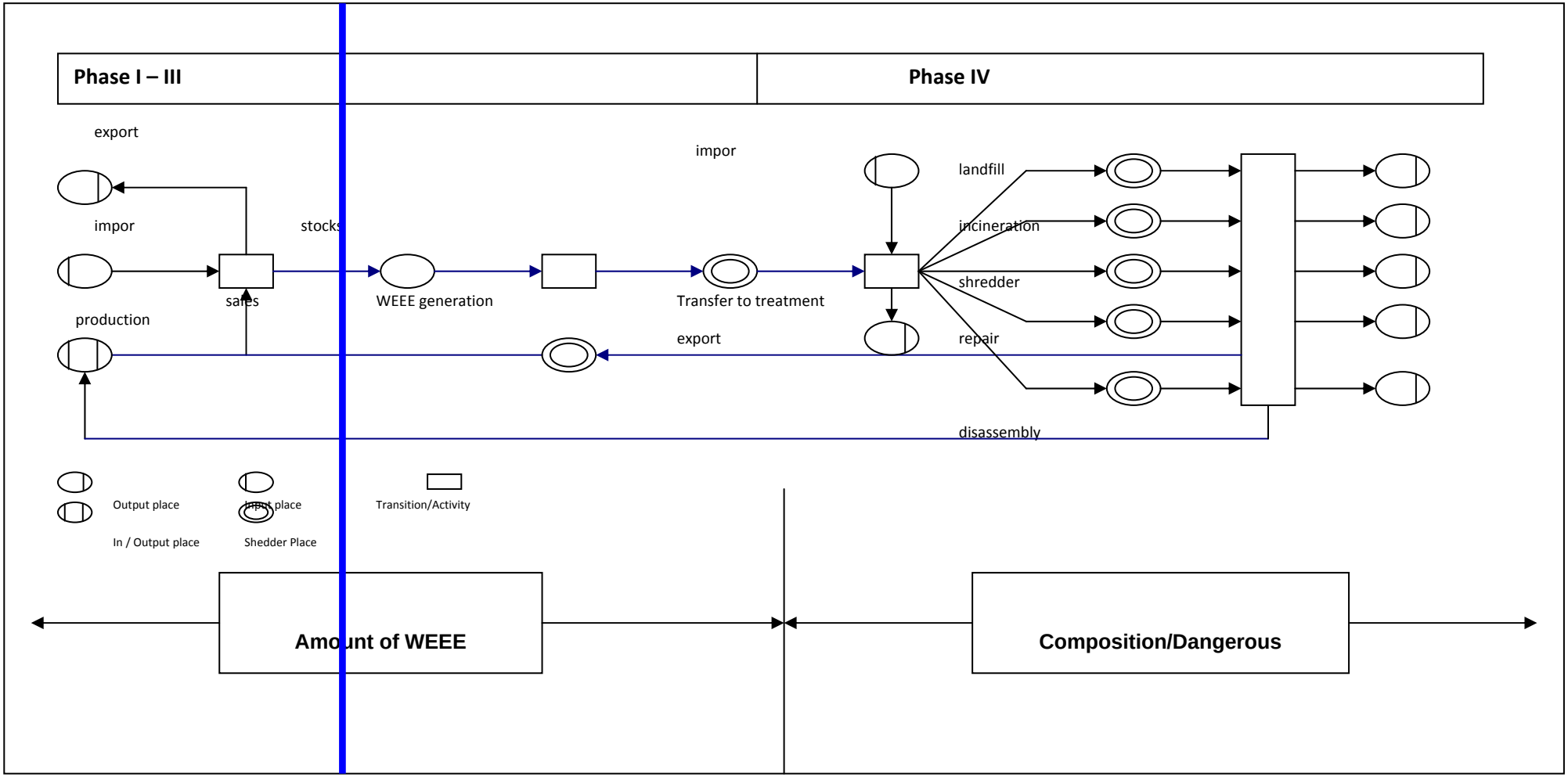


Figure 3.3: The 'Four-Phase-Model'

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.

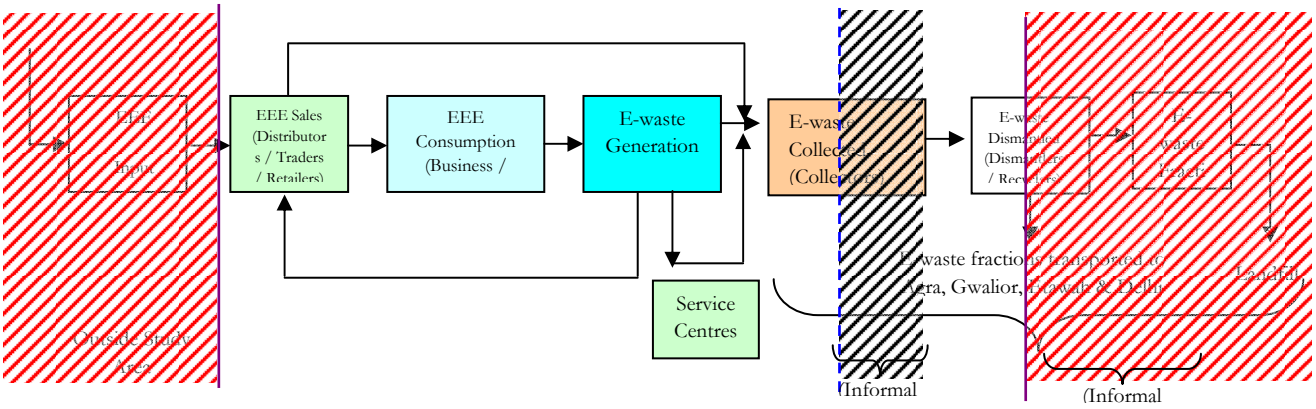


Figure 3.4: Tentative E-waste trade value chain in Study Area

Producers

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.

Consumers

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**.

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
LG	√		√	√	
Panasonic	√		√		
Samsung	√			√	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	√	√			Exchange your electronic item to your nearest dealer or where you buy the product
Electrolux	√	√			Exchange your electronic item to your nearest dealer or where you buy the product
Godrej	√	√			
Hitachi	√				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	√	√			E-waste Regarding no information Contact to nearest dealer
Philips	√			√	Call on customer care door to door collection of E-waste / discarded items of Philips
Whirlpool	√	√			To dealer he exchange your electronic item
Printers					
HP	√	√			Drop your items as dealer's drop off locations.

Brands	Collection through Call Centre	Collection through Dealers / Retailer	Collection through Service Centre	Collection through Collection Centre / establishment	Remarks
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.

Informal Sector

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.

Market Features

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**.

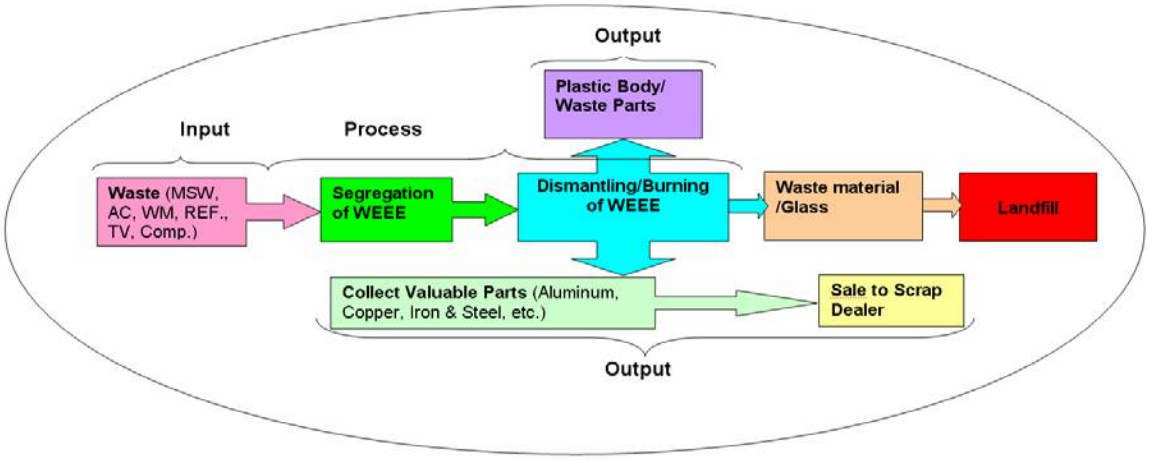
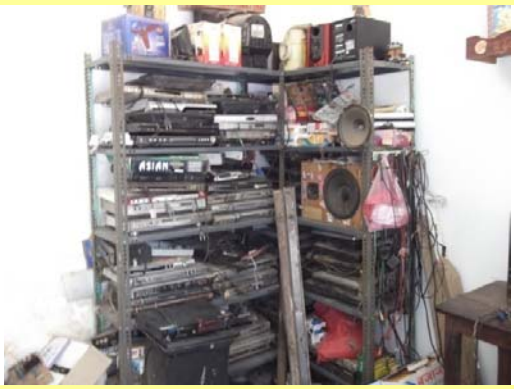
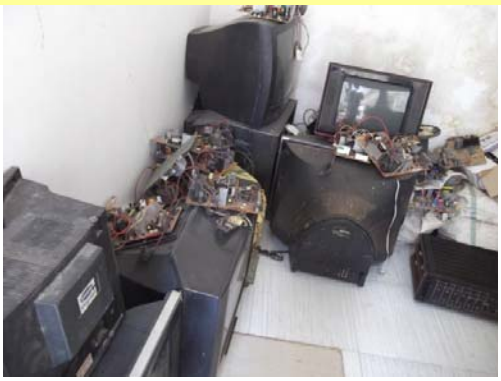


Figure 3.5: Processes observed at dumpsite

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**.

Table 3.5: Process involved for E-waste recycling in Study Area

Sr. No.	Process	Photographs
1.	**E-waste Collection**	 
2.	**E-waste Segregation**	 
3.	**E-waste Generation**	 

4. **E-waste Storage**

5. **E-waste Dismantling**

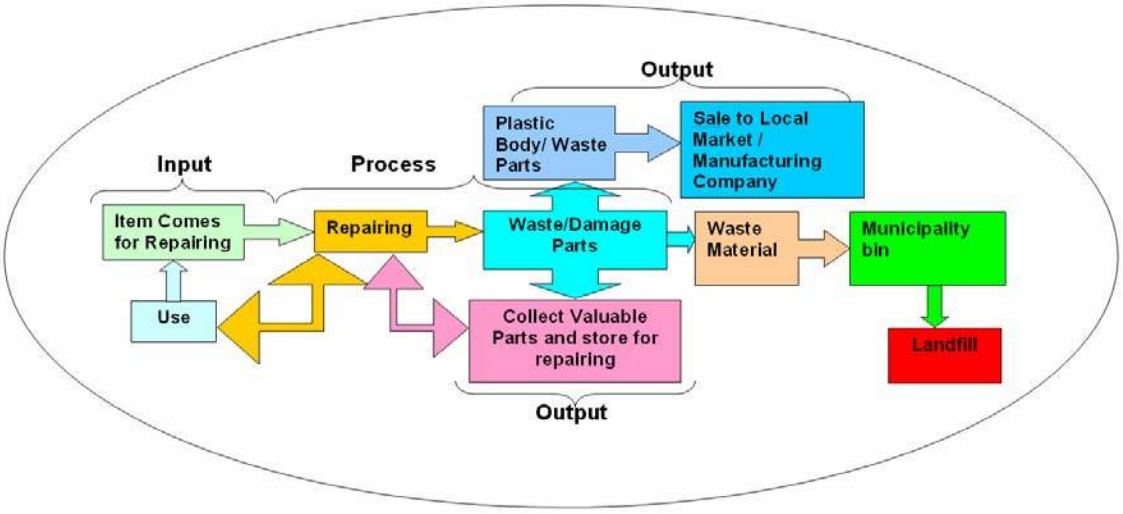


Figure 3.6: Processes observed at scrap dealers / junkyards

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**.

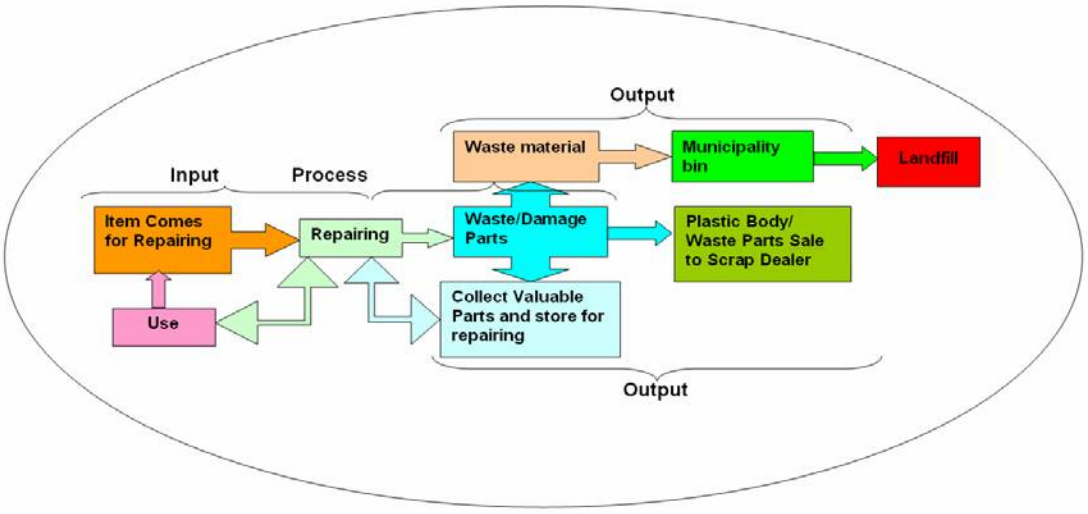


Figure 3.7: Processes observed at AC, Washing Machine, and Refrigerator Repair Shop

Figure 3.8: Image showing Repairing Shop of AC/WM/REF in Project Area

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** and illustrated in **Figure 3.10**.

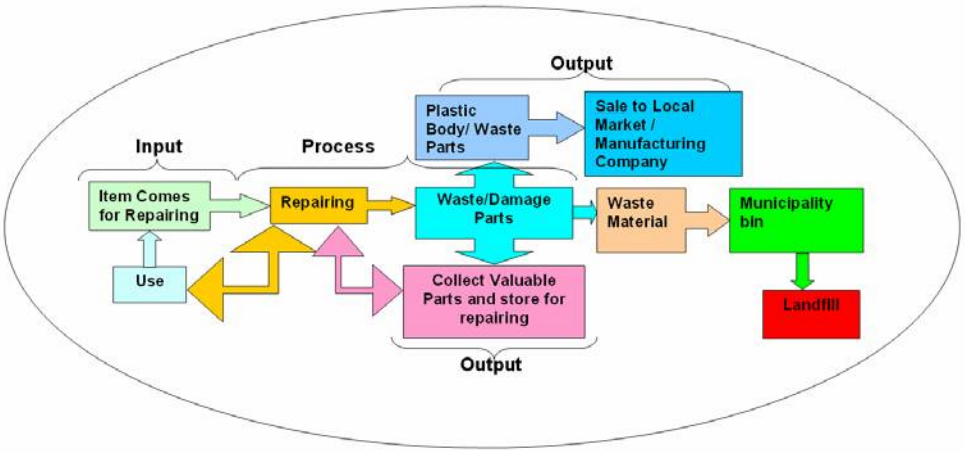


Figure 3.9: Processes observed at TV, Computer, and Mobile Phone Repair Shop

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**.

Table 3.6: Processes involved for E-waste recycling in different towns

Sr. No.	Process name	Process Status				
		Dhamtari	Gariaband	Raipur	Baloda Bazar (new)	Mahasamund
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	No	No	No	No	No

Sr. No.	Process name	Process Status				
		Dhamtari	Gariaband	Raipur	Baloda Bazar (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.

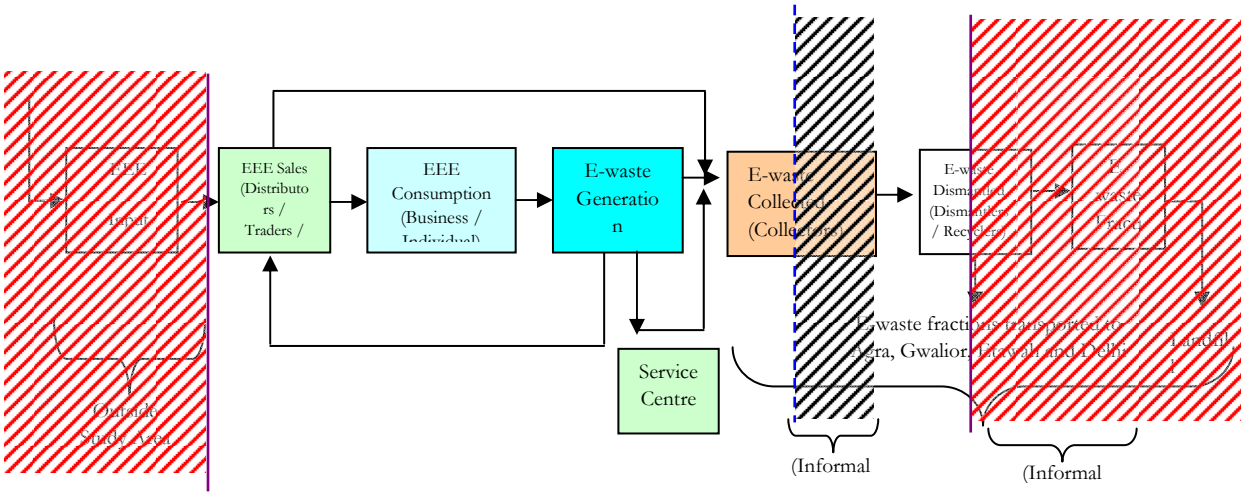


Figure 4.1: E-waste material flow chain in Study Area

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 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)
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)		

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.

Table 4.2: Data Matrix Vs Methodology

Methodology/ Data Requirement	Saturation Level		Number of Household	Calculated Sales			Stock Data		Average Lifetime	Storage data	Reuse	Recycle / dismantling	Landfill
	Household	Industry		Export Data	Import Data	Manufacturing / Production	Private	Industry					
Time Step Method	X		√	X	X	√	X	X					
Market				X	X	√			√				

Methodology/ Data Requirement	Saturation Level		Number of Household	Calculated Sales			Stock Data		Average Lifetime	Storage data	Reuse	Recycle / dismantling	Landfill
	Household	Industry		Export Data	Import Data	Manufacturing / Production	Private	Industry					
Supply Method													
Carnegie Mellon Method				X	X	√			√	√	√	√	√
Approximation 1	X	X	√			√	X	X	√				
Approximation 2				X	X	√							

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.

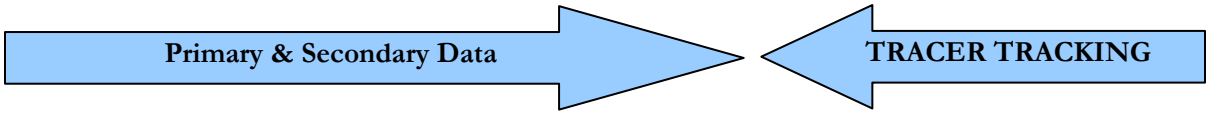


Figure 4.2: WEEE/E-waste data collection approach along the material flow chain in Raipur Division

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**.

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

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

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 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

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 Area (in numbers)

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

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 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 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 Raipur 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**.

Table 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

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)

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

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

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

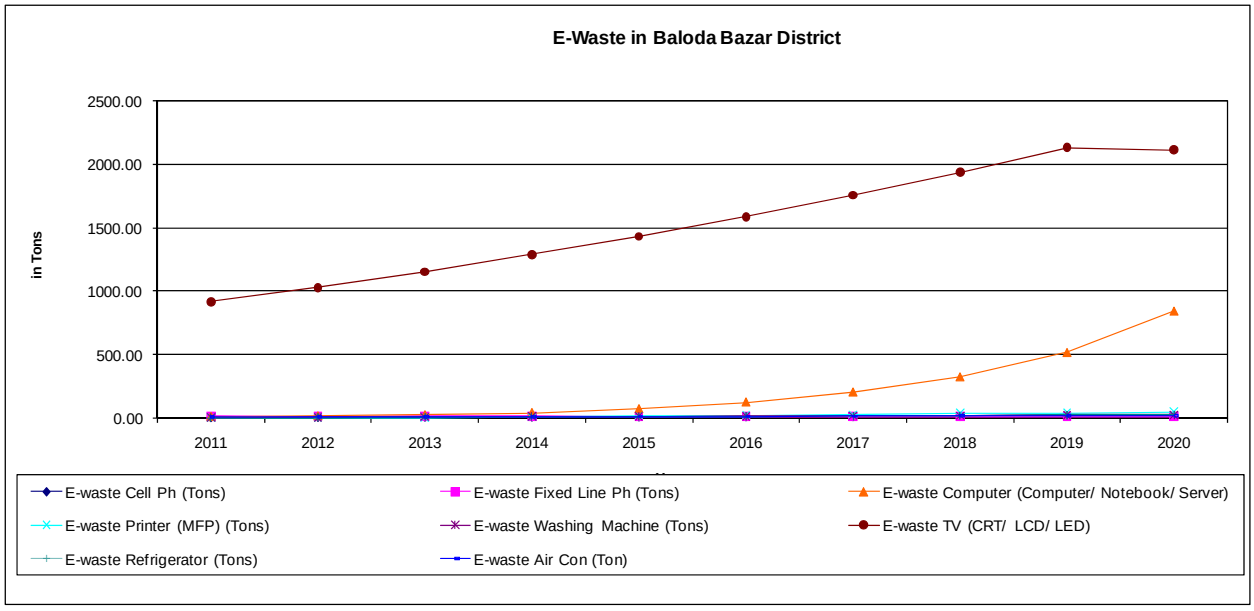


Figure 5.1: Item wise E-waste Projection of Baloda Bazar District

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

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

2020	56838	6823	24901	4373	351	45879	636	278

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

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

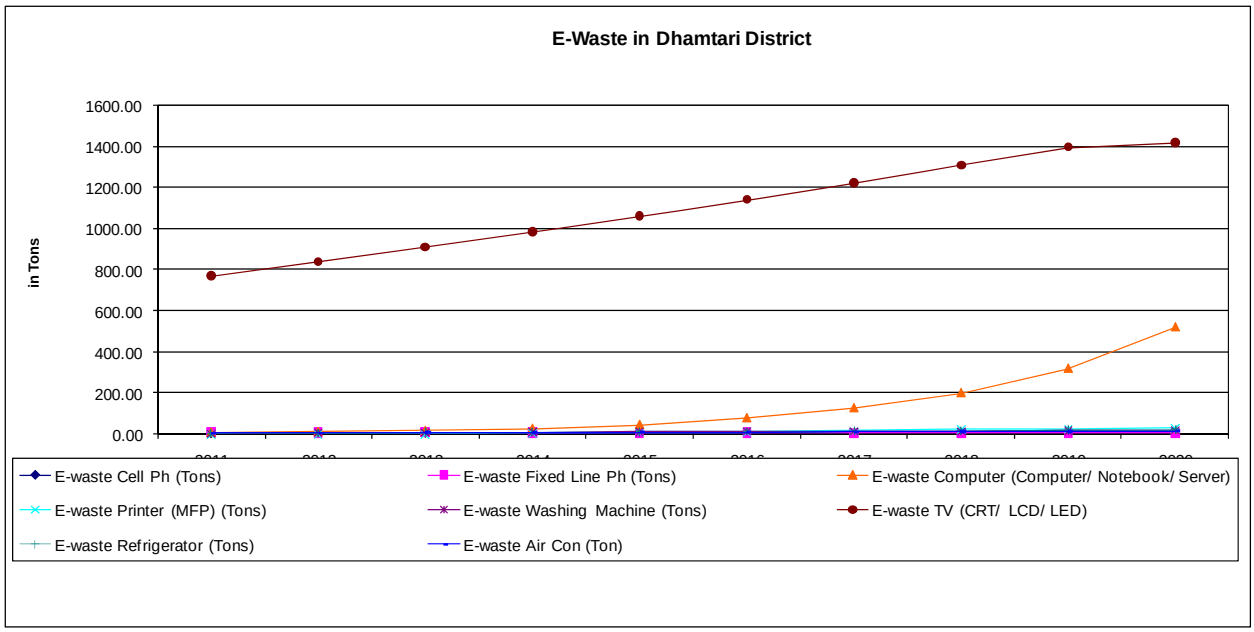


Figure 5.2: Item wise E-waste Projection of Dhamtari District

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

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

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)

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

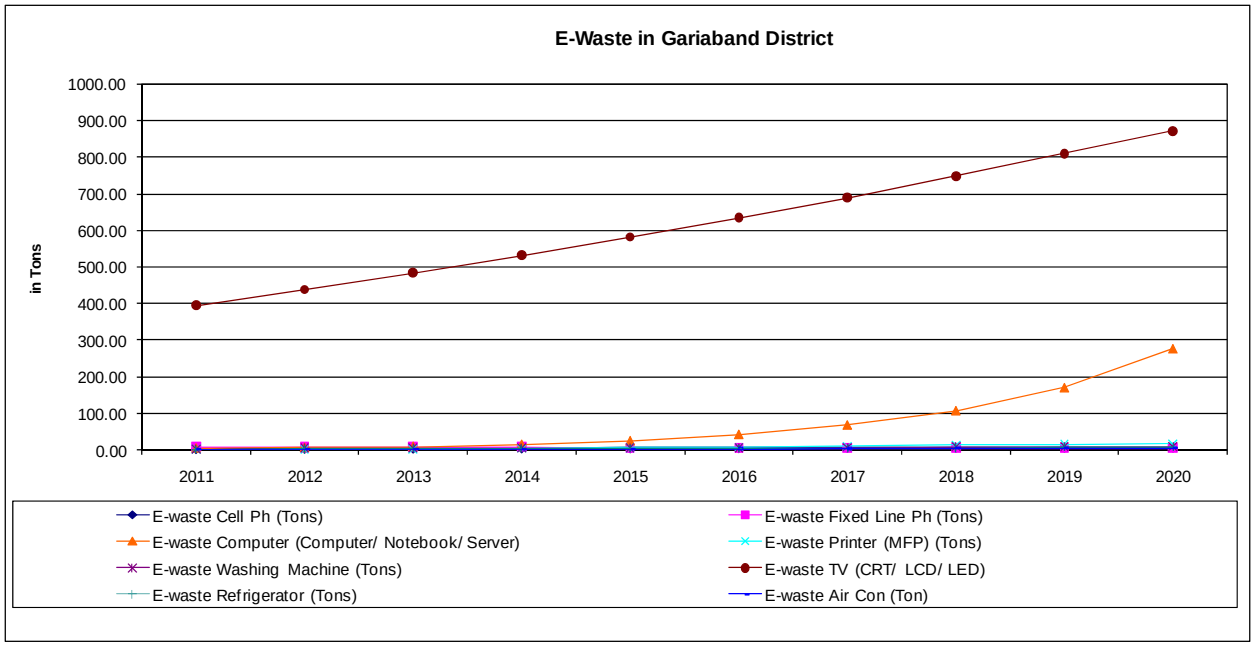


Figure 5.3: Item wise E-waste Projection of Gariaband District

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

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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 Inventory of Mahasmund District (in Tons)

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

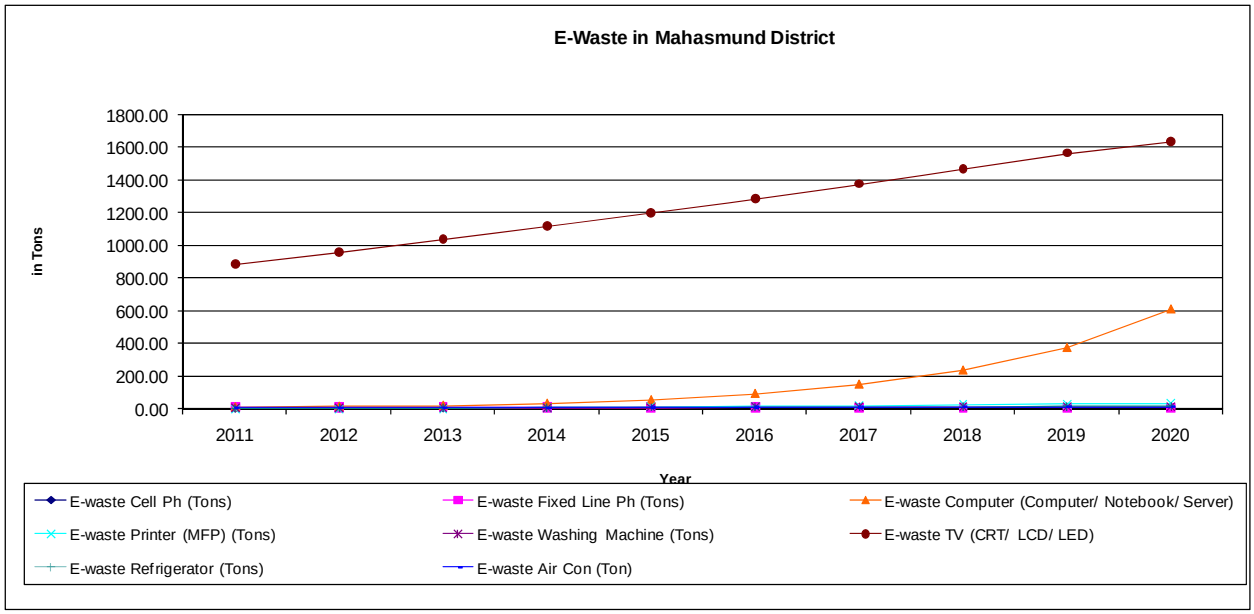


Figure 5.4: Item wise E-waste Projection of Mahasmund District

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

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
2011	110546	50488	4815	1528	674	157748	1007	1072
2012	148080	42951	6837	2460	1005	172198	1474	1159

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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)

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air Conditioner
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

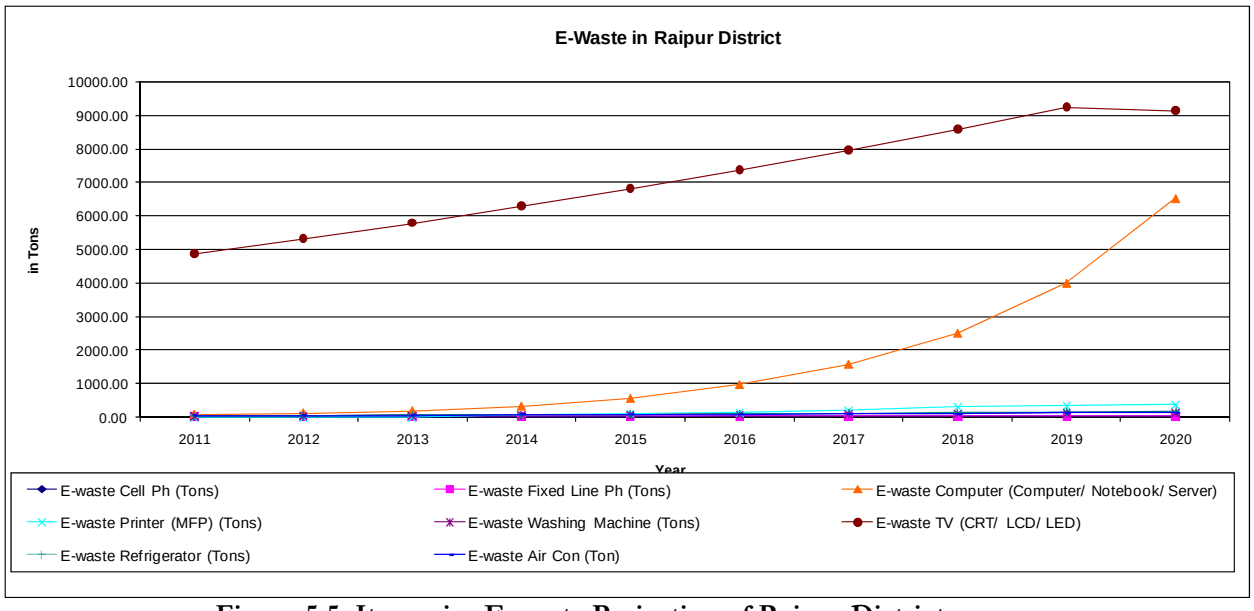


Figure 5.5: Item wise E-waste Projection of Raipur District

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

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

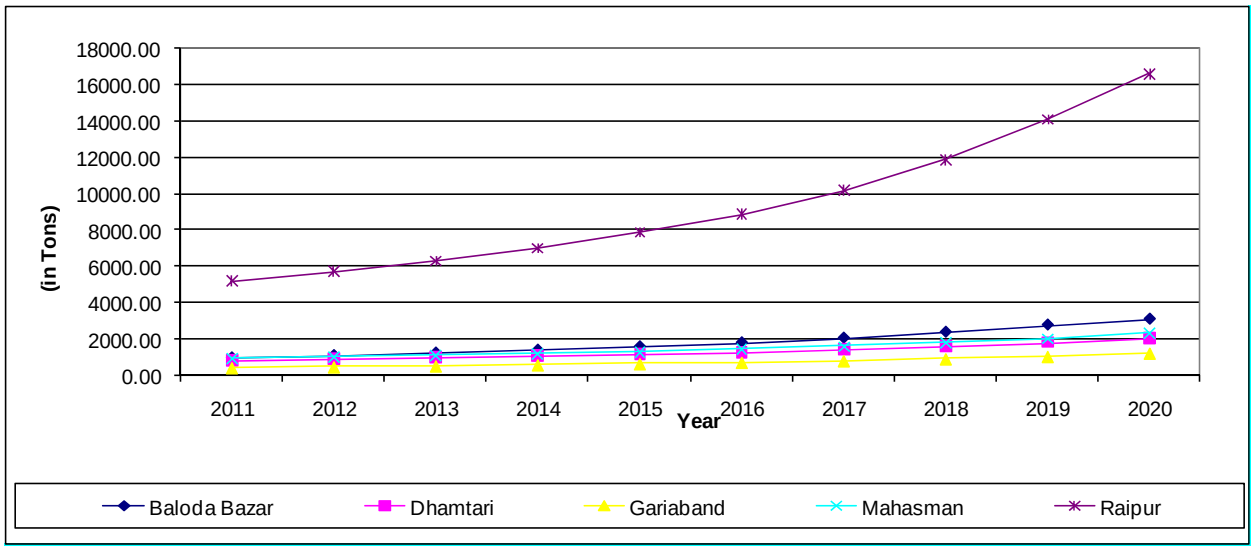


Figure 5.6: District wise Total E-waste Inventory Projection

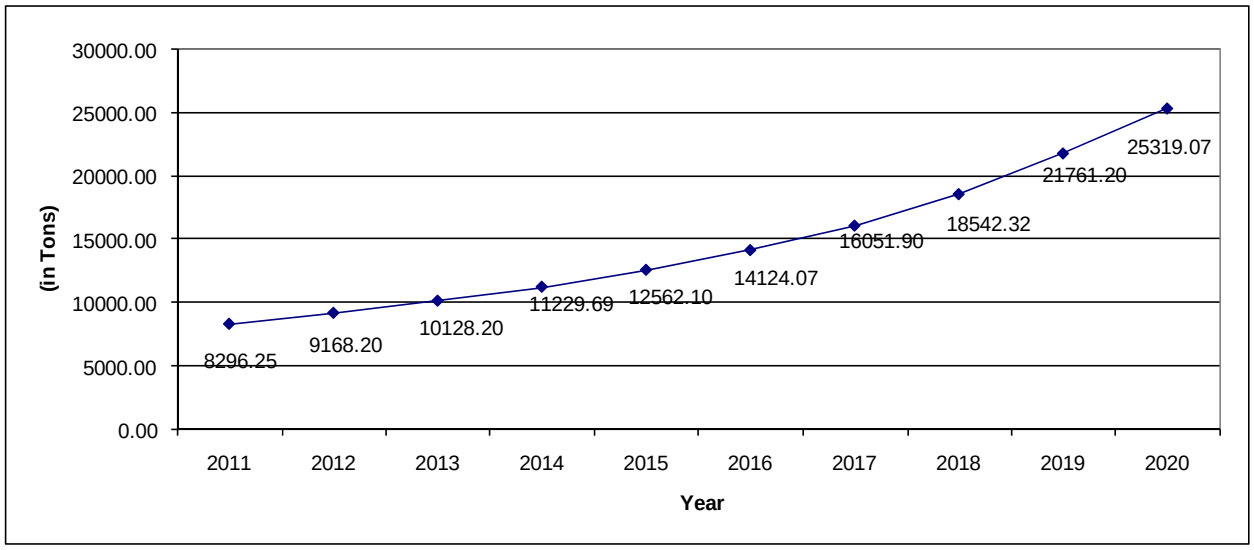


Figure 5.7: Total E-waste Inventory Projection in Raipur Division from 2011 to 2020

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.
2. 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**.

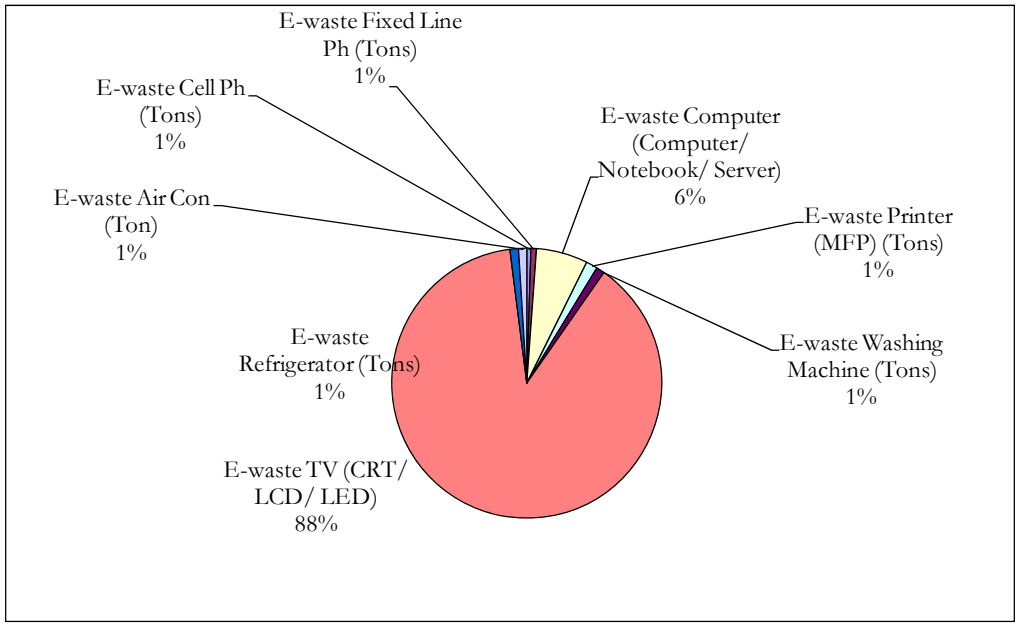


Figure 5.8: Item-wise E-waste in Percent for Raipur Division in 2015

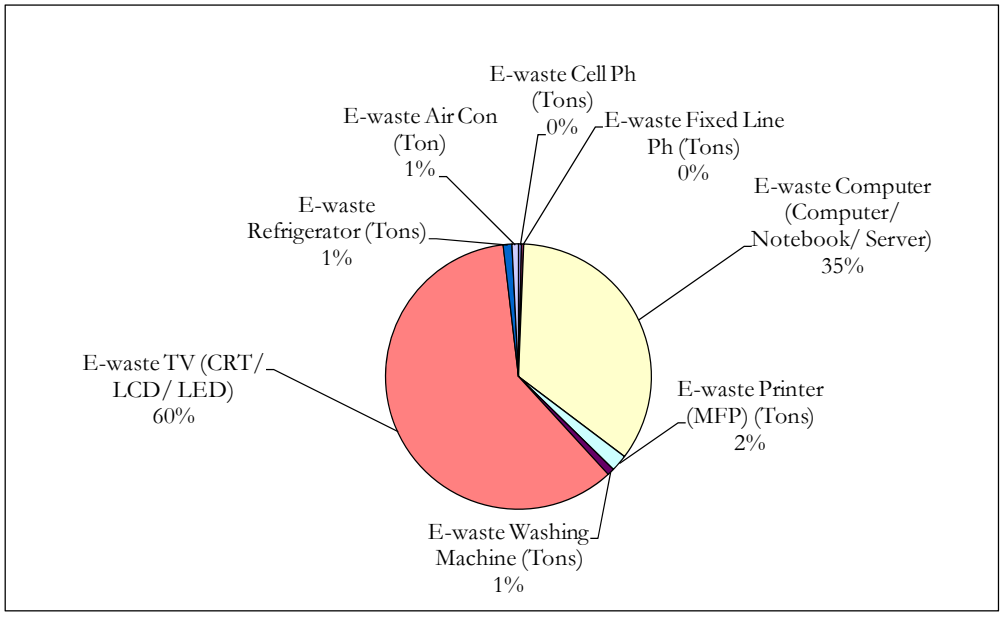


Figure 5.9: Item-wise E-waste in Percent for Raipur Division in 2020

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 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.

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

Sr. No.	Process name	Process Status				
		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

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 economics of Raipur Division E-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

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 Risk Matrix

Risks/ intensities		High	Medium	Low
Risks of availability of raw material	Short term		√	
	Long term		√	
Risk associated with collection	Short term	√		
	Long term		√	
Risk associated with transportation	Short term			√
	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 E-waste 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. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				Bandra (East) Mumbai 400 098 Ph. No. +91+22-2650-0031
		Group Companies		**Allied JB Friction Private Limited** A-12, Site IV, Industrial Area, 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 – 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 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 Category	Brand	Address / Contact Details
				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) 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, 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. 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	LG Electronics India Pvt. Ltd, Plot No. 51, Udyog Vihar, Surajpur Kasna Road, Greater Noida: 201306 Uttar Pradesh
		Manufacturing Facilities	Markson	**SGV Industries** Plot No.41 & 42, Sector-6A, Sidcul Indl Area, Haridwar (Uttrakhand) 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
				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
		Head Office		PLOT No. 378, F.I.E, PATPARGANJ, DEHLI - 110092 Ph. No. +91-11-43086501-502, 22157662-63
		Corporate & Head Office	Moser Baer	43B, Okhla Industrial Estate, New Delhi - 110020. India. Tel +91 11 40594444, 91 11 26911570 - 74 Fax +91 11 41635211, 26911860
		Branch Offices		**Chennai** Moser Baer India Ltd. 81, IInd Floor 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
		Representative & Distributor		**USA Distributor** **Media Masters LLC** #440, 2601 S. Minnesota Ave., Ste 105 Sioux Falls, SD 57105-4750 USA Phone: +1-(888)-243-4465 Fax: +1-(877) 835-2834 E-mail: sales@mediamastersdisc .com
		Manufacturing Facilities		**BOM & M& ES** 66, Udyog Vihar, 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
		Corporate Address	Onida	MIRC Electronics Ltd. Onida House, G-1, M.I.D.C, Mahakali Caves Road, Andheri (E), Mumbai - 400 093. 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	**Samsung India Electronics** 6th, 7th & 8th Floors, Ifci Tower, 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	**Philips Electronics India Limited** 9th Floor, DLF 9-B, 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, 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
				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
				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	**TCL India Holding Pvt. Ltd.** Sco 254, 2nd Floor, Sector 44 C 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
			T-Series	**Laxbro Manufacturing Company** W-53, MIDC Area, Bhosari Indl. Estate, PMC – 411026, Maharashtra
			Toshiba	**TOSHIBA INDIA PVT. LTD.** 3rd Floor, Building No. 10 Tower - B, Phase - II 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. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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	**Videocon Industries Ltd.** 14 Kms Stone, Aurangabad- Paithan 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
			Weston	**Westway Electronics Limited** B-102, Phase – II, Noida – 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. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
		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
			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	Next Retail India Limited, 3rd Floor, Aadeshwar Arcade Above Loop Gallary, 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

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 Fax: +91 33 30489230

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 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
	Air Conditioner	Window	Blue star	**Corporate Headquarters** Kasturi Buildings, Mohan T Advani Chowk, Jamshedji Tata Road, 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 **Tel:** (91) (22) 66544000 **Fax:** (91) (22) 66544001
				Regional Headquarters **Chennai** No.104, Old No. 46, Garuda Buildings, Cathedral Road, Chennai - 600 086

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 Nahan Road Ranpur Jattan Kala Amb

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 / 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 **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 Category	Brand	Address / Contact Details
				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. 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 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
			Carrier	**INDIAN HEADQUARTERS :** **Carrier Airconditioning & Refrigeration Limited** Delhi - Jalpur Highway, Narsingpur, Gurgaon, 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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 & 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 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 Category	Brand	Address / Contact Details
				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 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
				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 : 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 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 KOLKATA - 700 017 Tel : 033 - 40602006
			Godrej	Given Above
			Haier	Given Above
			Hitachi	Given Above
			LG	Given Above

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
			Onida	Given Above
			Samsung	Given Above
			Videocon	Given Above
			TCL	Given Above
	Corporate Headquarters		Voltas	**Voltas Limited** Voltas House 'A' Block Dr. Babasaheb Ambedkar Road Chinchpokli Mumbai 400 033 Tel: 022-66656 666
	Factories			2nd, Pokhran Road, 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
			Mitsubishi	**Gurgaon Head Office** 2nd Floor, Tower A & B, DLF 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, 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
				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: +91 (44) 2847-7374
			Panasonic	Given Above
			Samsung	Given Above
			Sanyo	Given Above
			TCL	Given Above

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
			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
			Siemens	Registered & Corporate Office 130, Pandurang Budhkar Marg, Worli, Maharashtra, Mumbai 400 018. Tel: +91 22 3967 7000 Fax: +91 22 3967 7500
	Mobile Phones		Acer	Acer India Private Limited 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
				Distributors

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 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	**Amazon Development Center India Pvt Ltd** Q-city, 2nd Floor-Block A & Block B Survey Number-109,110,111/2, 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
				#40,3rd Floor, SP Infocity M G R Salai, Perungudi

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 Tel: (519) 888-7465 Fax: (519) 888-7884
				BlackBerry United States BlackBerry 5000 Riverside Drive,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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	**BLU Products** 10814 NW 33rd St# 100 Doral, FL 33172 (305) 715 – 7171
			Bosch	Bosch Sicherheitssysteme GmbH Robert-Bosch-Ring 5 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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 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
				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
			Dell	Dell Computer Corporation One Dell Way

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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
				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.

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
				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. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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, 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, Oberoi Garden City, Off. Western Express Highway,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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	**Huawei Telecommunication (INDIA) Co. Pvt Ltd.** 7th Floor, Tower A, Spaze I-Tech Park, Sohna Road, 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	Karbonn Mobiles #39/13, off 7th main, HAL 2nd stage Appareddy Palya, Indiranagar, Bangalore – 560038 Tel: 080 40894888
				Karbonn Mobiles D-170, Okhla Industrial Area, Phase-1 New Delhi – 110020 011 46604660
			Kyocera	**KYOCERA Corporation** **Cutting Tool Group** 6 Takeda, Tobadono-cho, Fushimi-ku, Kyoto 612-8501, Japan Phone: +81-75-604-3473 Fax: +81-75-604-3472
				KYOCERA Asia Pacific India Pvt. Ltd. 1001A, 1001B, 1002, 10th Floor JMD Regent Square, M.G. Road Gurgaon-122 002 Haryana, 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. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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

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

Sl. No.	Address	Latitude			Longitude		
		Deg.	Min.	Sec.	Deg.	Min.	Sec.
	Raipur						
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

Sl. No.	Address	Latitude			Longitude		
		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						
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

Sl. No.	Address	Latitude			Longitude		
		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						
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

Sl. No.	Address	Latitude			Longitude		
		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

Sl. No.	Address	Latitude			Longitude		
		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

Sl. No.	Address	Latitude			Longitude		
		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						
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

Sl. No.	Address	Latitude			Longitude		
		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

Partial list of Bulk Consumers in Raipur Division- Annexure 3

Sl. No.	Name	Address	Latitude			Longitude		
			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

Sl. No.	Name	Address	Latitude			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						
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

Partial list of Service Centers in Raipur Division- Annexure 4

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
Raipur								
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

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								
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

Sl. No.	Name of Shops	Address	Latitude			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								
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

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
60	**Gopal TV Center**	Old Kachahari Chowk, 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	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
78	**Verma Electronis**	Main Market, Bagbahra, Mahasamund	21	2	56.5	82	22	53.8

Inventory of Physically Established Collection Centers- Annexure-5

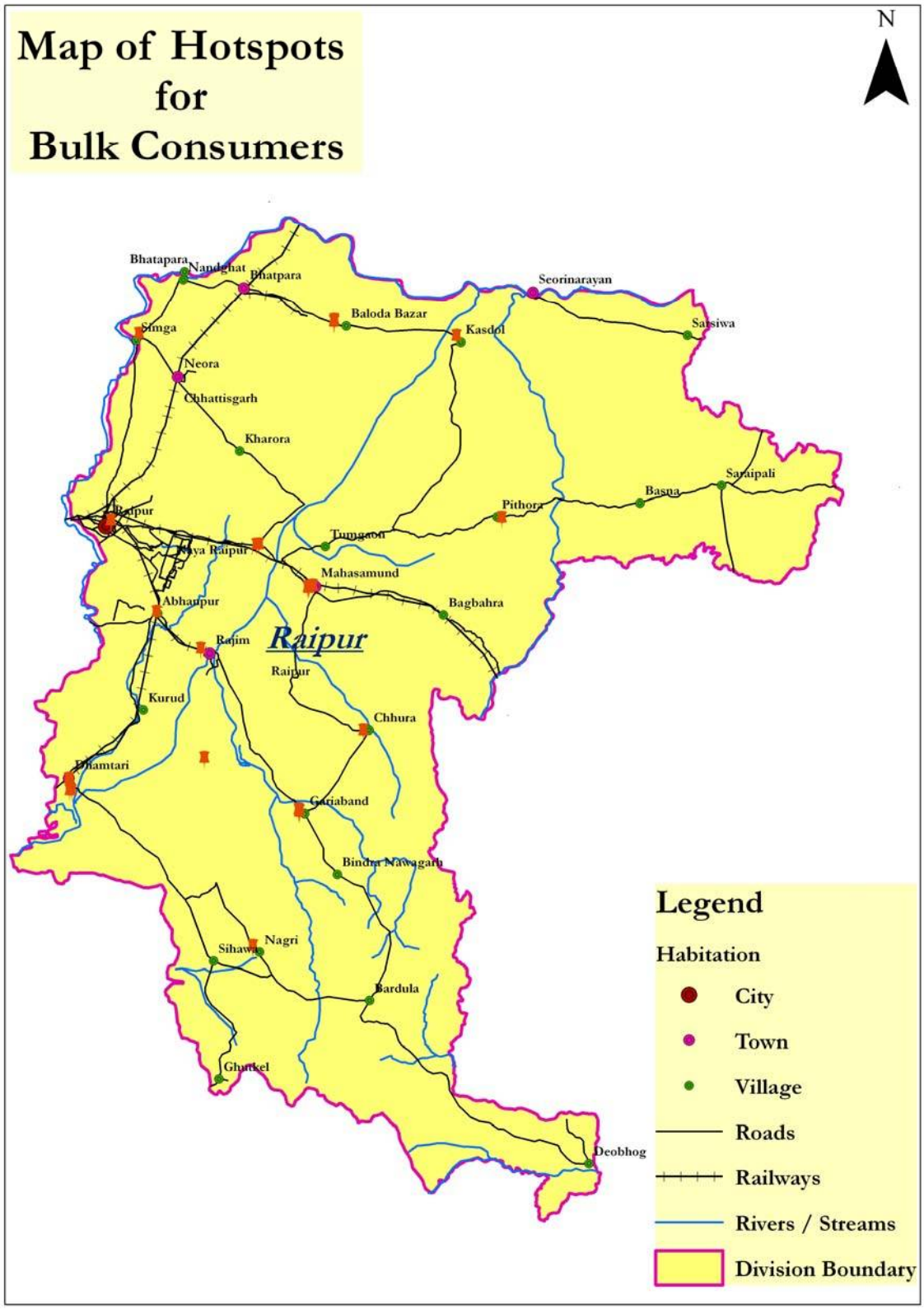
Sl No.	Name	Address
1.	M/s Navrachna Recycling Pvt. Ltd.	**Plot No 1B, Somni Industrial Area, Rajnandgaon**
2.	M/S ADV Metal Combine Private Limited	**Borai Industrial Growth Center, Durg**

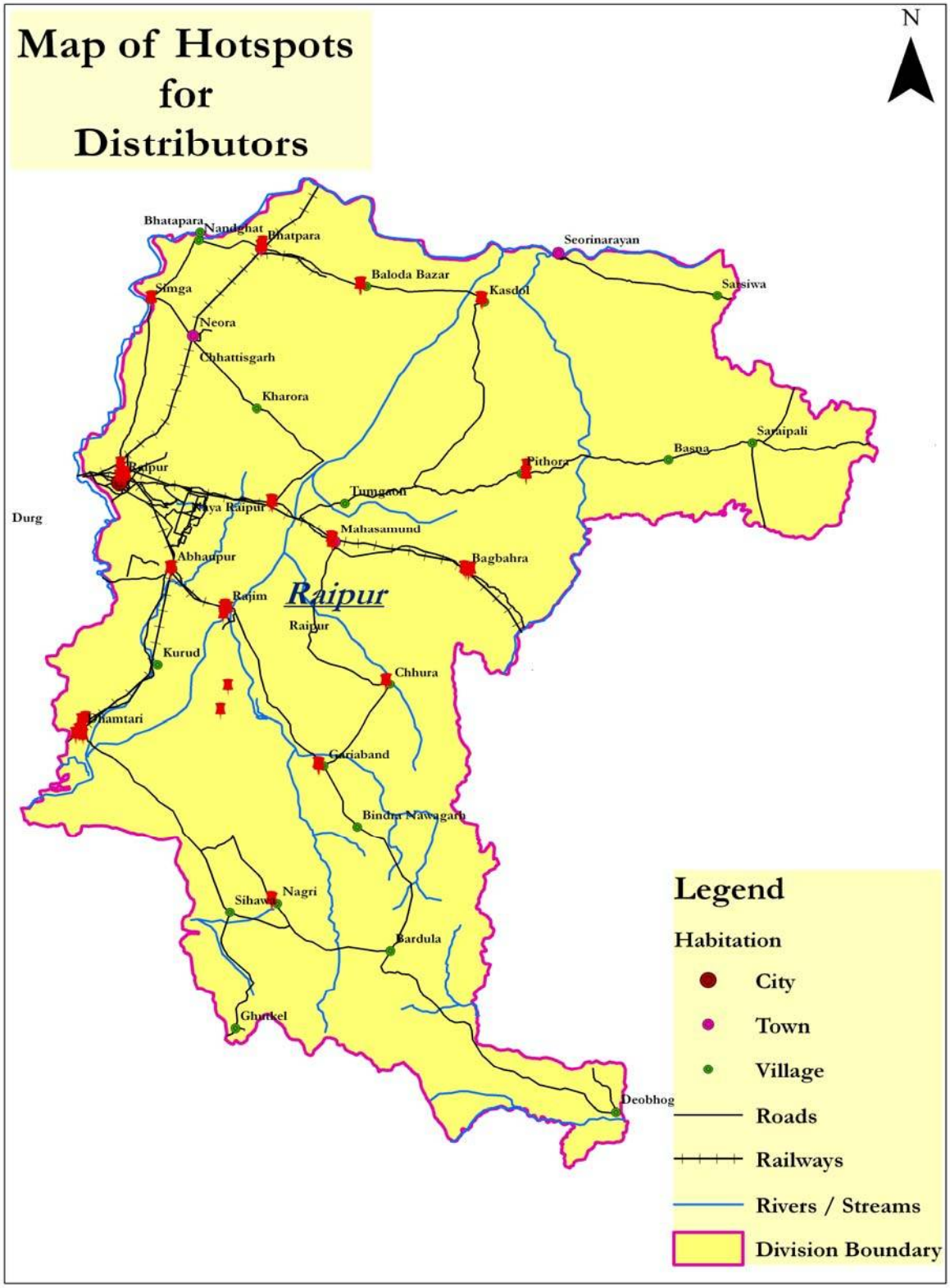
Partial inventory of Scrap vendor/ Dismantler- Annexure 6

Sl. No.	Name	Address	Latitude			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								
18	**Abdul Gani**	Nayapara, Rajim, Gariaband	20	58	14.3	81	51	27.1

Sl. No.	Name	Address	Latitude			Longitude		
			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								
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


Map of Hotspots for Bulk Consumers
N
Bhatapara
Nandghat
Bhatpara
Seorinarayan
Baloda Bazar
Kasdol
Saisiwa
Simga
Neora
Chhattisgarh
Kharora
Saraipali
Basna
Pithora
Raipur
Tumgaon
Naya Raipur
Mahasamund
Abhanpur
Bagbahra
Rajim
Raipur
Raipur
Kurud
Chhura
Dhamtari
Gariaband
Bindra Nawagarh
Nagri
Sihawa
Bardula
Ghurkel
Deobhog
Legend
Habitation
City
Town
Village
Roads
Railways
Rivers / Streams
Division Boundary


Map of Hotspots for Distributors
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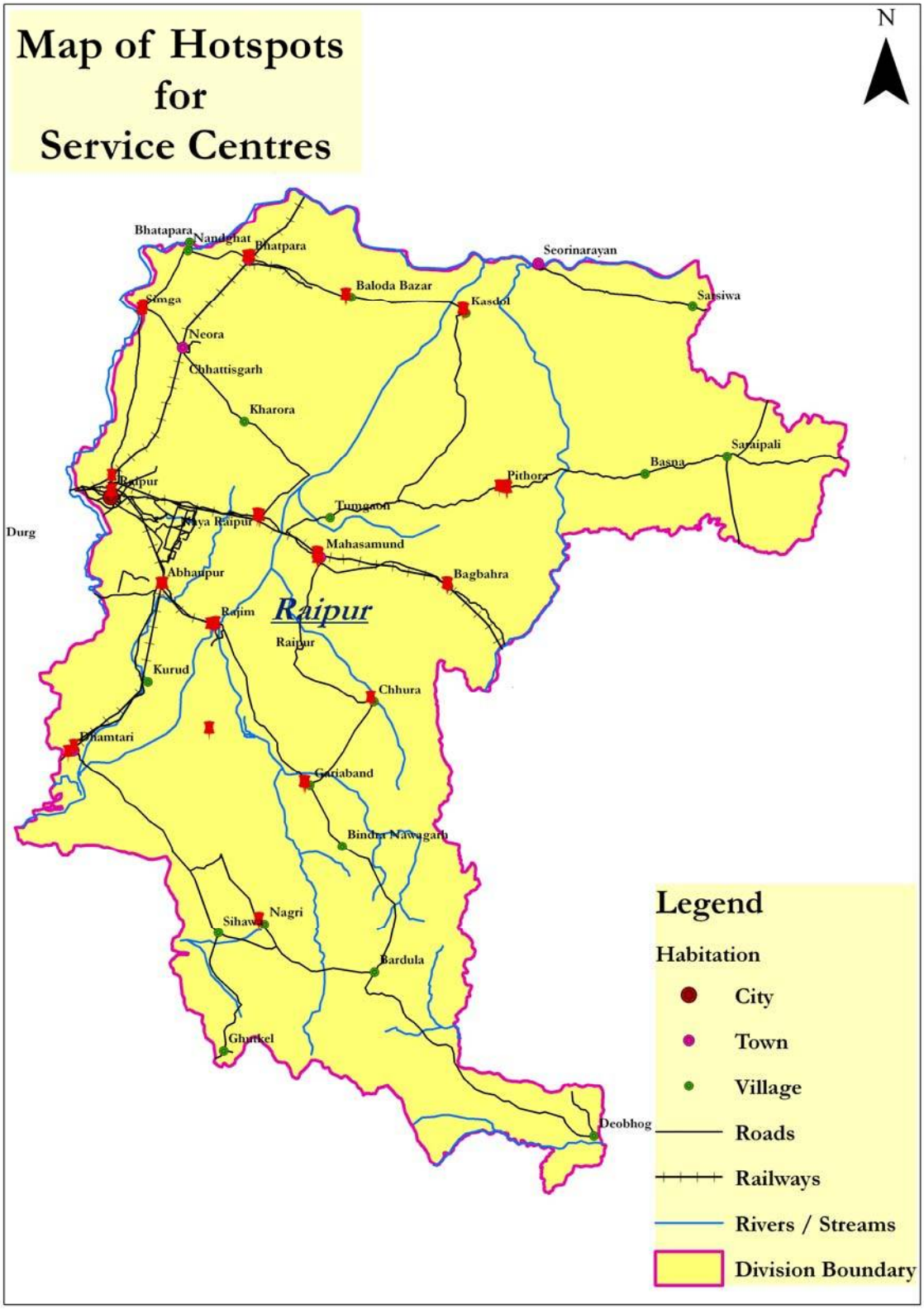
Bhatapara
Nandghat
Bhatpara
Seorinarayan
Baloda Bazar
Kasdol
Sarsiwa
Simga
Neora
Chhattisgarh
Kharora
Saraipali
Basna
Pithora
Raipur
Tumgaon
Durg
Mahasamund
Bagbahra
Abhanpur
Rajim
Raipur
Raigur
Kurud
Chhura
Dhamtari
Gariaband
Bindra Nawagarh
Nagri
Sihawa
Bardula
Ghurtkel
Deobhog
Legend
Habitation
City
Town
Village
Roads
Railways
Rivers / Streams
Division Boundary


Map of Hotspots for Service Centres
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Bhatapara
Nandghat
Bhatpara
Seorinarayan
Baloda Bazar
Kasdol
Sarsiwa
Simga
Neora
Chhattisgarh
Kharora
Saraipali
Basna
Pithora
Raipur
Tumgaon
Naya Raipur
Durg
Mahasamund
Abhanpur
Bagbahra
Rajim
Raipur
Raipur
Kurud
Chhura
Dhamtari
Gariaband
Bindra Nawagarh
Nagri
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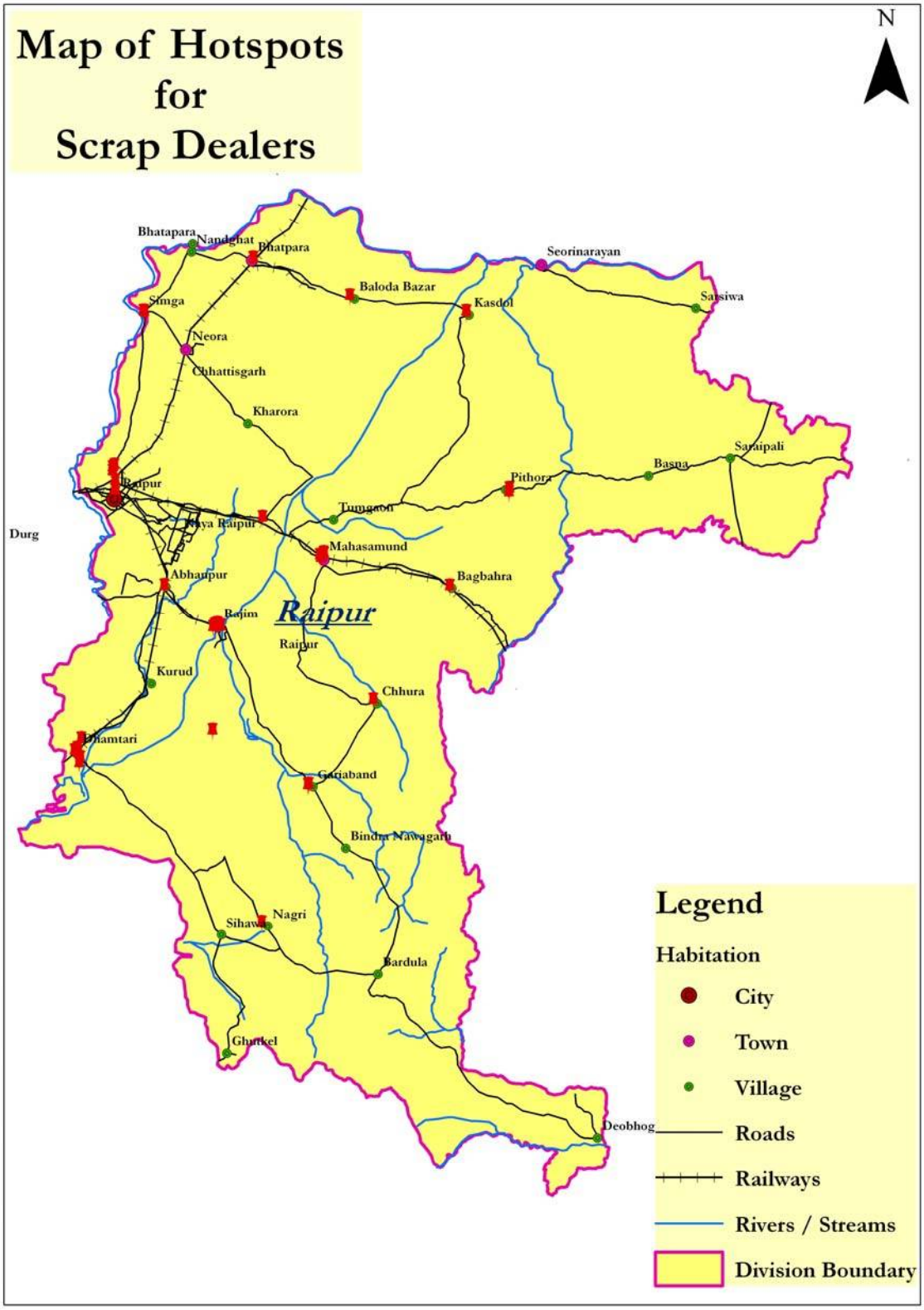
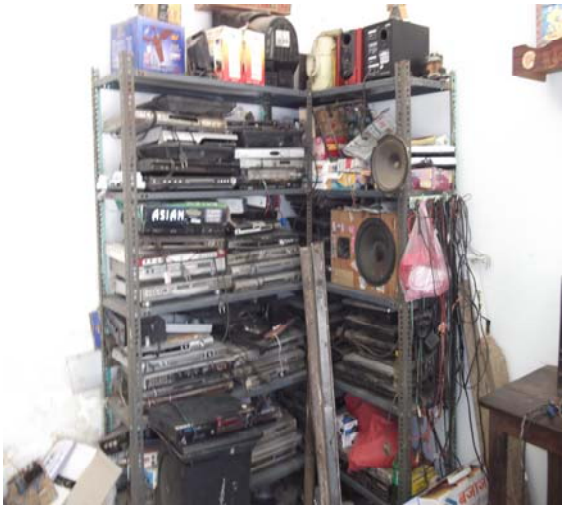
Legend
Habitation
City
Town
Village
Roads
Railways
Rivers / Streams
Division Boundary


Map of Hotspots for Scrap Dealers
N
Bhatapara
Nandghat
Bhatpara
Seorinarayan
Baloda Bazar
Kasdol
Saisiwa
Simga
Neora
Chhattisgarh
Kharora
Saraipali
Basna
Pithora
Raipur
Tumgaon
Durg
Mahasamund
Bagbahra
Abhanpur
Rajim
Raipur
Raipur
Kurud
Chhura
Dhamtari
Gariaband
Bindra Nawagarh
Sihawa
Nagri
Bardula
Ghurkel
Deobhog
Legend
Habitation
City
Town
Village
Roads
Railways
Rivers / Streams
Division Boundary

Sample Photo Documentation- Annexure 8








इलेक्ट्रानिक्स

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) $= [\text{Stock}(t_1) - \text{Stock}(t)]_{\text{private}} + [\text{Stock}(t_1) - \text{Stock}(t)]_{\text{industry}} + \bullet \text{Sales}(n) - \bullet \text{WEEE}(n)$ $\quad n=t1+1 \text{ to } t-1 \quad n=t1+1 \text{ to } t \text{ with } t_1 < t$

$\text{Stock}_{\text{private}}$ = Number of households * (saturation level of households / 100)

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

$\text{Stock}_{\text{industry}}$ = 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

d_S - 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)

Features of the five inventory assessment methods

Methodology/Features	Requirements	Constraints	Advantages
The Time Step Method	1. Information about domestic sales. 2. Appliance stock levels for household. 3. Industrial stock levels.	1. Household saturation levels are based on predetermined stock levels 2. Industrial stock levels are assumed in the calculations because they are difficult to obtain and require assumptions. 3. Assumption that all the WEEE/E-waste generated is collected and transferred to treatment and disposal facility.	1. Calculations can be carried out very easily. 2. Method gives good results in a saturated market.
The market Supply Method	1. Information about domestic sales. 2. Average life of new and second hand items.	1. 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. 2. WEEE/ E-waste are often stored for years. 3. Assumed that all appliances produced in the same year will be in line for disposal after exactly the average life. 4. Assumption that the average variance in life of items of EEE does not change very much, whereas, in reality, lifetimes may	1. Necessary data need not be very wide-ranging 2. Calculations can be carried out very easily using a simple formula 3. 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.

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.	1. 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. 2. This model also requires a full coverage of sales data as early as possible in the WEEE/E-waste trade value chain.	1. The model allows for an electrical and electronic equipment to be purchased, reused, stored and finally recycled or landfilled representing "material flow" more precisely. 2. 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.	1. A product's constant mean lifespan is assumed in this method. 2. 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.	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 appliances plays a significant role in consumer behaviour.	1. This method is suitable for carrying 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.

Data Requirements for E-waste Inventory Assessment

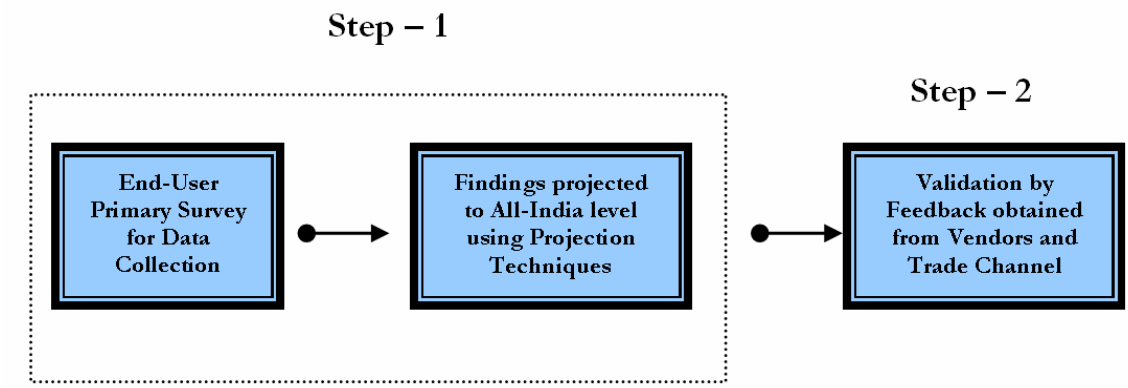
Methodology/ Data Requirement	Saturation Level		Number of Household	Calculated Sales			Stock Data		Average Lifetime	Storage data	Reuse	Recycle	Landfill
	Household	Industry		Export Data	Import Data	Manufacturing /Production	Private	Industry					
Time Step Method	√	√	√	√	√	√	√	√					
Market Supply Method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

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.

$$\sum_{i=1}^{n} \text{Last one year market size in employee band i} = \sum_{i=1}^{n} \left(\text{Acquisition rate in employee band i} \times \text{Universe of estab. in employee band i} \right)$$

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 1. Pure households 2. 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-

Step	Purpose
	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	

2016

FINAL REPORT

E- Waste Inventorization of Surguja Division

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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 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.

Producers: 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, 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.

Consumers: 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. 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.

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.

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. 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 E-waste 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 E-waste 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 E-waste 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, Bastar and Sarguja. The overall aim of this initiative is to assess the generators, quantity and present practices for handling of E-waste 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**.

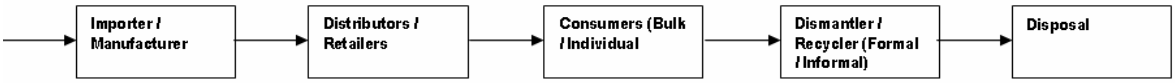


Figure 1.1: Conceptual WEEE business chain

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.

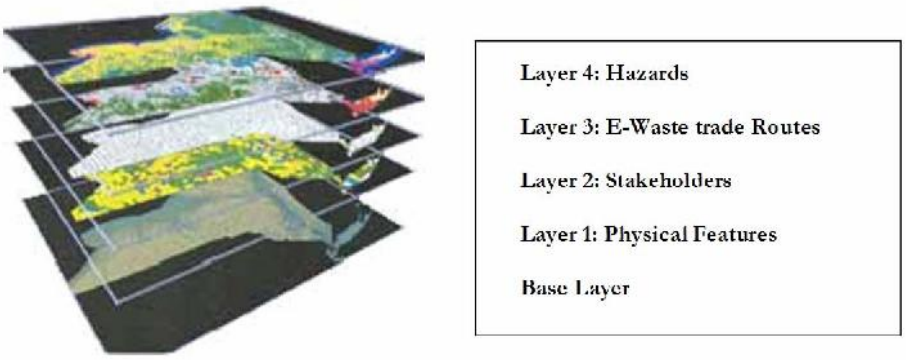


Figure 1.2: Geographical mapping of different attributes

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.

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**.

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, 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

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

Regulations / Guidelines	E-waste Management		Export & Import of E-waste	
	Pre 1st May 2012	Post 1st May 2012	Pre 1st May 2012	Post 1st May 2012
E-waste (Management & Handling) Rules 2011		√		
Hazardous Waste (Management, Handling & Transboundary) Rules 2008	√		√	√
Guidelines for Environmentally Sound Management of E-waste 2008	√	√		
Guidelines for Implementation of E-waste Regulations 2012	√	√		

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.

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
Collection	**Manufacturing**	√					
	End of Life	√					
Take-back	**Individual**	√					
	Collectively	√					
Transportation to	**Producer**		√	√			
	Collection Centre	√	√	√			
	Dismantlers/ Recyclers	√	√	√	√	√	
	TSDF* Facility	√				√	√
Storage					√	√	√
Financing		√					
Registration		√			√	√	
Filing of Annual Returns		√			√	√	√
Return of Annual Inventory Handled		√		√	√	√	√

Note: √ 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, poly-brominated 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 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.

<u>Scope of EPR for the Producer:</u>

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**.

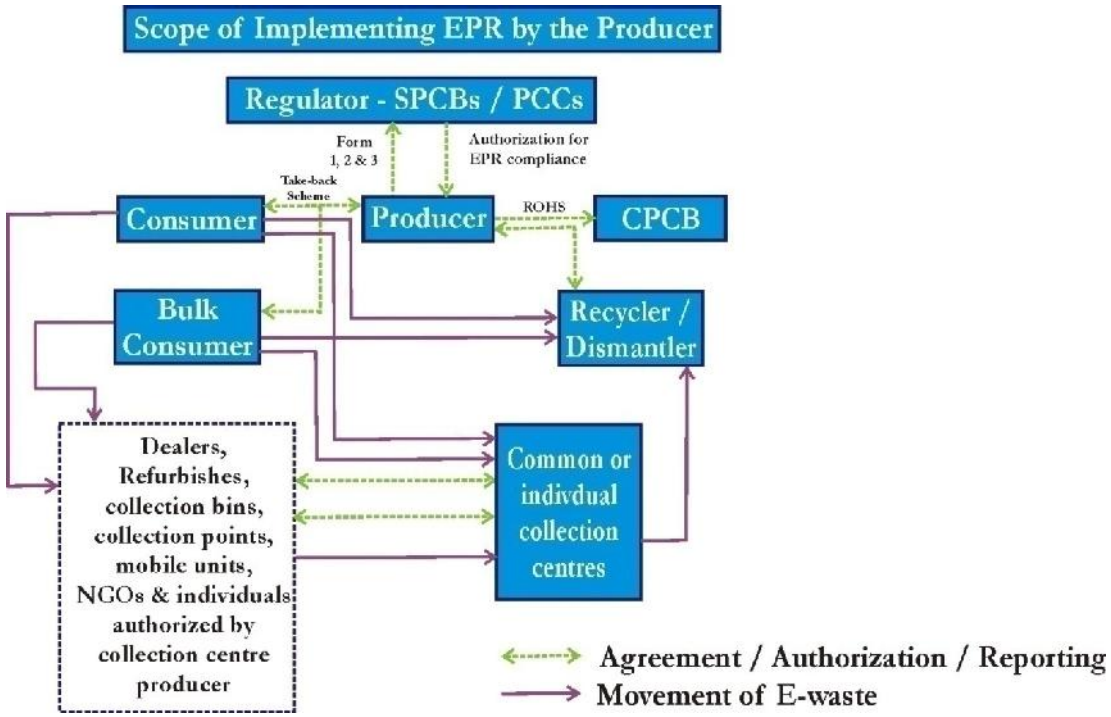


Figure 2.1: Scope of implementing EPR for Producers

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.

<u>The criteria for setting up collection centres are</u>

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.

    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**.

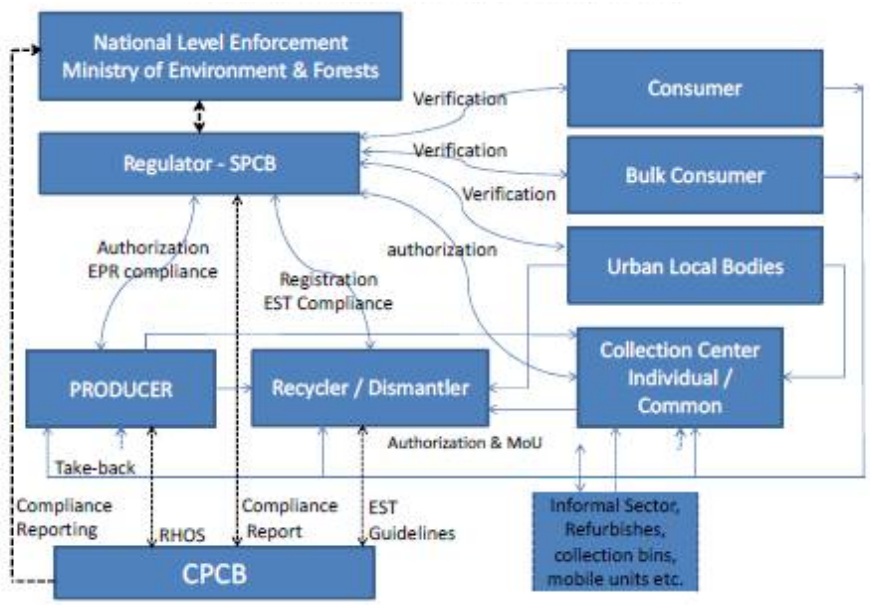


Figure 2.2: Implementation of E-Waste Rules 2011

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**.

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

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

Sr. No.	Authority/(ies)	Duties
		viii. Any other function delegated by the Ministry under these rules
3.	Urban Local Bodies (Municipal Committee/Council/Corporation)	(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**.

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
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 MoEF.
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	i. Grant licence for import of hazardous wastes ii. Refuse licence for hazardous wastes prohibited for imports and exports.

Sr. No.	Authority/(ies)	Duties and Corresponding Rule
5.	Port Authorities under Indian Port Act 1908 and Customs Authorities under the customs Act, 1962	i. Verify the documents ii. Inform the ministry of Environment and Forests, Govt. of India of any illegal traffic 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	X	X	X	X
2.	Bulk Consumer	√	√	X	X	X	X
3.	Urban Local Bodies	√	X	X	X	X	X
4.	Collection Centre	√	√	√	√	X	X
5.	Producer –offer to sell	√	√	√	√	X	√
6.	Producer - importer	√	√	√	√	X	√
7.	Producer - Manufacturing EEE	√	√	√	√	X	√
8.	Dismantler	√	√	√	√	√	X
9.	Recycler	√	√	√	√	√	X

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 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.

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 Telecommunication Equipment**																				
1.	Centralized Data Processing	√	√	√	√	√		√	√	√	√		√					√	√		√
2.	Mainframes	√	√	√	√	√		√	√	√	√		√					√	√		√
3.	Mini Computers	√	√	√	√	√	√	√	√	√	√		√					√	√		√
4.	Personal Computing	√	√	√	√		√	√	√	√	√		√								
5.	Personal Computers (Central processing unit with input and output devices)	√	√	√	√		√	√	√	√	√	√	√						√		√
6.	Laptop Computers (Central processing unit with input and output devices)		√	√	√	√		√	√	√	√		√	√				√	√		√
7.	Notebook Computers	√	√	√	√	√		√	√	√	√		√	√				√	√		√
8.	Notepad Computers	√	√	√	√	√		√	√	√	√		√	√				√	√		√
9.	Printers including cartridges	√	√	√	√	√			√	√	√		√					√			√
10.	Copying Equipment	√	√	√	√	√		√	√	√	√		√					√			√
11.	User Terminals and Systems	√		√	√	√	√		√	√	√	√	√					√			√
12.	Facsimile	√	√	√	√				√	√	√		√					√			√
13.	Telephones	√		√	√				√	√	√		√								√
14.	Pay Telephones	√		√	√			√	√	√	√		√					√	√		√
15.	Cordless Telephones	√		√	√			√	√	√			√					√	√		√
16.	Cellular Telephones	√	√	√	√	√		√	√	√			√					√	√		√
17.	Answering Systems	√	√	√	√			√	√	√			√					√	√		√
II.	**Consumer Electrical and Electronics**																				
18.	Cathode Ray Tube (CRT) TV	√		√		√				√	√	√	√					√			√
19.	Liquid Crystal Display (LCD) TV	√		√		√				√	√		√	√				√			√
20.	Light Emitting Diode (LED) TV	√		√		√				√	√		√	√				√			√
21.	Refrigerator	√	√	√	√	√			√	√					√		√	√		√	√
22.	Washing Machine	√	√	√		√			√	√			√			√	√				√
23.	Air Conditioners excluding centralized air conditioning plants	√	√	√	√				√	√			√				√	√		√	√
24.	Compact Fluorescent Lamp CFL																				

√ 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**.

Table 3.2: Possible Hazardous Substances in E-waste Components

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

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.

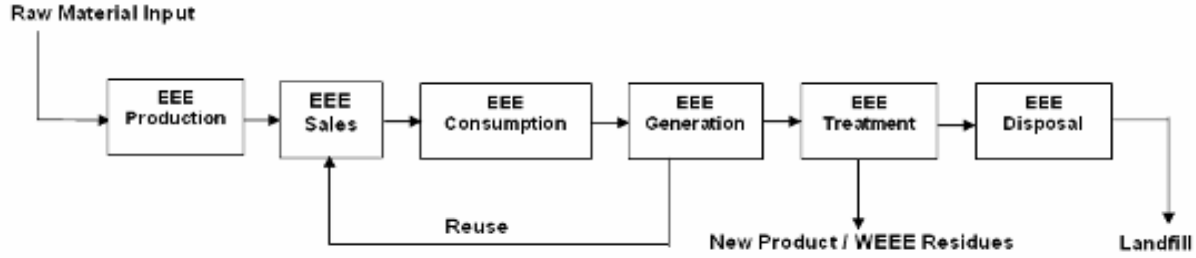


Figure 3.1: Conceptual E-waste trade value chain

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.

Table 3.3: Phases of material flow model

S.No.	Phase	Stakeholders
1.	Phase I: 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.	Phase II: 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.	Phase III: 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.	Phase IV: 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.

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.

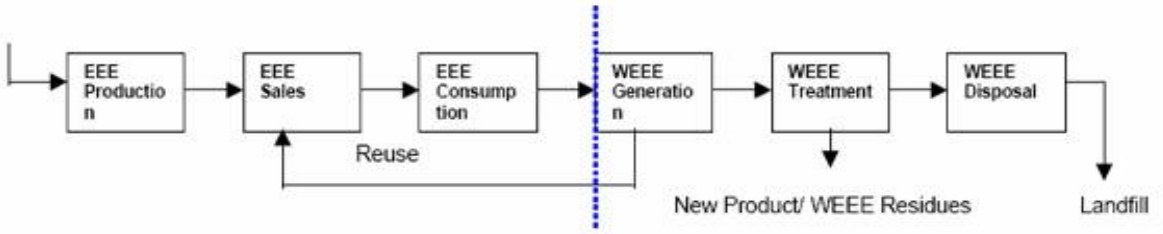


Figure 3.2: Generic E-waste trade value chain in a developing country

Source: UNEP Manual Vol. II; Inventory Assessment Manual

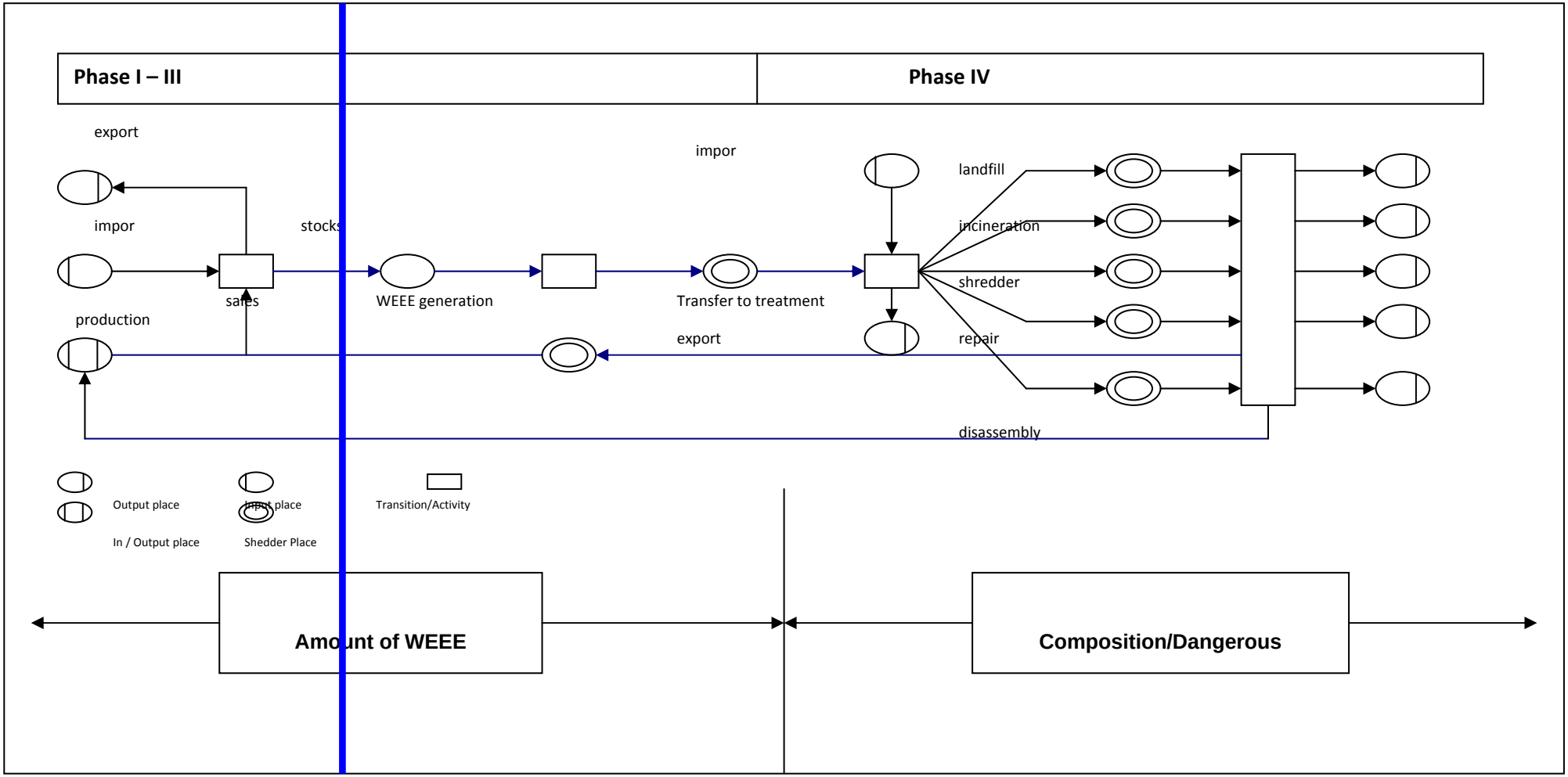


Figure 3.3: The 'Four-Phase-Model'

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.

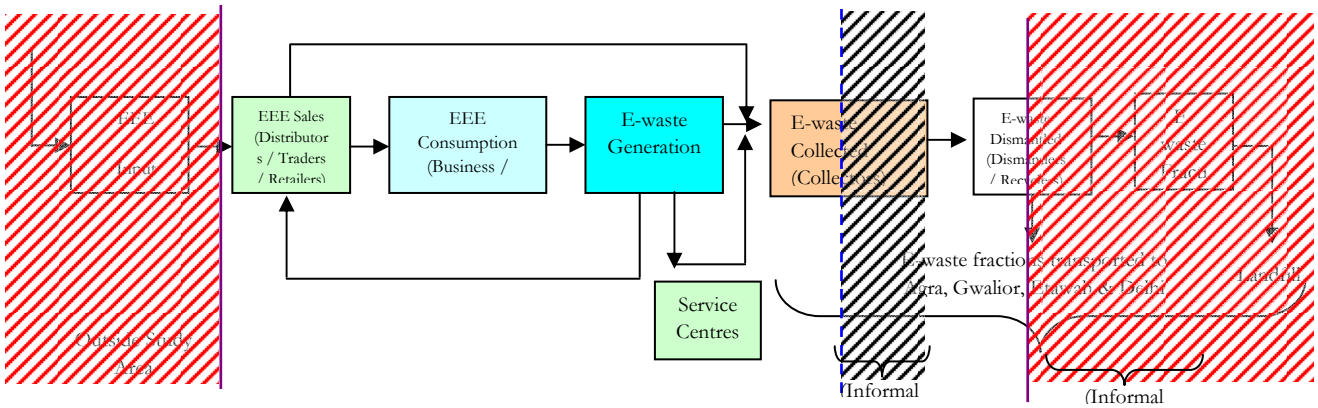


Figure 3.4: Tentative E-waste trade value chain in Study Area

Producers

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.

Consumers

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**.

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

Brands	Collection through Call Centre	Collection through Dealers / Retailer	Collection through Service Centre	Collection through Collection Centre / establishment	Remarks
LG	√		√	√	
Panasonic	√		√		
Samsung	√			√	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	√	√			Exchange your electronic item to your nearest dealer or where you buy the product
Electrolux	√	√			Exchange your electronic item to your nearest dealer or where you buy the product
Godrej	√	√			
Hitachi	√				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	√	√			E-waste Regarding no information Contact to nearest dealer
Philips	√			√	Call on customer care door to door collection of E-waste / discarded items of Philips
Whirlpool	√	√			To dealer he exchange your electronic item
Printers					
HP	√	√			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 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.

Informal Sector

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.

Market Features

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**.

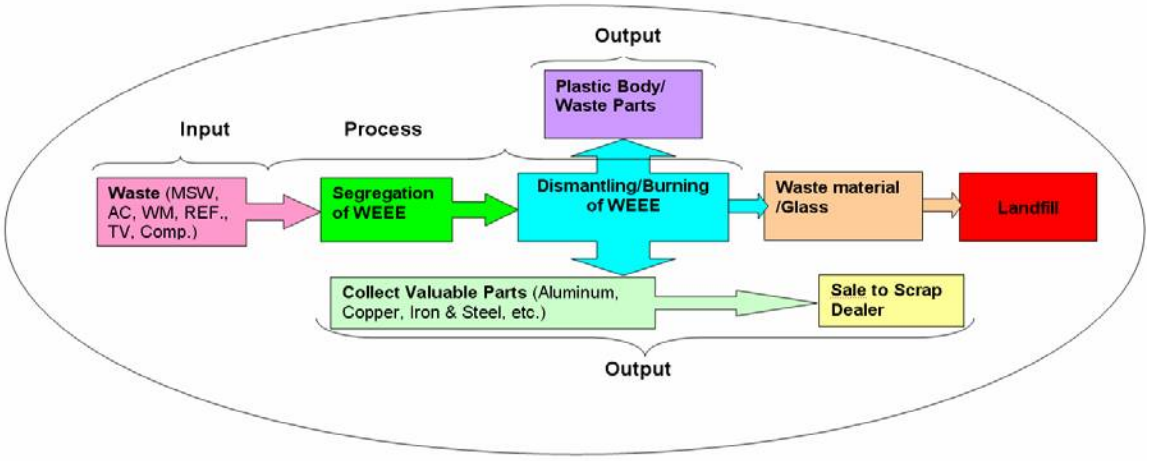


Figure 3.5: Processes observed at dumpsite

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**.

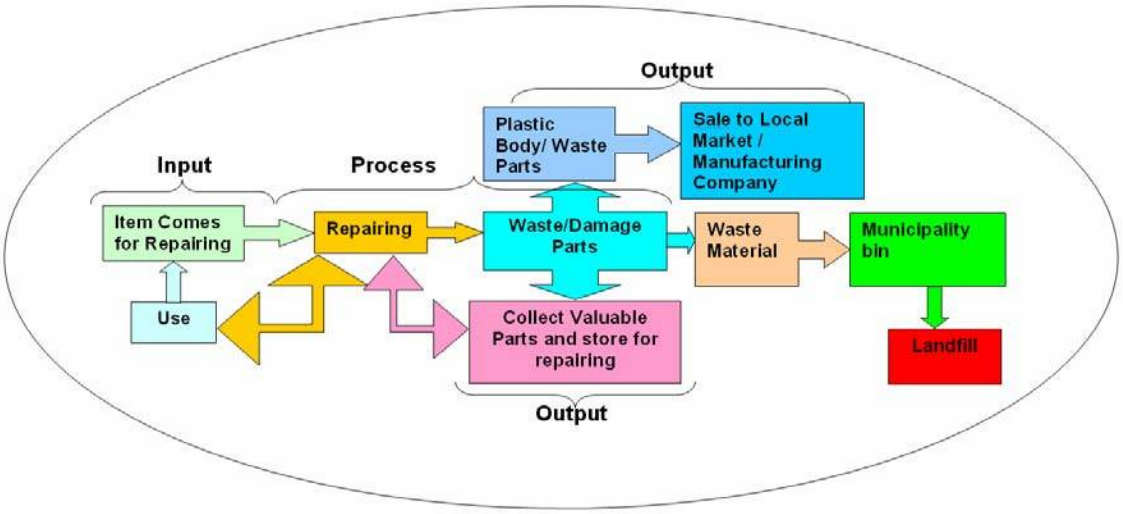


Figure 3.6: Processes observed at scrap dealers / junkyards

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**

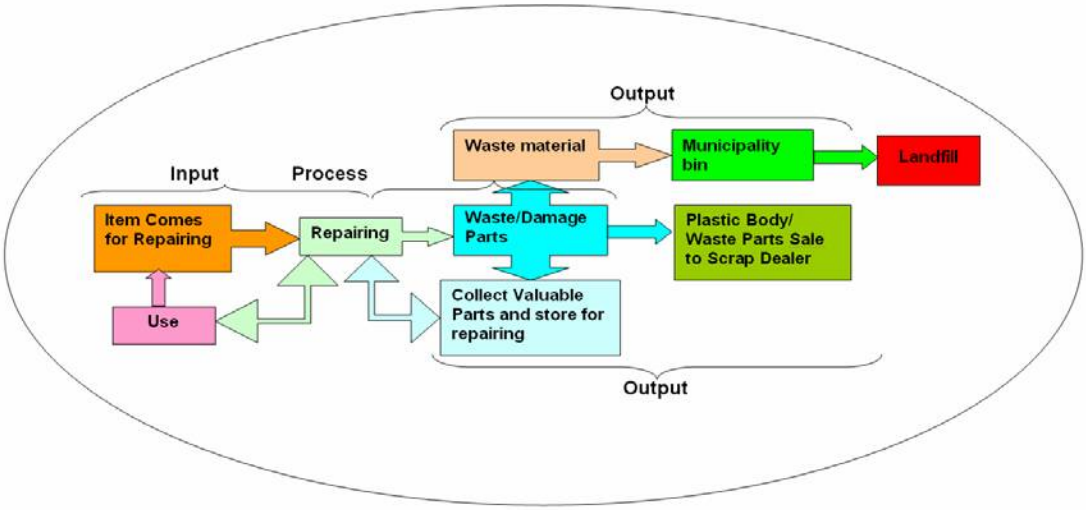


Figure 3.7: Processes observed at AC, Washing Machine, and Refrigerator Repair Shop

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**.

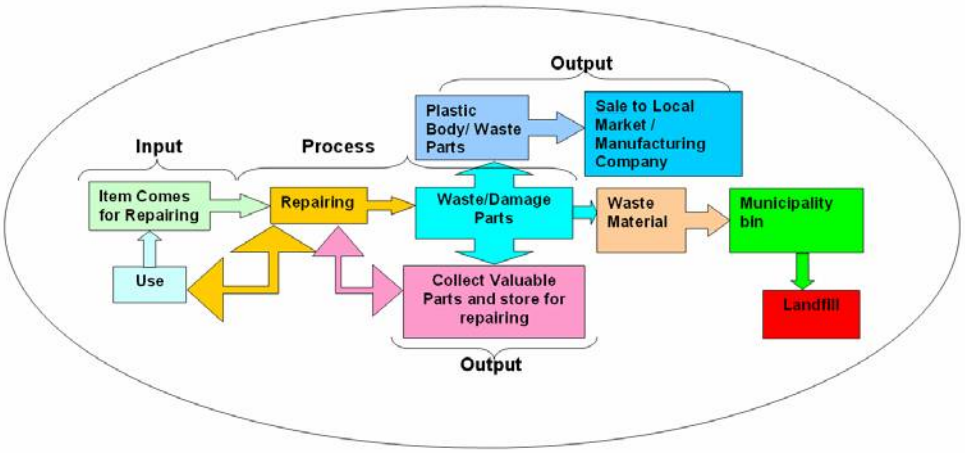


Figure 3.8: Processes observed at TV, Computer, and Mobile Phone Repair Shop

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**.

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

Sr. No.	Process name	Process Status				
		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

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.

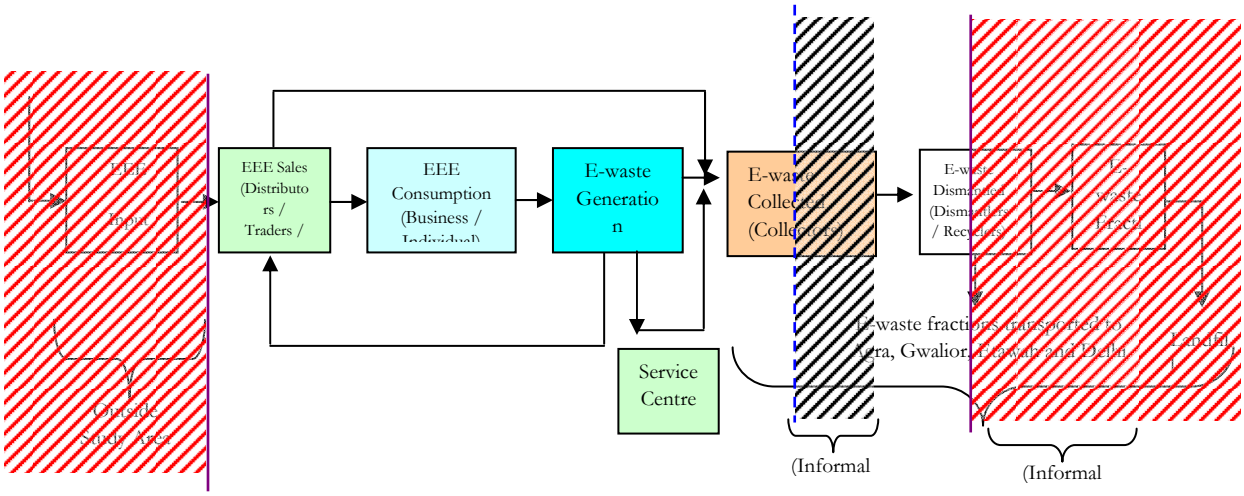


Figure 4.1: E-waste material flow chain in Study Area

Major observations related to data availability are given below.

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 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)
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		

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.

Table 4.2: Data Matrix Vs Methodology

Methodology/ Data Requirement	Saturation Level		Number of Household	Calculated Sales			Stock Data		Average Lifetime	Storage data	Reuse	Recycle / dismantling	Land fill
	Household	Industry		Export Data	Import Data	Manufacturing / Production	Private	Industry					
Time Step Method	X		√	X	X	√	X	X					
Market Supply				X	X	√			√				

Methodology/ Data Requirement	Saturation Level		Number of Household	Calculated Sales			Stock Data		Average Lifetime	Storage data	Reuse	Recycle / dismantling	Land fill
	Household	Industry		Export Data	Import Data	Manufacturing / Production	Private	Industry					
Method													
Carnegie Mellon Method				X	X	√			√	√	√	√	√
Approximation 1	X	X	√			√	X	X	√				
Approximation 2				X	X	√							

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.

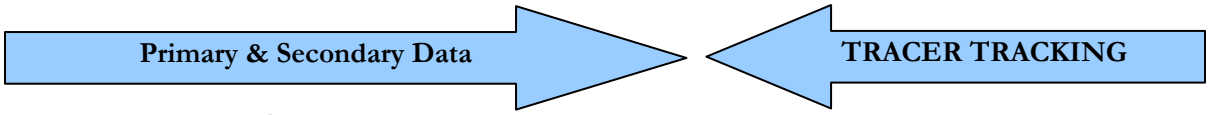


Figure 4.2: WEEE/E-waste data collection approach along the material flow chain in Surguja Division

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 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**.

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

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

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 Area (in numbers)

Year	Surajpur	Surguja	Jashpur	Balrampur	Koriya
2006	10278	10986	11184	9334	8782
2007	8621	9189	9314	7828	7301
2008	9953	10577	10676	9036	8351
2009	9073	9609	9659	8233	7538
2010	8312	8770	8783	7539	6835
2011	7987	8506	8621	7394	6670
2012	7696	8170	8255	7133	6364
2013	7419	7849	7908	6885	6073
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: 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

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

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

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

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**.

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

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air 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 5.13: E-waste Inventory of Surajpur District (in Tons)

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air 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

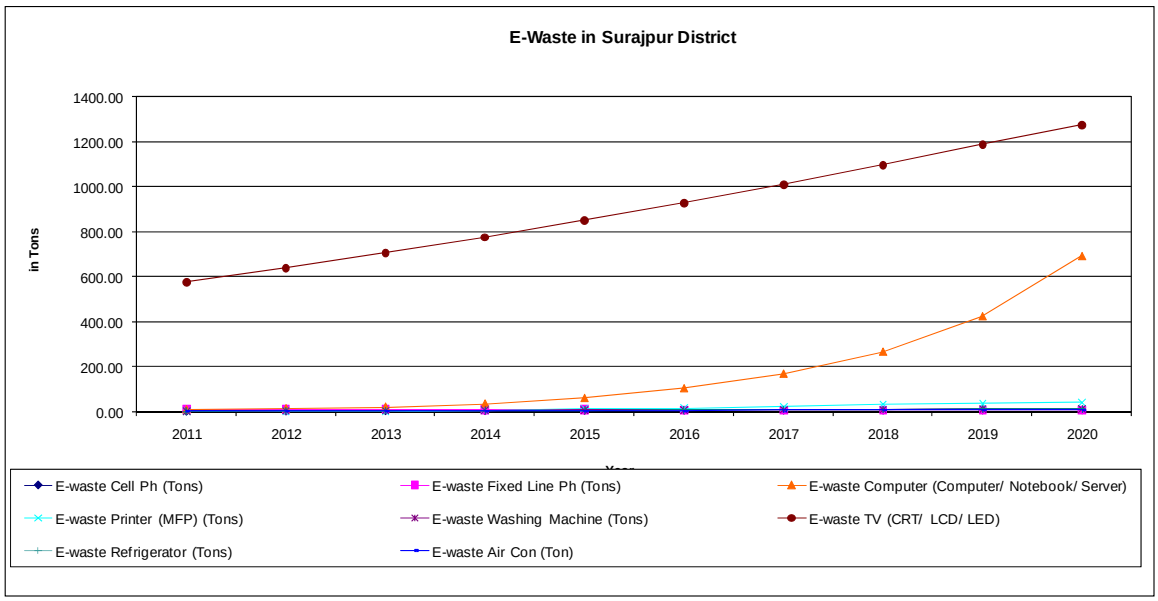


Figure 5.1: Item wise E-waste Projection of Surajpur District

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

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 5.15: 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

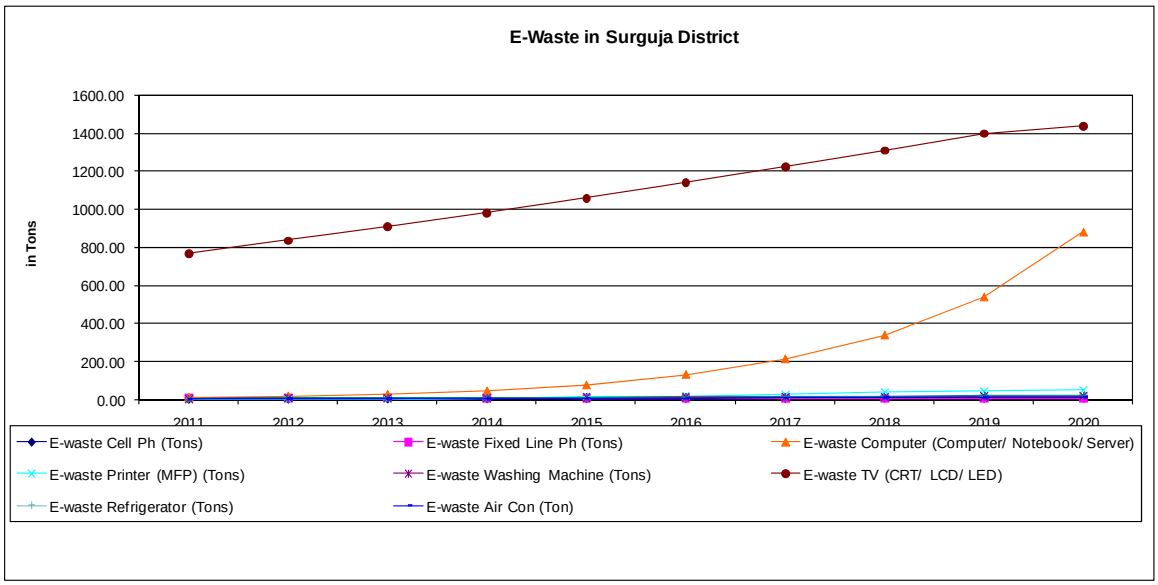


Figure 5.2: Item wise E-waste Projection of Surguja District

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

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air 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 5.17: E-waste Inventory of Jashpur District (in Tons)

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air 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

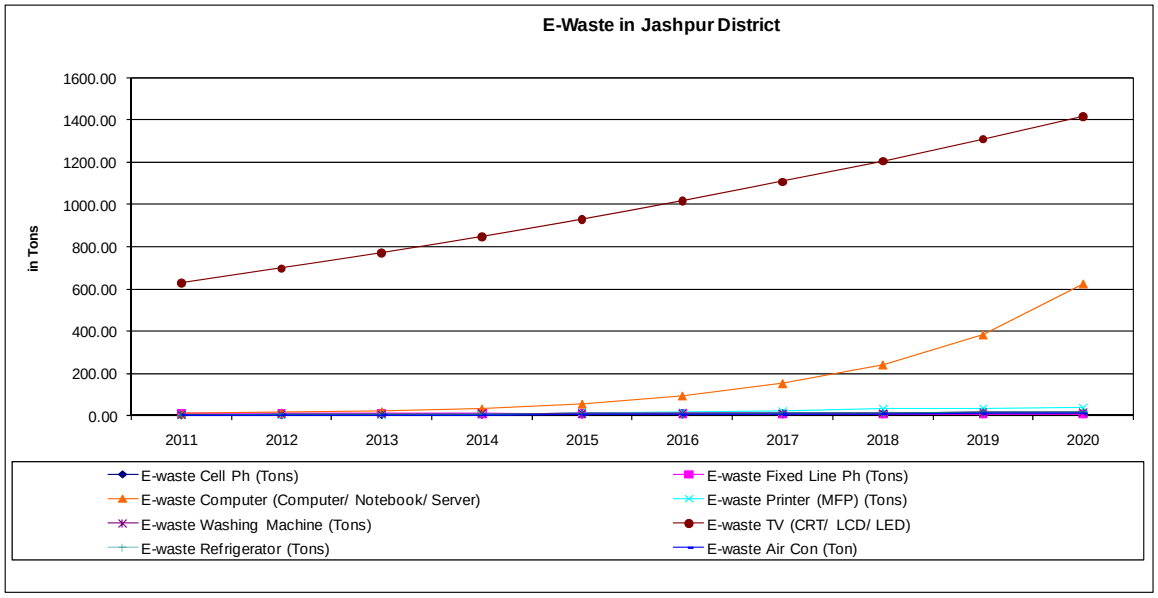


Figure 5.3: Item wise E-waste Projection of Jashpur District

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	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 5.19 E-waste Inventory of Balrampur District (in Tons)

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

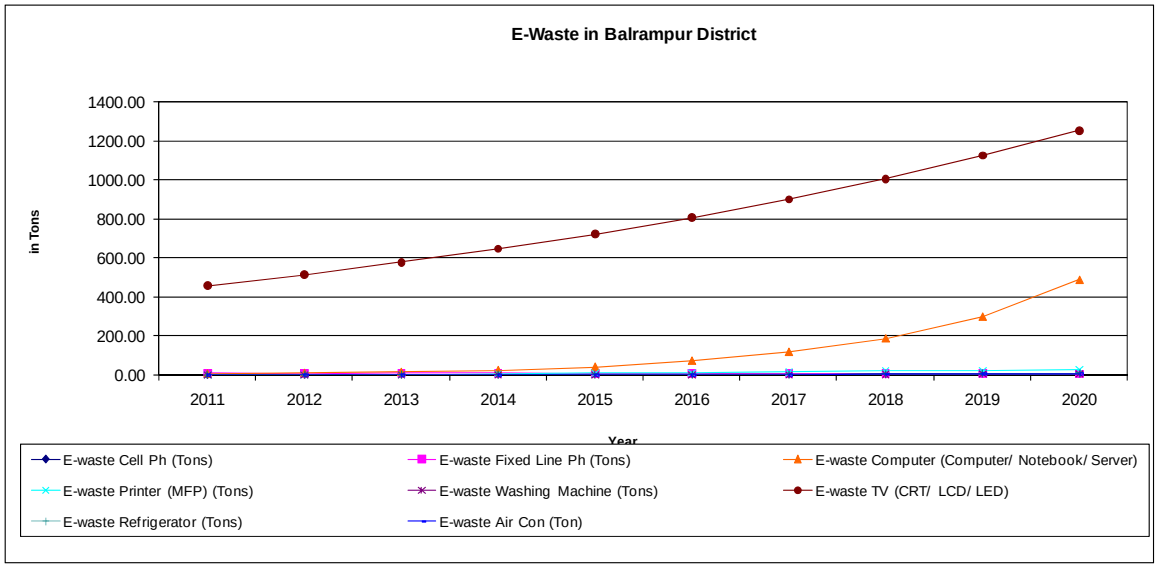


Figure 5.3: Item wise E-waste Projection of Balrampur District

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

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 5.21 E-waste Inventory of Koriya District (in Tons)

Year	Cellular Phone	Fixed Line Telephone	Computer	Printer	Washing Machine	TV	Refrigerator	Air 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

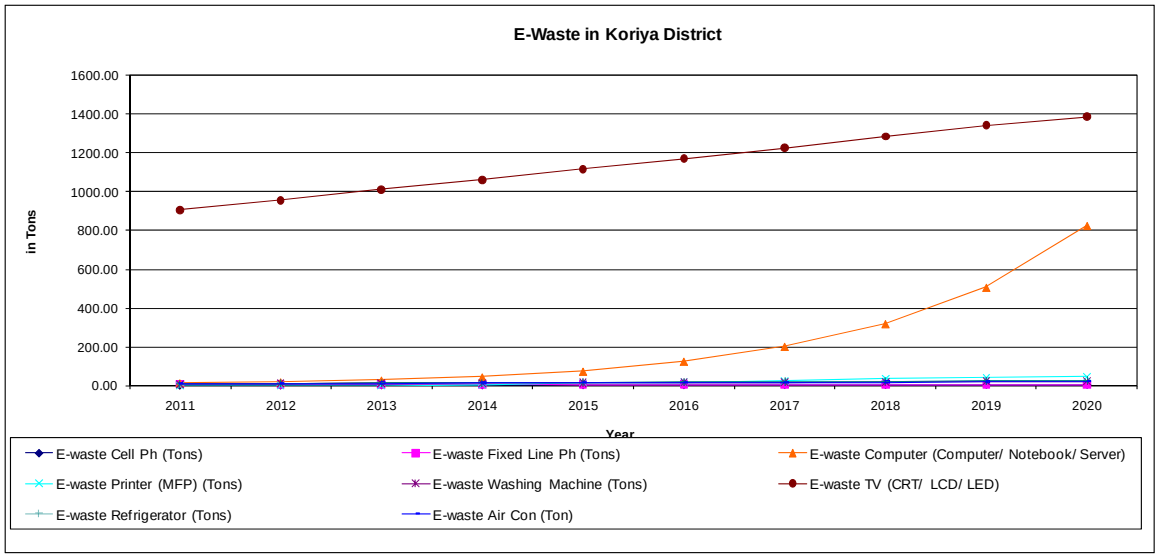


Figure 5.3: Item wise E-waste Projection of Koriya District

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

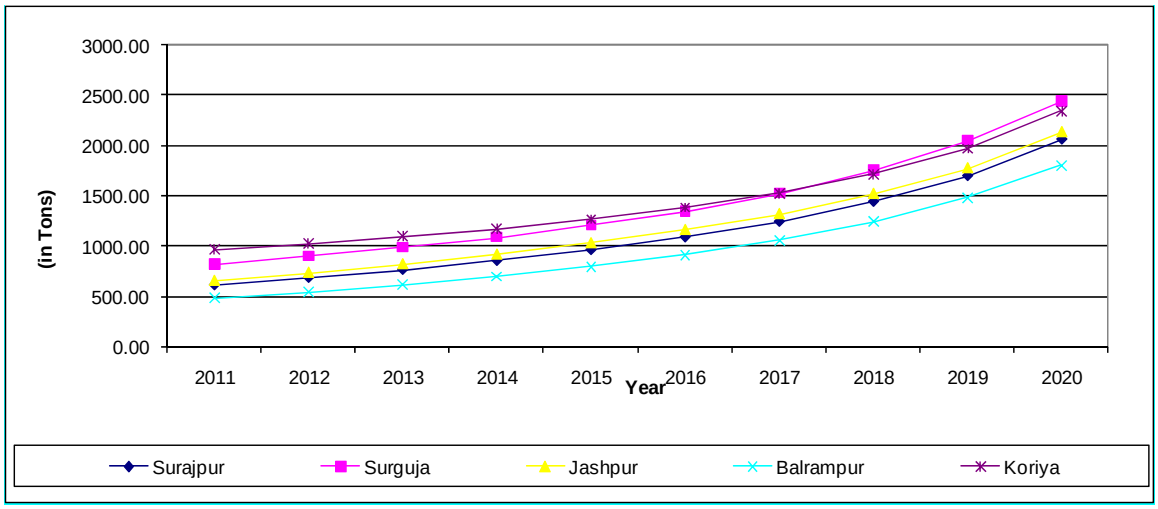


Figure 5.6: District wise Total E-waste Inventory Projection

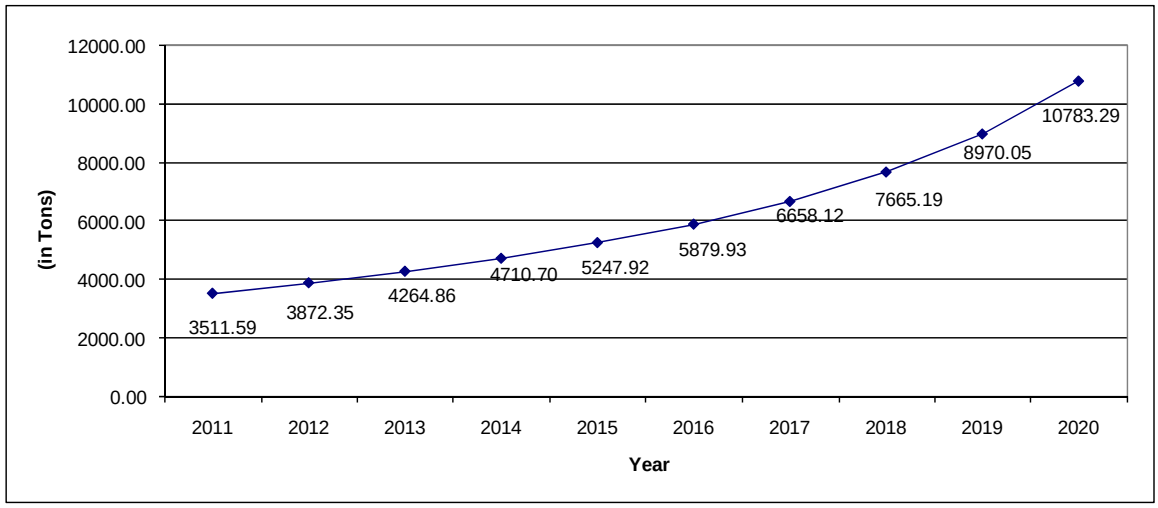


Figure 5.7: Total E-waste Inventory Projection in Surguja Division from 2011 to 2020

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.
2. 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%).

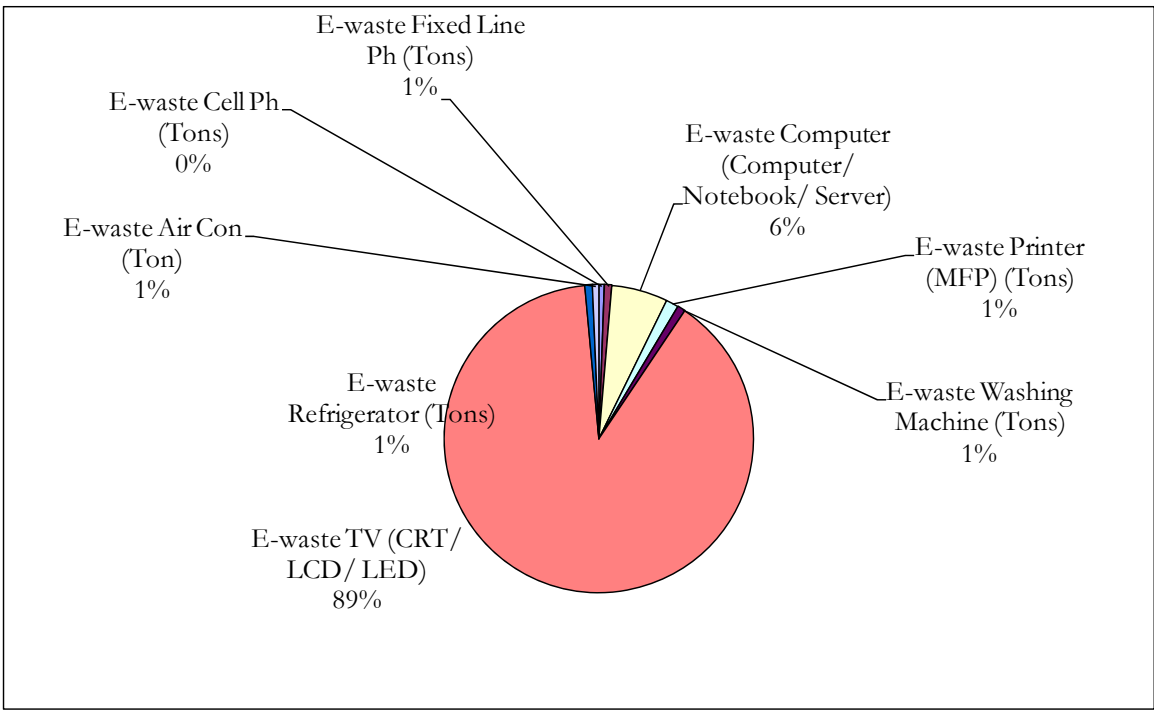


Figure 5.8: Item-wise E-waste in Percent for Surguja Division in 2015

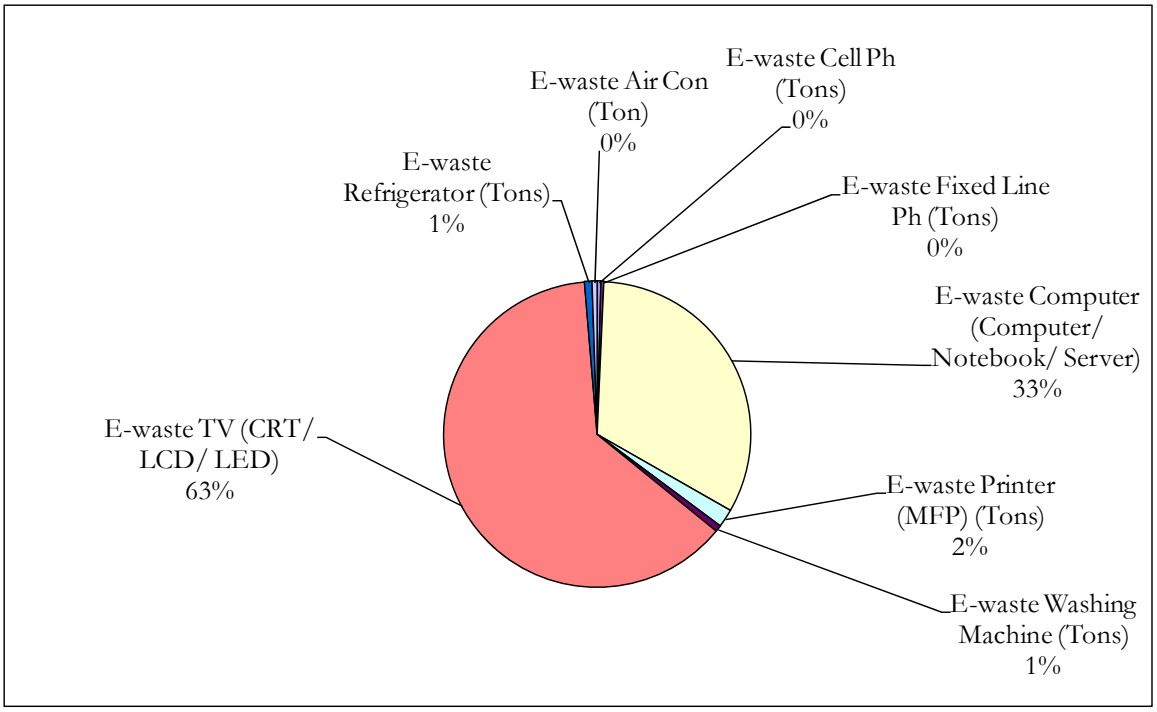


Figure 5.9: Item-wise E-waste in Percent for Surguja Division in 2020

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.

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

Sr. No.	Process name	Process Status				
		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

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 economics of Surguja Division E-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

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 Risk Matrix

Risks/ intensities		High	Medium	Low
Risks of availability of raw material	Short term		□	
	Long term		□	
Risk associated with collection	Short term	□		
	Long term		□	
Risk associated with transportation	Short term			□
	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 E-waste 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.

Detailed Inventory 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
		Group Companies		**Allied JB Friction Private Limited** A-12, Site IV, Industrial Area, 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 – 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 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 Category	Brand	Address / Contact Details
				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) 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, 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. 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	LG Electronics India Pvt. Ltd, Plot No. 51, Udyog Vihar, Surajpur Kasna Road, Greater Noida: 201306 Uttar Pradesh
		Manufacturing Facilities	Markson	**SGV Industries** Plot No.41 & 42, Sector-6A, Sidcul Indl Area, Haridwar (Uttrakhand) 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
				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
		Head Office		PLOT No. 378, F.I.E, PATPARGANJ, DEHLI - 110092 Ph. No. +91-11-43086501-502, 22157662-63
		Corporate & Head Office	Moser Baer	43B, Okhla Industrial Estate, New Delhi - 110020. India. Tel +91 11 40594444, 91 11 26911570 - 74 Fax +91 11 41635211, 26911860
		Branch Offices		**Chennai** Moser Baer India Ltd. 81, IInd Floor 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
		Representative & Distributor		**USA Distributor** **Media Masters LLC** #440, 2601 S. Minnesota Ave., Ste 105 Sioux Falls, SD 57105-4750 USA Phone: +1-(888)-243-4465 Fax: +1-(877) 835-2834 E-mail: sales@mediamastersdisc .com
		Manufacturing Facilities		**BOM & M& ES** 66, Udyog Vihar, 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
		Corporate Address	Onida	MIRC Electronics Ltd. Onida House, G-1, M.I.D.C, Mahakali Caves Road, Andheri (E), Mumbai - 400 093. 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	**Samsung India Electronics** 6th, 7th & 8th Floors, Ifci Tower, 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	**Philips Electronics India Limited** 9th Floor, DLF 9-B, 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, 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 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
				2nd Floor, Hameedia Centre, 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 Category	Brand	Address / Contact Details
				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	**TCL India Holding Pvt. Ltd.** Sco 254, 2nd Floor, Sector 44 C 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
			T-Series	**Laxbro Manufacturing Company** W-53, MIDC Area, Bhosari Indl. Estate, PMC – 411026, Maharashtra
			Toshiba	**TOSHIBA INDIA PVT. LTD.** 3rd Floor, Building No. 10 Tower - B, Phase - II 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, 100 Feet Road Indiranagar, Bangalore - 560038,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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	**Videocon Industries Ltd.** 14 Kms Stone, Aurangabad-Paithan 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
			Weston	**Westway Electronics Limited** B-102, Phase – II, Noida – 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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
			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
			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	Next Retail India Limited, 3rd Floor, Aadeshwar Arcade Above Loop Gallary, 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. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				'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
			Gem	**Gem Equipments Pvt. Ltd.** S.F. No. 103, Avanashi Road, Arasur

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 Fax: +91 33 30489230
				Bangalore Factory: IFB Industries Limited

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				16/17, Visveswaraiah 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
			Samsung	Given Above
			Toshiba	Given Above
			Videocon	Given Above
			Whirlpool	Given Above
	Air Conditioner	Window	Blue star	**Corporate Headquarters** Kasturi Buildings, Mohan T Advani Chowk, Jamshedji Tata Road, 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 **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. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 Himachal Pradesh 173030 **Tel :** (91) (01702) 238760

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 / 2573670 / 2570024 **Fax:** (91) (674) 2570544
				Chandigarh Adarsh Mall, 4th Floor, Plot No. 50,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 Category	Brand	Address / Contact Details
				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. 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 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
			Carrier	**INDIAN HEADQUARTERS :** **Carrier Airconditioning & Refrigeration Limited** Delhi - Jalpur Highway, Narsingpur, Gurgaon, 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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 & 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 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 Category	Brand	Address / Contact Details
				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 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
				ETA General Pvt. Ltd.

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 : 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 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 KOLKATA - 700 017 Tel : 033 - 40602006
			Godrej	Given Above
			Haier	Given Above
			Hitachi	Given Above
			LG	Given Above
			Onida	Given Above

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
			Samsung	Given Above
			Videocon	Given Above
			TCL	Given Above
	Corporate Headquarters		Voltas	**Voltas Limited** Voltas House 'A' Block Dr. Babasaheb Ambedkar Road Chinchpokli Mumbai 400 033 Tel: 022-66656 666
	Factories			2nd, Pokhran Road, 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
			Mitsubishi	**Gurgaon Head Office** 2nd Floor, Tower A & B, DLF Cyber Greens, Dlf Cyber City, DLF Phase -III,Gurgaon-122002, India Phone: +91 (124) 463-0300 +91

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				(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: +91 (44) 4923-2249

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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: +91 (44) 2847-7374
			Panasonic	Given Above
			Samsung	Given Above
			Sanyo	Given Above
			TCL	Given Above

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
			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
			Siemens	Registered & Corporate Office 130, Pandurang Budhkar Marg, Worli, Maharashtra, Mumbai 400 018. Tel: +91 22 3967 7000 Fax: +91 22 3967 7500
	Mobile Phones		Acer	Acer India Private Limited 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
				Distributors

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 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	**Amazon Development Center India Pvt Ltd** Q-city, 2nd Floor-Block A & Block B Survey Number-109,110,111/2, 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
				#40,3rd Floor, SP Infocity M G R Salai, Perungudi

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 Tel: (519) 888-7465 Fax: (519) 888-7884
				BlackBerry United States BlackBerry 5000 Riverside Drive,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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	**BLU Products** 10814 NW 33rd St# 100 Doral, FL 33172 (305) 715 – 7171
			Bosch	Bosch Sicherheitssysteme GmbH Robert-Bosch-Ring 5 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

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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 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
				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
			Dell	Dell Computer Corporation One Dell Way

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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
				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.

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
				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. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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, 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, Oberoi Garden City, Off. Western Express Highway,

Sr. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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	**Huawei Telecommunication (INDIA) Co. Pvt Ltd.** 7th Floor, Tower A, Spaze I-Tech Park, Sohna Road, 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	Karbonn Mobiles #39/13, off 7th main, HAL 2nd stage Appareddy Palya, Indiranagar, Bangalore – 560038 Tel: 080 40894888
				Karbonn Mobiles D-170, Okhla Industrial Area, Phase-1 New Delhi – 110020 011 46604660
			Kyocera	**KYOCERA Corporation** **Cutting Tool Group** 6 Takeda, Tobadono-cho, Fushimi-ku, Kyoto 612-8501, Japan Phone: +81-75-604-3473 Fax: +81-75-604-3472
				KYOCERA Asia Pacific India Pvt. Ltd. 1001A, 1001B, 1002, 10th Floor JMD Regent Square, M.G. Road Gurgaon-122 002 Haryana, 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. No.	Product Name	Product Sub Category	Brand	Address / Contact Details
				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

Partial list of Distributor, Trader & Retailer in Surguja Division – Annexure 2

Sl. No.	Name	Address	Latitude			Longitude		
			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,	22	53	6.7	84	8	10.8

Sl. No.	Name	Address	Latitude			Longitude		
			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

Sl. No.	Name	Address	Latitude			Longitude		
			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
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
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

Sl. No.	Name	Address	Latitude			Longitude		
			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	Sri Ram Electronics Mobile & Eletronics	Hospiral Road, Ambikapur, Sarguja	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

Sl. No.	Name	Address	Latitude			Longitude		
			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	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			Longitude		
			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

Partial list of Bulk Consumers in Surguja Division- Annexure 3

Sl. No.	Name	Address	Latitude			Longitude		
			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	49-.2
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

Sl. No.	Name	Address	Latitude			Longitude		
			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			Longitude		
			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
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

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
		Balrampur						
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
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

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			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								
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
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

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			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
Surajpur								
1	Kamal Electronics	Near Poice Stn., Pratappur Road,	23	23	27.6	82	51	0.7

Sl. No.	Name of Shops	Address	Latitude			Longitude		
			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

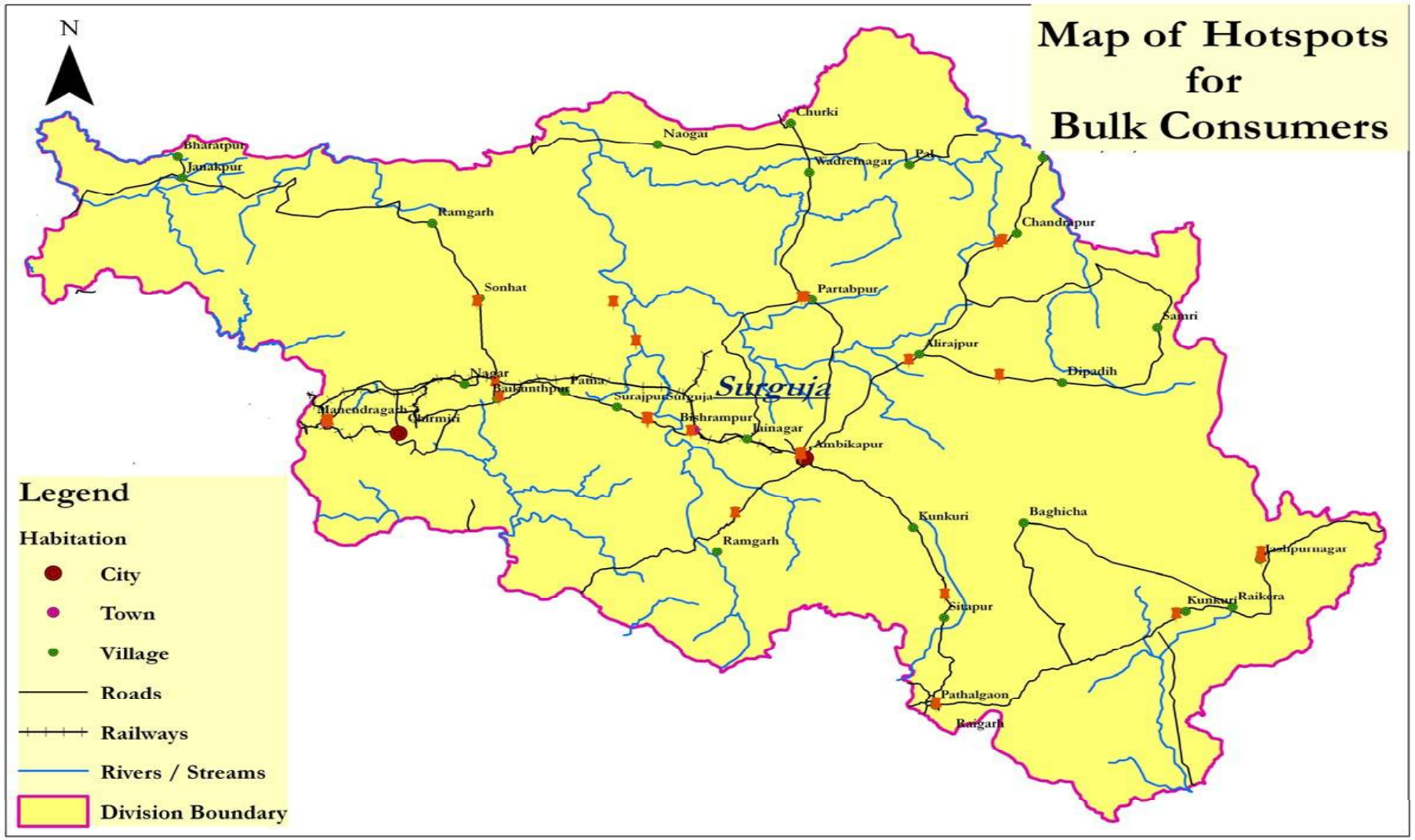
Inventory of Physically Established Collection Center- Annexure 5

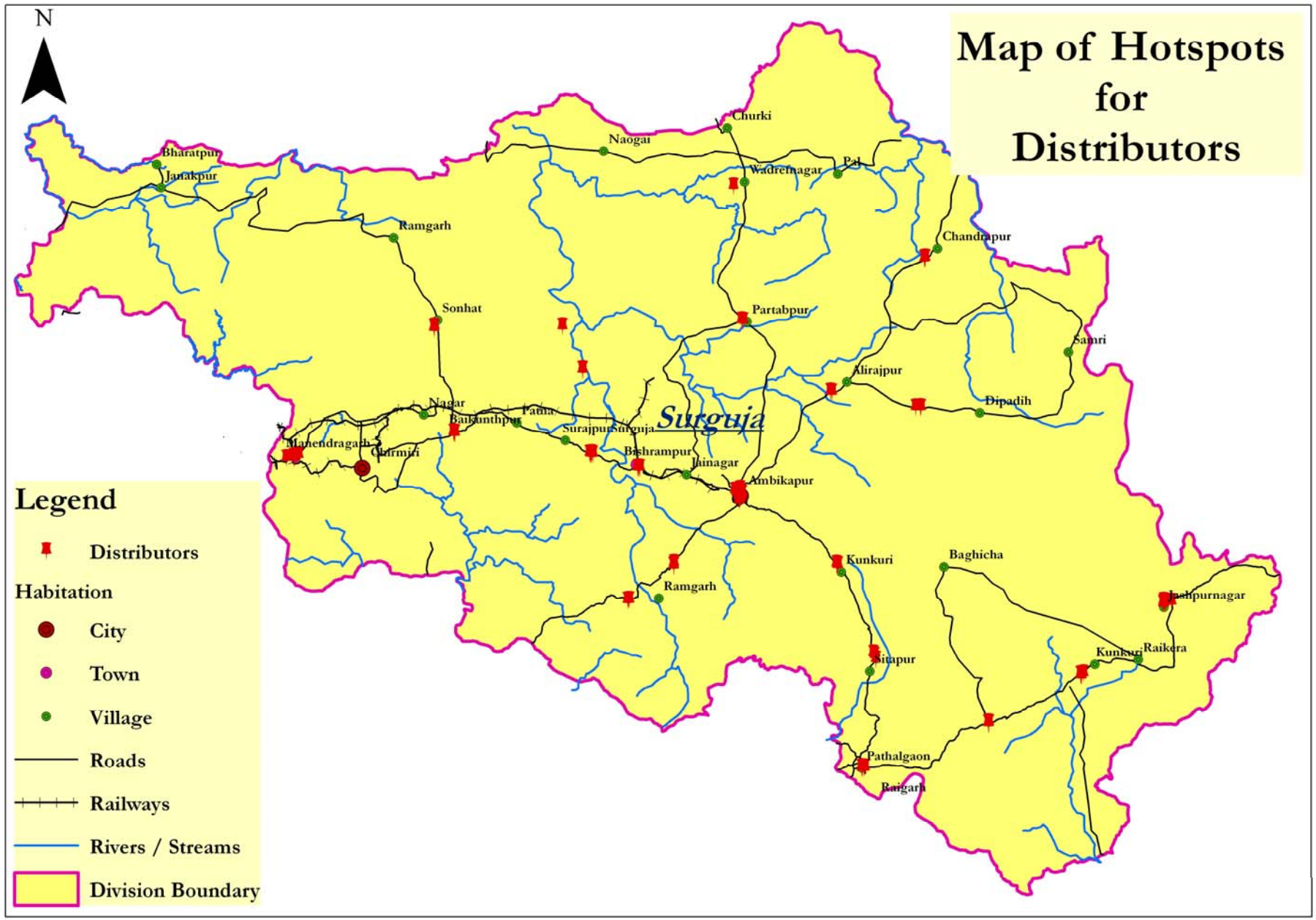
Sl No.	Name	Address
1.	M/s Navrachna Recycling Pvt. Ltd.	**Plot No 1B, Somni Industrial Area, Rajnandgaon**
2.	M/S ADV Metal Combine Private Limited	**Borai Industrial Growth Center, Durg**

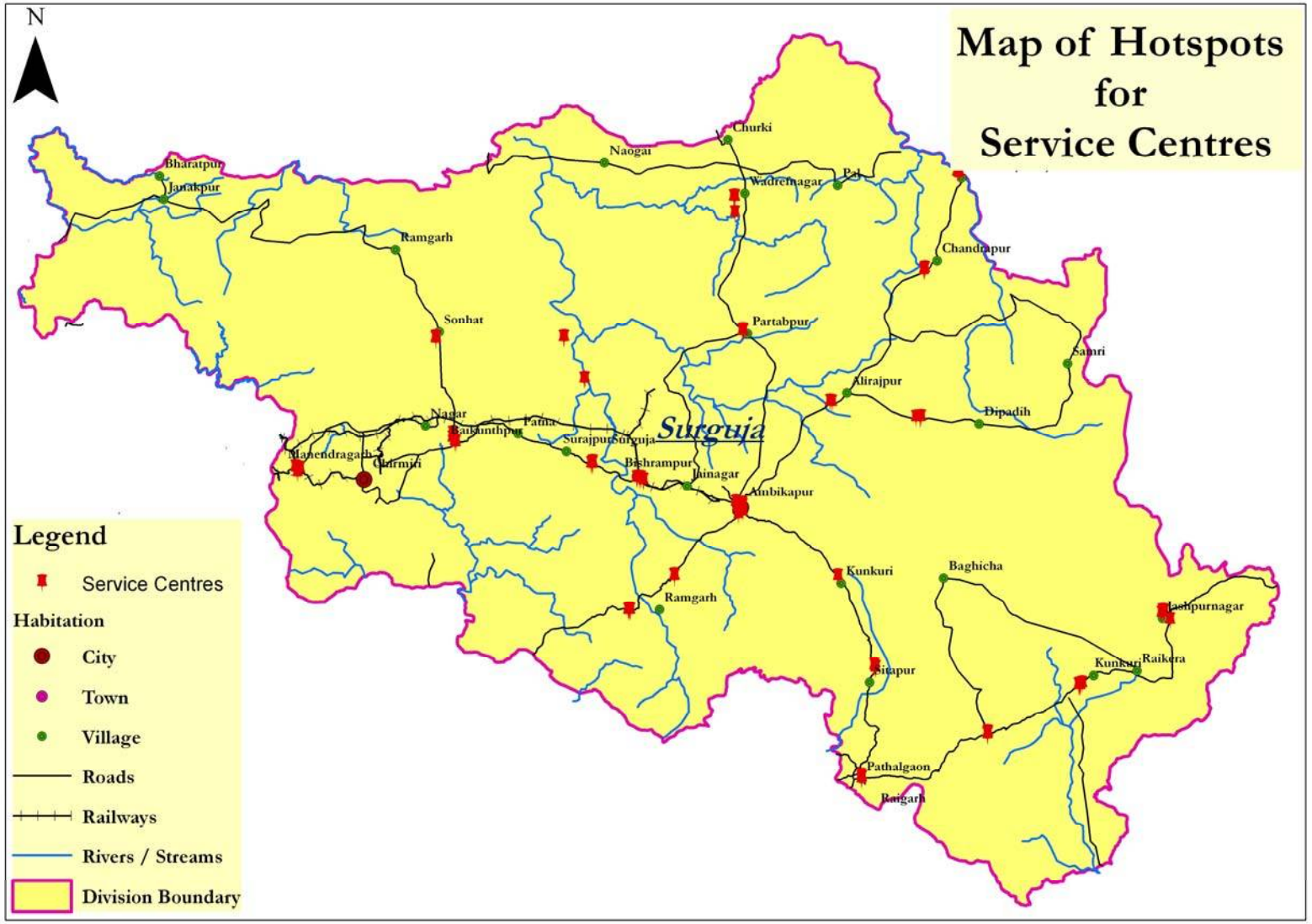
Partial inventory of Scrap Vendors/ Dismantler – Annexure 6

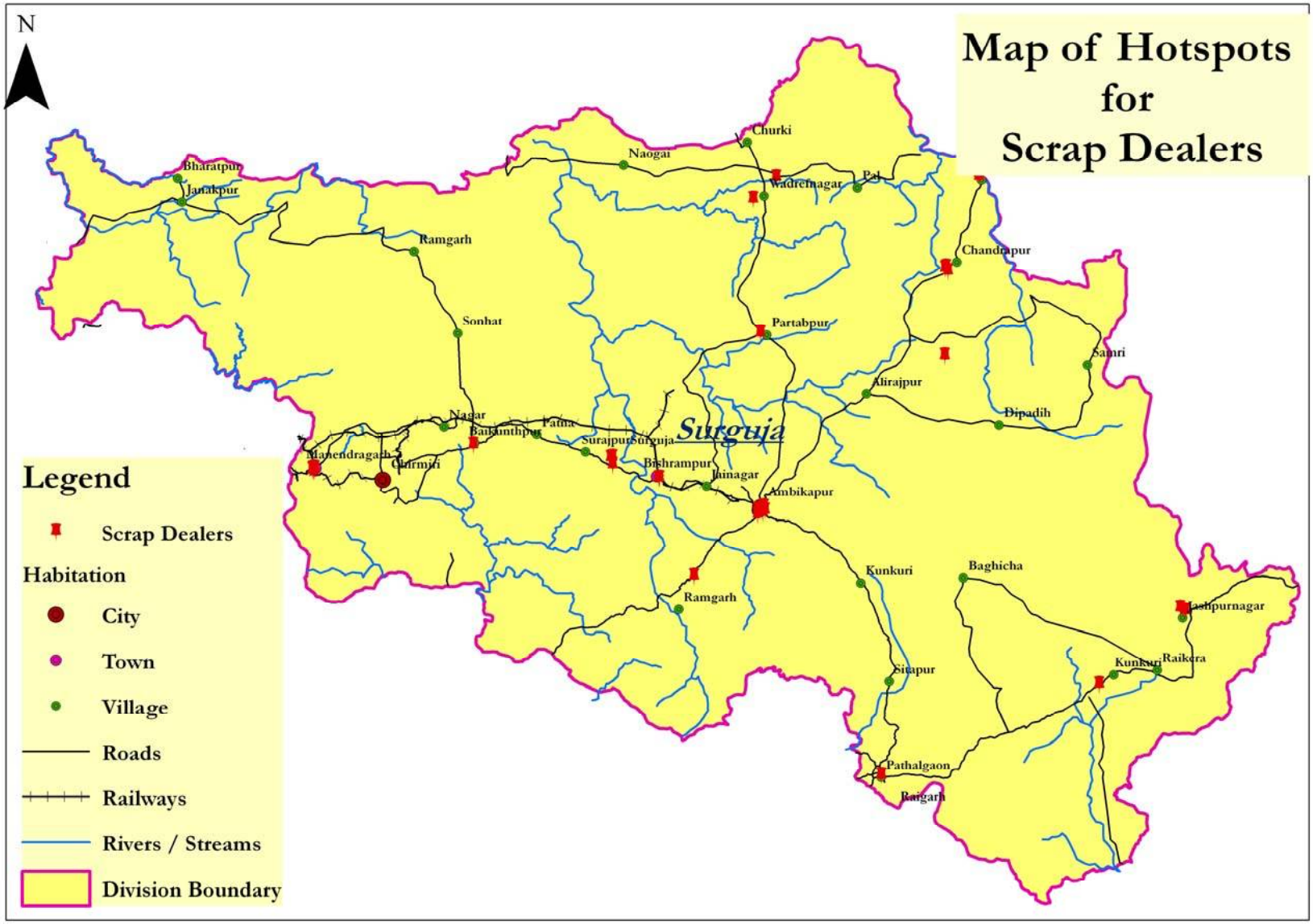
Sl. No.	Name	Address	Latitude			Longitude		
			Deg.	Min.	Sec.	Deg.	Min.	Sec.
Balrampur								
1	Javed	Chando Road, Balrampur	23	25	53.9	83	37	2.3
2	Tabrej	Mission Road, Balrampur	23	36	27.9	83	37	41.0
3	Dipu Gupta	Shanti para, Balrampur	23	36	47.7	83	37	15.8
4	Umesh	Dhanna Road, Shanti para, Balrampur	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	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,	23	12	45.9	82	11	48.4

Sl. No.	Name	Address	Latitude			Longitude		
			Deg.	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

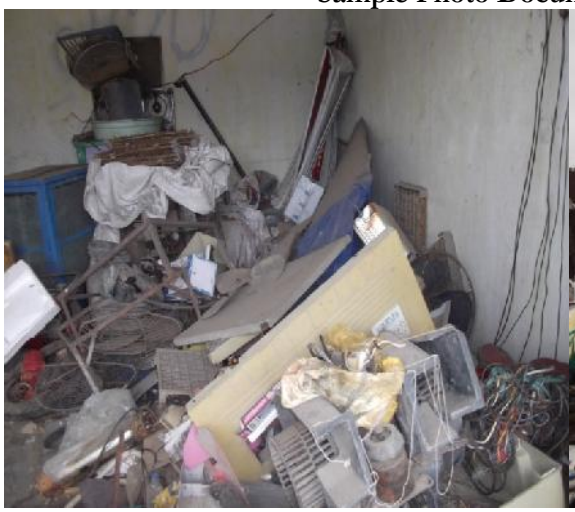

Map of Hotspots for Bulk Consumers
N
Legend
Habitation
City
Town
Village
Roads
Railways
Rivers / Streams
Division Boundary
Surguja
Churki
Naogai
Bharatpur
Janakpur
Wadrafnagar
Pal
Ramgarh
Chandrapur
Sonhat
Partabpur
Samri
Jilirajpur
Dipadih
Nagar
Patna
Baikunthpur
Surajpur
Bishrampur
Jhinagar
Ambikapur
Mahendragarh
Gharmiri
Kunkuri
Baghicha
Ramgarh
Jashpurnagar
Sitapur
Kunkuri
Raikera
Pathalgaon
Raigarh


N
Map of Hotspots for Distributors
Churki
Naogai
Bharatpur
Janakpur
Wadrafnagar
Pal
Ramgarh
Chandrapur
Sonhat
Partabpur
Samri
Alirajpur
Dipadih
Nagar
Pania
Surguja
Baikunthpur
Surajpur
Mahendragarh
Charmiri
Bishrampur
Jainagar
Ambikapur
Kunkuri
Baghicha
Ramgarh
Jashpurnagar
Kunkuri
Raikera
Sitapur
Pathalgaon
Raigarh
Legend
Distributors
Habitation
City
Town
Village
Roads
Railways
Rivers / Streams
Division Boundary


N
Map of Hotspots for Service Centres
Churki
Naogai
Bharatpur
Janakpur
Wadrafnagar
Pal
Ramgarh
Chandrapur
Sonhat
Partabpur
Samri
Alirajpur
Dipadih
Nagar
Patna
Surajpur
Surguja
Bishrampur
Jainagar
Ambikapur
Mahendragarh
Charmuri
Kunkuri
Baghicha
Ramgarh
Jashpurnagar
Raikera
Kunkuri
Sitapur
Pathalgaon
Raigarh
Legend
Service Centres
Habitation
City
Town
Village
Roads
Railways
Rivers / Streams
Division Boundary


N
Map of Hotspots for Scrap Dealers
Legend
Scrap Dealers
Habitation
City
Town
Village
Roads
Railways
Rivers / Streams
Division Boundary
Surguja
Churki
Naogai
Bharatpur
Janakpur
Wadrafnagar
Pal
Ramgarh
Chandrapur
Sonhat
Partabpur
Samri
Alirajpur
Dipadih
Nagar
Patna
Baikunthpur
Surajpur
Surguja
Bishrampur
Jhinagar
Ambikapur
Manendragarh
Chirmiri
Kunkuri
Baghicha
Ramgarh
Jashpurnagar
Kunkuri
Raikera
Sitapur
Pathalgaon
Raigarh

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) $= [\text{Stock}(t_1) - \text{Stock}(t)]_{\text{private}} + [\text{Stock}(t_1) - \text{Stock}(t)]_{\text{industry}} + \bullet \text{Sales}(n) - \bullet \text{WEEE}(n)$ $\quad n=t1+1 \text{ to } t-1 \quad n=t1+1 \text{ to } t \text{ with } t_1 < t$

$\text{Stock}_{\text{private}}$ = Number of households * (saturation level of households / 100)

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

$\text{Stock}_{\text{industry}}$ = 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

d_S - 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)

Features of the five inventory assessment methods

Methodology/Features	Requirements	Constraints	Advantages
The Time Step Method	1. Information about domestic sales. 2. Appliance stock levels for household. 3. Industrial stock levels.	1. Household saturation levels are based on predetermined stock levels 2. Industrial stock levels are assumed in the calculations because they are difficult to obtain and require assumptions. 3. Assumption that all the WEEE/E-waste generated is collected and transferred to treatment and disposal facility.	1. Calculations can be carried out very easily. 2. Method gives good results in a saturated market.
The market Supply Method	1. Information about domestic sales. 2. Average life of new and second hand items.	1. 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. 2. WEEE/ E-waste are often stored for years. 3. Assumed that all appliances produced in the same year will be in line for disposal after exactly the average life. 4. 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	1. Necessary data need not be very wide-ranging 2. Calculations can be carried out very easily using a simple formula 3. 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.

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.	1. 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. 2. This model also requires a full coverage of sales data as early as possible in the WEEE/E-waste trade value chain.	1. The model allows for an electrical and electronic equipment to be purchased, reused, stored and finally recycled or landfilled representing "material flow" more precisely. 2. 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.	1. A product's constant mean lifespan is assumed in this method. 2. 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.

Data Requirements for E-waste Inventory Assessment

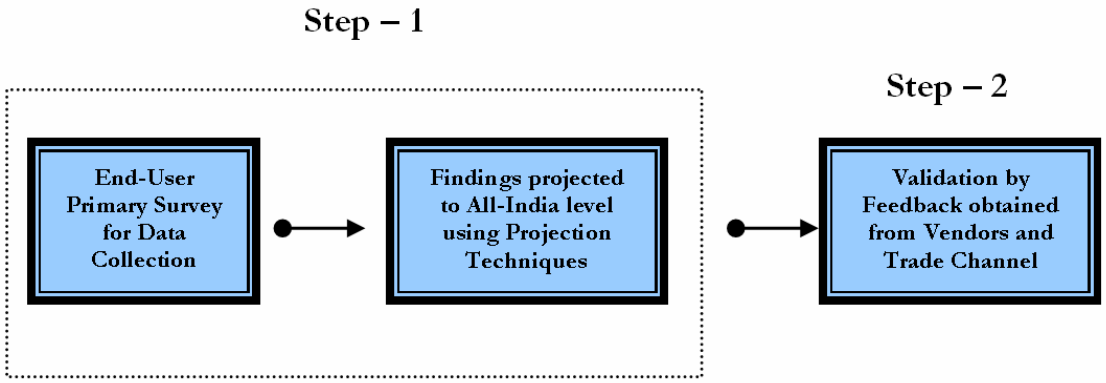
Methodology/ Data Requirement	Saturation Level		Number of Household	Calculated Sales			Stock Data		Average Lifetime	Storage data	Reuse	Recycle	Landfill
	Household	Industry		Export Data	Import Data	Manufacturing /Production	Private	Industry					
Time Step Method	√	√	√	√	√	√	√	√					
Market Supply Method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

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.

$$\sum_{i=1}^{n} \text{Last one year market size in employee band i} = \sum_{i=1}^{n} \left(\text{Acquisition rate in employee band i} \times \text{Universe of estab. in employee band i} \right)$$

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 1. Pure households 2. 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

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	