

File No. SIA/CG/IND2/59925/2021, Category 'B'

**EXECUTIVE SUMMARY**  
of  
**Environmental Impact Assessment Report**  
For  
New Molasses Based 80 KLPD Distillery

**Project Proponent**

**M/s. NKJ Biofuel Private Limited**  
Ramhepur-Bodla, Dist.:Kabirdham, Chhattisgarh

Prepared by



**VASANTDADA SUGAR INSTITUTE, PUNE**

Manjari (Bk.), Tal.:Haveli, Dist.:Pune - 412 307, Maharashtra, India  
Ph. : (020) 2690 2100, 2690 2343/7, Fax : (020) 26902244  
E-mail : admin@vsisugar.org.in Website : www.vsisugar.com

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**APRIL 2021**

VSI/EIA/NBPL/DR-01/20210403

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## EXECUTIVE SUMMARY

### 1.0 INTRODUCTION

M/s. NKJ Biofuel Pvt. Ltd., (NBPL), is planning to set up proposed distillery at village Ramhepur, Bodla tehsil of Kabirdham district in Chhattisgarh. The unit is registered as per Activity Code mentioned under company CIN Number U23200CT2020PTC010818, dated 27th Oct. 2020. This unit will be developed as a 'Public-Private Partnership' project between M/s. Bhoramdeo Sahakari Shakkar Utpadak Karkhana Maryadit (M/s. BSSUKM) and the project proponent. For this concession agreement has been signed between M/s. BSSUKM and the project proponent. As per the concession agreement M/s. BSSUKM will be providing required land and raw material i.e. Molasses or Juice/Syrup to NBPL. The proposed plant will be based on advanced technology of cascade continuous fermentation with provision to switch over to Fed Batch fermentation when molasses quality is poor and Multi-pressure distillation and Molecular Dehydration Technology (MSDH). For treatment and disposal of effluent, the management has decided to install standalone multiple effect spentwash evaporation plant (SMEE). Concentrated spentwash will be incinerated to achieve "Zero Spentwash Discharge" as per CPCB norms.

The purpose of this environmental impact assessment (EIA) study is to obtain an Environmental Clearance for new molasses-based distillery unit 80 KLPD of M/s. NKJ Biofuel Pvt. Ltd (NBPL). The notification no. S.O. 1533 promulgated on September 14, 2006 has covered distillery industry under activity 5(g). According to recent notification no. S.O. 1960(E), dated June 13, 2019, molasses-based distilleries less than 100 KLPD capacity are placed under category 'B'.

### 1.1 Selection of Site

The site is well connected by road, railway as well as air network. It is approx. 0.7 km away from the national highway NH-30-A. Nearest railway station and airport is Bilaspur approx.108 km from the project site. The headquarters of Kabirdham district i.e. Kawardha town is 10 km from the site. The site is well connected by tar roads to other towns & cities of the state. Apart from this, water and electricity are also available in the area. Reasonably good infrastructure, support facilities and skilled, unskilled labor etc. are available in the vicinity. The highlights of the project are given in table 1.

**Table 1: Highlights of the project**

1.	<b>Project Proponent</b>	M/s. NKJ Biofuel Pvt. Ltd (NBPL)	
2.	<b>Project</b>	New 80 KLPD molasses based distillery unit	
3.	<b>Location of the project</b>	Khasra number 1/2, 2, 3/1, of Village: Ramhepur, and 62/1 and 62/4 of village Budhwara, Tahsil. Bodla, Dist: Kabirdham, Chhattisgarh.	
<b>PROJECT CONCEPT</b>			
4.	<b>Working days</b>	Year around	
5.	<b>Main Products</b>	Rectified spirit OR ENA OR Anhydrous Alcohol (i.e. fuel ethanol)	<b>80 KLPD</b>
		<b>By-product/s</b>	
	Impure spirit (Average 5%)	<b>4 KLPD</b>	
		Fusel oil	320 L/day
6.	<b>Boiler</b>	Proposed new 30 TPH Incineration boiler, 45 Kg/cm <sup>2</sup> pressure and 390±5 °C temp.	
7.	<b>Air Pollution Control Systems for stack</b>	Electro Static Precipitator (ESP)	
8.	<b>Effluent Treatment/disposal System</b>	Multi-effect evaporation (MEE) followed by incineration for spent wash. Condensate polishing unit (CPU) for spent lees, MEE condensate and other low strength effluent	
<b>INFRASTRUCTURE</b>			
9.	<b>Land</b>	Total land allocated for distillery= 20 acres or 81026 sq m Industrial plot (includes distillery process units, evaporation unit (MEE), spent wash, molasses and finished product storage tanks, ETP/CPU, Incineration boiler, bagasse/rice husk storage, internal roads etc.) = 13.4 acres or 54314 sq m Green belt (33% of plot). = 6.6 acres or 26712 sq m Open plot on the west boundary of existing sugar unit of BSSUKM will be developed into a distillery; No acquisition of new land.	
10.	<b>Main Raw Material</b>	Feedstock	C-Heavy molasses 297 TPD OR B-Heavy molasses 258 TPD OR Sugar cane juice/syrup= 315 TPD
		Nutrient N,P	120 kg/d
		Turkey Red Oil (TRO)	400 kg/d
11.	<b>Steam</b>	<b>Total:</b> Maximum 550 TPD = 22.9 TPH	

		<p><b>Source:</b> Proposed incineration boiler capacity: 30 TPH</p> <p><b>Steam utilization:</b> Distillery, MEE etc.</p>
12.	Fuel	<p><b>Spent wash:</b> ~198.4 TPD (=160 m<sup>3</sup>/day)</p> <p><b>Source:</b> Process effluent after MEE</p> <p><b>Coal:</b> 58.67 TPD OR</p> <p><b>Bagasse:</b> 103.92 TPD from BSSUKM</p> <p><b>Rice husk</b> is also considered as supplementary fuel in case of shortage of bagasse which will be around 15% of total fuel requirement. Source -nearby market</p>
13.	Stack height	57 m (on the basis of SO <sub>2</sub> generation from burning of coal + SW as fuel)
14.	Power and its Source	<p><b>Power requirement: 1.86 MW</b></p> <p>Source: Captive. Proposed TG set of 3 MW capacity will be installed with independent incineration boiler.</p>
15.	Water Requirement and its Source	<p>Maximum 712 m<sup>3</sup>/day (considering recycle and reuse)</p> <p><b>Water source:</b> bore well</p>
16.	Manpower	Total: 164 (96 Skilled + 68 semi or Unskilled)
<b>FINANCIAL ASPECT</b>		
17.	Capital expenses for EMP	Rs. 3920.00 lakh
18.	Project Cost	Rs. 12670.39 lakh
19.	CER Provision	Rs. 191.00 lakh
20.	Total Project cost including CER	Rs. 12861.39 lakh

TPD = Tons Per Day

## 2.0 MATERIAL AND INFRASTRUCTURE

### 2.1 Molasses

The estimated molasses requirement for 80 KLPD production capacity for year-round of operation (330 days per annum) will be 297 TPD (C heavy) and 258 TPD (B heavy). The sugar mill expected to be operated at an average crushing rate of 3500 TCD installed capacity.

The molasses will be pumped through pipeline, from storage tanks to the distillery day molasses tank. Raw material and chemical requirements given in the following table.

Raw materials for the proposed project will be available from the local market. Bagasse used as a fuel and molasses as raw material will be available from in-house only. Product wise raw material consumption is given below.

**Table 2: Availability of raw materials, finished good product and mode of transport**

Particulars	Estimated quantity	Source market	Final product	Estimated quantity	Transport mode
<b>Raw Material</b>					
Molasses (C-Type)	297 TPD	From BSSUKM and nearby sugar mills	Rectified spirit + Impure spirit (5%) or ENA + IS or Fuel Alcohol + IS	80 KLPD	By pipeline from BSSUKM & by tanker from other mills
Molasses (B-Type)	258 TPD				
Sugarcane juice	315 m <sup>3</sup> /day				
<b>Chemicals</b>					
Nutrients N, P	120 Kg/day	From nearby market etc.	-	-	By Road- Truck
Turkey Red Oil	400 Kg/day				
<b>Utilities</b>					
<b>Fuel</b>					
Spentwash + Coal/ Bagasse /Rice husk	198.4 TPD + 58.56 TPD/ 103.92 TPD/ 15%	s/w from Distillery coal From market	-	-	By Road/rail
<b>Water</b>	712 m <sup>3</sup> /d max	Borewell	-	-	
<b>Steam</b>	550 TPD max	Captive incineration boiler			
<b>Power</b>	1.86 MW		-	-	-

## 2.2 Water

Estimated daily fresh water requirement of the proposed project will be maximum 712 m<sup>3</sup> after recycling of steam condensate, spent lees and treated process condensate. Water requirement has been estimated in three scenarios i.e. in case of using C Heavy molasses, B Heavy molasses and sugarcane syrup. Fresh water requirement will be met from borewell. NBPL plans to extract ground water and has applied for permission for the same. Detailed water budget is as follows.



Table 3: Water Balance: Distillery of 80 KLPD (Quantities in cum/day)

Description	Cum/day		
	C-Heavy	B-Heavy	Syrup
<b>WATER INPUT</b>			
Process Water for Fermentation section and CO2 scrubber	700	686.5	432
Boiler feed water @24 TPH (capacity 30 MT/hr)	577.5	483.5	400
Soft Water For Vacuum Pump & Others	100	100	100
For Cooling Towers make up water	602	520	274
Other Domestic Usage	10	10	10
Daily utilise washing and other	86.50	158.5	94
<b>Total Water Input at start-up</b>	<b>2076</b>	<b>1958.5</b>	<b>1310</b>
<b>WATER OUTPUT</b>			
Spent Lees (PR & Rect.)	120	120	120
Soft Water For Vacuum Pump & Others	100	100	100
Exhaust condensate	550	460.5	380
Process condensate	480	534	216
Soft Water For Vacuum Pump & Others	100	100	100
<b>Total water out put</b>	<b>1350</b>	<b>1314.5</b>	<b>916</b>
<b>WATER LOSS</b>			
CT Evaporation & Drift Losses	602	520	274
Domestic Consumption loss	10	10	10
Boiler blow down & steam loss (to CPU)	27.5	23	20
Daily washing and other (Sent to CPU)	86.50	91	90
<b>Total Water loss</b>	<b>726</b>	<b>644</b>	<b>394</b>
<b>RECYCLE STREAMS</b>			
Lees Recycle For RS Dilution (after CPU)	120	120	120
Process Condensate (after CPU)	480	534	216
Steam condensate recycled to boiler	550	460.5	380
Soft Water For Vacuum Pump & Others cooling water	100	100	100
Other Effluent like boiler blow down, flower washing & WTP reject	114	185.5	114
<b>Total Recycling /Re-utilization of water</b>	<b>1364</b>	<b>1399.5</b>	<b>930</b>

per day			
Total Daily Water requirement/Input =	2076-1364 = 712	1985.5 -1399.5 = 586	1310 - 930 = 380
The fresh water requirement per lit of Alcohol including domestic water	8.9 lit/lit of RS	7.32 lit/lit of RS	4.75 lit/lit of RS
Concentrated spent wash incinerated at boiler cum/day	160	106.67	24

### 2.3 Fuel

Concentrated spent wash of about 55° to 60° brix (solids) will be incinerated along with fuel i.e. coal. Specific gravity of spentwash is usually observed to be around 1.24. Bagasse is planned as alternative to coal or rice husk in case of if shortage of bagasse.

### 2.4 Steam

The maximum steam requirement will be 12.00– 12.75 TPH for the 80 KLPD distillery to produce R.S. or anhydrous alcohol and 6.00 -6.50 TPH for standalone spent wash evaporation plant and about 4.00-4.25 TPH for de-aerator and SCAPH of incineration boiler. Therefore, NBPL is going to install an independent incineration boiler of 30 TPH having 45 kg/cm<sup>2</sup>(g) steam pressure. Produced steam will be initially supplied to a steam turbine generator (STG) of 3 MW capacity, to produce 1.86 MW power for captive consumption.

### 2.5 Power

An estimated power requirement for proposed distillery, its ancillary units such as MEE, CPU/ETP, air pollution control device, and miscellaneous (street light, office, etc.) will be 1.86 MW/hr. Fig.1 shows the schematic of steam and power generation.

### 2.6 Boiler

One new fluidized bed combustion boiler proposed for the project. It will be of 30 TPH capacity having operating parameters of 45 kg/cm<sup>2</sup> (g) pressure & 390 ± 5°C temperature. It will be manufactured as per latest IBR specifications. Important technical features of proposed boiler are as follows.

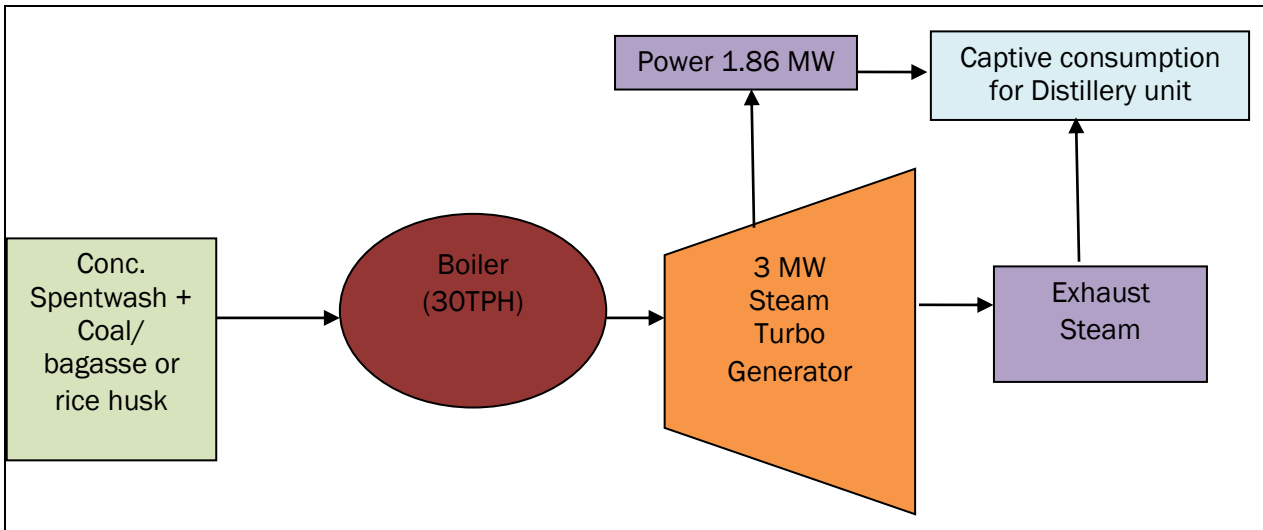


Figure 1: Schematic of steam and power generation

## 2.7 Fuel Handling System

Coal/bagasse/rice husk storage area will be contained by wind-shield. Mechanized fuel handling system comprised of closed conveyor belts will be installed. Following measures will be adopted to reduce fugitive dust generation.

- Enclosure will be provided for belt conveyors and transfer points of belt conveyors. The above enclosures will be rigid and permanent and fitted with self-closing doors and close fitting entrances and exits, where conveyors pass through the enclosures. Flexible covers will be installed at entry and exit of the conveyor to the enclosures, minimizing the gaps around the conveyors.

Entire coal storage area/ yard will be covered with permanent weather shed roofing and walls on three sides. Mechanized fuel handling system as well as dust suppression system will be installed for this area.

## 2.8 Ash handling system

The ash handling system envisages wet extraction of bottom ash & dry extraction for fly ash. The fly ash will be extracted in dry form from the electrostatic precipitator hoppers, economizer, air heater hoppers, stack hopper, and transported to storage silo as a measure for promoting ash utilization.

## 2.9 Land

The project requires around 20 acre of land. Greenbelt to be developed on 33% of allocated plot area, i.e. approx. 6.6 acres.

## 2.10 Manpower

The project will be generating 164 direct employment opportunities.

## 3.0 PROCESS DESCRIPTION

For the proposed project, the Management has planned to adopt the latest technology for process as well as for effluent disposal. Overall objective of this is to achieve high efficiency of operations, save energy and water as well as achieve Zero Liquid Discharge (ZLD). The characteristics of manufacturing process is given below and a schematic is shown in Fig. 2.

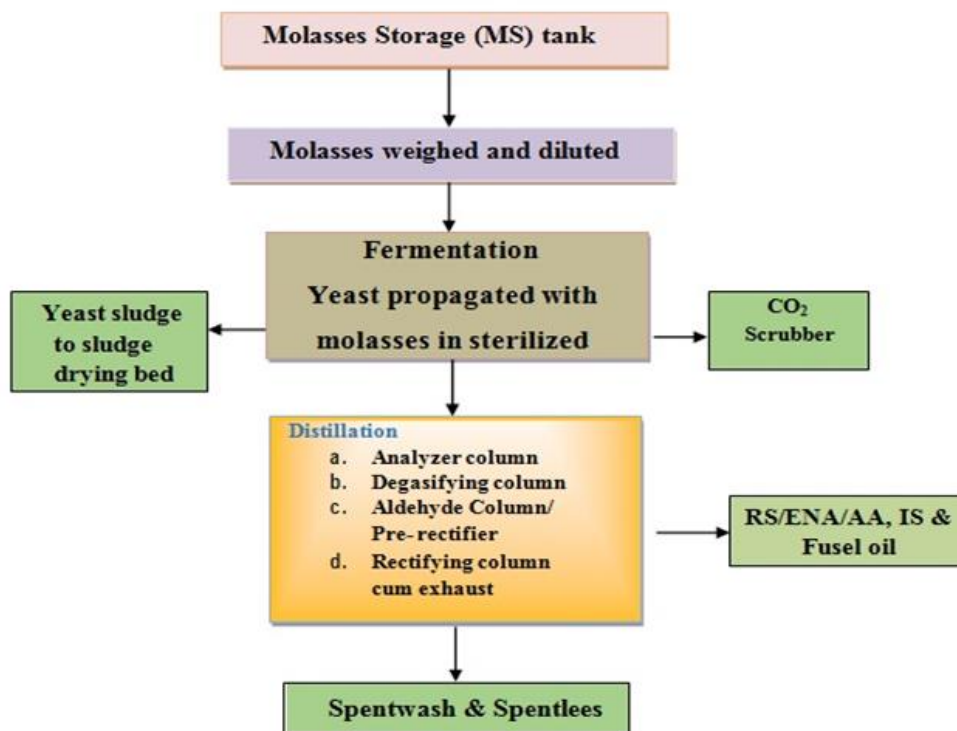


Figure 2: Schematic of Manufacturing Process

## 3.1 Manufacturing Process

The production process mainly involves fermentation and distillation process.

### 3.1.1 Fermentation

Molasses is the chief raw material used for production of alcohol. Molasses contains around 50% total sugars, of which 30 to 33 % are cane sugar and the rest are reducing sugar. During the fermentation, yeast strains of the species *Saccharomyces cerevisiae*, a living microorganism belonging to class fungi converts sugars such as sucrose or glucose present in the molasses in to

alcohol. The continuous fermentation process involves addition of fresh nutrients medium either continuously or intermittent withdrawal of portion of nutrient for recovery of fermentation products.

### 3.1.2 Distillation

After fermentation, the next stage in the manufacturing process is to separate alcohol from fermented wash and to concentrate it to 95%. This is called Rectified Spirit (RS). For this purpose, method of multi- pressure distillation will be adopted. After separation of alcohol, the remaining part is the effluent of the process i.e. spent wash and spent lees.

#### 3.1.2.1 Multi-pressure Distillation

Multi-pressure distillation system is an advance technology. It saves energy and steam.

#### 3.1.2.2 Re-Distillation to Manufacture Extra Neutral Alcohol (ENA)

ENA is prepared by re-distillation of the rectified spirit (RS) for the removal of impurities like higher alcohols, aldehydes and methyl alcohol. This is done by, remixing rectified spirit with soft water and distilling it in the ENA column.

#### 3.1.2.3 Anhydrous Alcohol (AA)

Anhydrous alcohol is an important product required by industry. As per IS specification it is nearly 100% pure or water free alcohol. Alcohol as manufactured by Indian distilleries is rectified spirit, which is 94.68% alcohol. It is not possible to remove remaining water from rectified spirit by straight distillation as ethyl alcohol forms a constant boiling mixture with water at this concentration and is known as azeotrope. Therefore, a special process molecular sieve dehydration (MSDH) used for removal of water.

## 4.0 BASELINE ENVIRONMENTAL CONDITIONS

The guiding factors for the present baseline study are the requirements prescribed by the Ministry of Environment, Forestry and Climate Change (MoEFCC) for conducting Environmental Impact Assessment study published in the EIA notification 2006. For baseline data collection sampling of air, water and soil was carried out from March to May 2018.

**Table 4: Summary of Environmental features of study area**

Facet	In brief
General characteristics	Sub-tropical climate characterized by extreme summer and moderate winter
Rainfall	1066.20 mm/annum (Average)
Temperature	In summer 40°C to 46°C. In winter 10°C to 16°C.
Humidity	maximum >85% in monsoon and ranges from 20 to 50 % in other seasons

Wind	Predominant wind direction during study period W, NW and N Maximum average wind speed observed between 1.8 to 25 km/h.
Land use	Crop land 85.71 %; Scrub 5.98 %; Forest 3.66 %, Water bodies 1.41 %, Settlement 3.25 %
Air Quality	complies NAAQ standards of Nov. 2009 at all monitored locations
Noise	Complies the standard
Ground water	As per Ground Water Year Book of Chhattisgarh 2015-16 - suitable for drinking, domestic, industrial and agriculture uses in most of the places
Soil	moderate - good for cultivation in the study area
Nearest sanctuary	Bhoramdeo sanctuary (buffer area) is approx. at 10.5 km from the project site

#### 4.1 Land use

The proposed unit will be located at village Ramhepur, Bodla, Dist.: Kabirdham, Chattisgarh state. It is covered in survey of India (SOI) toposheet no. F 44J4 & F 44J8, and latitudes and longitudes of the four corner of the site are as follows

- 1) 22°05'56.28" N, 81°14'54.97" E;
- 2) 22°05'52.77" N, 81°15'07.58" E;
- 3) 22°05'41.93" N, 81°15'03.92" E;
- 4) 22°05'45.67" N, 81°14'51.53" E

**Table 5: Landuse/ Land cover statistics for the 10 square km area**

#	Class	Area (Ha)	Area (%)
1	Waterbody	426.46	1.41
2	Crop land	25938.01	85.71
3	Scrub land	1811.08	5.98
4	Settlement	982.21	3.25
5	Forest	1106.35	3.66

## 5.0 IMPACT ASSESSMENT

### 5.1 Air Environment

Impacts on ambient air quality during the operation phase of the project are likely due to vehicular and process emissions, Vehicular emissions will be generated from transportation of raw materials, finished product etc. Process related emissions can further be divided into two categories i) from burning of fuel to generate steam and ii) from fermentation process.

### 5.1.1 Impact causing factors

Emissions from process: It will be due to incineration of spent wash along with coal.

#### Transportation

Transportation of finished product i.e. RS/ENA or AA usually takes place in bulk. Considering the gross collective capacity of 2 storage tanks of 800 m<sup>3</sup> each. It will require about 80 tankers (considering each tanker of 20 m<sup>3</sup> capacity).

Fugitive Emissions and Other sources of air pollution: Fugitive emissions from handling and storage of coal and ash; transportation activities and odour are also anticipated to cause significant negative impact. System for suppression of dust from handling of coal and ash will be installed. It includes mainly, use of pulse jet bag filters for coal loading-unloading on conveyors, foggers/dust suppressors in coal and ash storage yard, wind breakers for ash storage area.

**5.1.2 Impact Assessment:** Estimated incremental concentrations of PM and SO<sub>x</sub> in the downwind direction of the site are minor, considering the baseline value. The baseline concentrations of these pollutants are well within the NAAQS. Therefore, after adding the incremental concentration to the baseline value at nearest downwind site will not exceed the NAAQS. So, it is anticipated that, the increase in the concentration of these air pollutants due to the burning of fuel, likely to cause minor negative impact on air environment.

#### 5.1.3 Preventive, control and mitigation measures

- Provision of asphalted roads inside the premises, all internal roads will be 6 m or more in width and turning radius will be of 9 m
- Provision of adequate parking for goods as well as staff vehicles
- Engaging authorized transport agency for goods transport on the term to use well maintained vehicles for all transportation activities
- While bulk transportation of raw material/finished product, manage the vehicles in such a way that waiting period for vehicles will be minimum. This will help in reducing the risks of traffic congestion and minor accidents. It will also helpful for reducing overall air/noise pollution.
- Tree plantation on both sides of internal road as well as approach road

Overall, the transportation activity will have continuous, long term but partially reversible negative impact. Noise generated from transportation is likely to cause negative impact along the transportation routes.

#### 5.1.3.1 Air Pollutant Dispersion Modeling

Prediction of impacts on air environment has been carried out employing mathematical model - AERMOD view dispersion model 9.2 software developed by Lakes Environment Software, Canada.



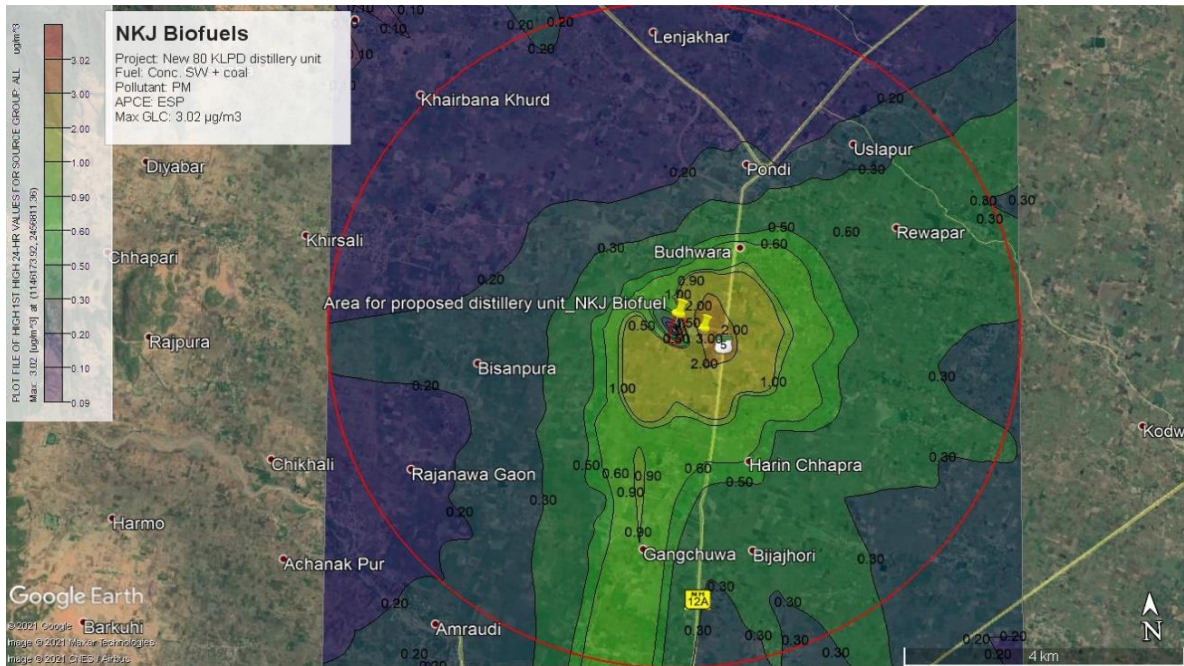


Figure 3: Short term 24 hourly GLCs of PM

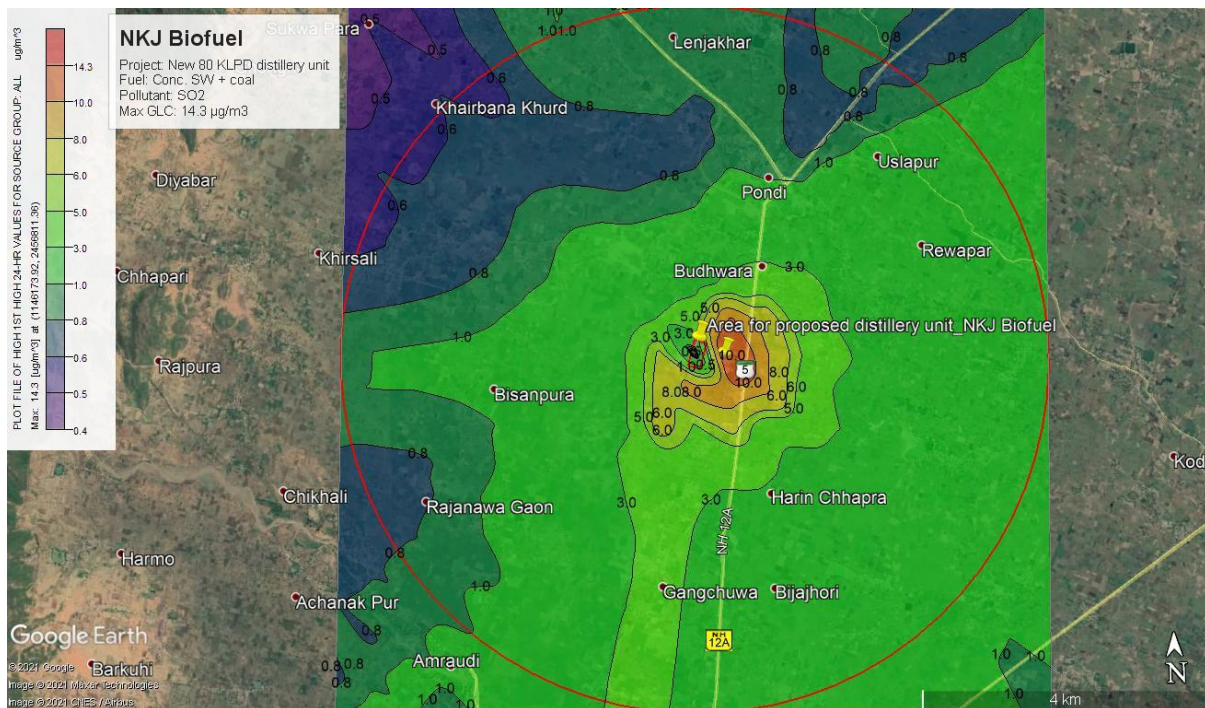


Figure 4: Short term 24 hourly GLCs of SO2

**Observation**

From the mathematical modeling of air pollutant dispersion study, it is observed that -There will be an increase in the concentration of PM and SOx mainly towards east. The maximum incremental load of 3.02 µg/m³ for PM and 14.35 µg/m³ for SOx anticipated at a distance of ~1 km towards east. This area is predominantly open grassland. Nearest residential area towards south is village Ramhepur (approx. 1.2 Km). From the results derived from the mathematical modeling study, it is observed that resultant concentration of these air pollutant in downwind



direction will be well within the national ambient air quality standards prescribed by CPCB in Nov. 2009.

**Table 6: Summary of Maximum 24-hour GLC due to proposed project**

Description	Concentration $\mu\text{g}/\text{m}^3$	
	PM	SO <sub>2</sub>
Maximum rise in GLC	3.02	14.35
Direction of occurrence from proposed project and distance	E (0.5 Km)	E (0.5 Km)
Coordinates of maximum GLC	Lat: 22°05'47" N Long: 81°15'20" E	22°05'47" N 81°15'20" E
Maximum increase anticipated at nearest village Ramhepur	1.00	5.00
Baseline Concentration reported at Ramhepur	47.22	15.43
Concentration anticipated considering incremental load at Ramhepur (Post project scenario)	48.22	20.43
NAAQS	PM <sub>10</sub> 100	80

## 5.2 Water Environment

**5.2.1 Impact causing factors:** The impact of a distillery project on water environment is crucial from two aspects viz. the consumption of water in process and wastewater handling, storage, treatment and disposal.

**5.2.2 Impact Assessment:** Water scarcity or shortage anticipated for other users from the region during a season when rainfall will be less than average. Though, reuse and recycle of water will save significant amount of freshwater intake but in abnormal conditions, there is a possibility of water shortage for other users. Considering the option/s planned for ZLD in the proposed expansion, no negative impact envisaged on water environment as well as aquatic ecosystems of the surrounding area. However, negative impact in the form of change in the qualitative characteristics of receiving waters, envisaged in case of accidental leakages and spillage of spent wash. In such circumstances, severe impact anticipated if the accidental release of spent wash reaches to nay of the nearest natural waterbodies.

**5.2.3 Environment management plan:** In order to reduce the fresh water intake, the management has planned to reuse of waste water after proper treatment. Wastewater from various sources will be collected and properly treated so as to reutilize it and thus conserve the fresh water resource. The sanitary wastewater will be disposed by using septic tank and soak pit system. Thus, zero liquid discharge will be achieved. The management also proposed to install rainwater harvesting system to recharge the aquifer and partly fulfill the requirement during startup.

### 5.3 Land Environment

The distillery industry is an agro-based industry and hence its impact on soil considered equally important

- **Impact of effluent discharge**

In case of molasses based distilleries, spent wash and spent lees are the probable sources of soil pollution if not managed properly. As described earlier, highly polluted wastewater i.e. spent wash if not stored properly in impervious tanks or discharged on land untreated or half treated, it likely to cause soil pollution. It affects seed germination and soil fertility. Leaching of salts from spent wash and its run off are the secondary pollution sources.

Similarly, the other wastewater streams i.e. spent lees, condensate from MEE, etc. if released untreated it affects soil fertility mainly due to its COD/BOD and other characteristics

#### Solid & Hazardous waste

Table 7: Solid Waste and its Management

#	Waste	Quantity (TPD)	Disposal
1.	Yeast sludge (wet weight)	2 - 3	Used as soil conditioner after drying
2.	Ash: a) Spent wash (28.57 TPD) + b) coal 23.81 TPD or c) Bagasse ash = 2.29 TPD	52.38 (with coal) 37.80 (with bagasse)	Sold to nearby brick manufacturing unit
3.	CPU sludge (wet weight)	0.5-0.8	Used as soil conditioner after drying
4	Spent oil	1-1.5 kl/annum	Burnt into furnace

#### 5.3.1 Impact causing factors: Disposal of solid and hazardous waste, disposal of effluent, change in topography

**5.3.2 Impact Assessment:** The only hazardous waste likely from the project is the scrap oil mainly from DG set and machines. However, the DG set will be used only in case of total power failure i.e. captive as well as failure of power supply from electricity board. Thus, the quantity of used or scrap oil is assumed very minor. This waste oil can be disposed-off safely by giving it to authorized hazardous waste oil dealer. Alternatively, it can be burnt in boiler along with fuel at periodical interval.

**5.3.3 Environmental management plan:** Sludge which usually rich in organic matter, will enhance the organic content of the soil. Hence, positive impact envisaged on soil due to sludge.

Ash is likely to cause long term change in the soil characteristics of ash storage area and surrounding soils. Ash storage and transportation likely to increase particulate matter in the ambient air - at and along the transportation route.

## 5.4 Ecology

**5.4.1 Impact causing factors:** Discharge of air and water pollutants into environment, solid waste, change in land use, removal of vegetation cover, reclamation of wetland/water bodies, etc.

**5.4.2 Impact assessment:** In the surrounding area, agricultural activities (cultivation area) is predominant. There are no natural waterbodies on site or its surroundings upto 1 km. Riverine ecosystem is at approx. 5.5 km distance. Buffer area of Borhamdev Wildlife Sanctuary (buffer stack gas emission areas) is approx. 11 km, west of the site. Minor negative impact anticipated on avi-fauna due to stack gas temperature (approx. 180°C). In normal operation scenario, minor impact due to increase in particulate matter on agricultural crop envisaged in close vicinity of the project (when air pollution control equipment will work normally)

**5.4.3 Environmental management plan:** Measures suggested in the main EIA report for air pollution control, water environment and solid waste management to be strictly followed. In addition, few other measures are given in the main EIA report will be implemented.

## 5.5 Socio- economic environment

**5.5.1 Impact Causing Factors:** While assessing impact issues of rehabilitation; restoration; population flux; pressure on available resources and infrastructure were considered.

**5.5.2 Impact Assessment:** Considering the long term benefits to the locals, the project will have positive impact on socio-economic environment.

**5.5.3 Environment Management Plan:** Project is agro-based – therefore, indirectly beneficial to local farmers; no issues of rehabilitation or restoration; local candidates will be employed – thus, migration of population to the site surrounding area and pressure on infrastructure and resources is anticipated to be negligible.

## 5.6 Other impact: Traffic

Vehicles of staff, contract workers and visitors are expected on daily basis in three shifts. It is likely to add 40-50 two wheelers and 5-7 cars per day. Raw material and finished product transportation will be carried out in mainly bulk. Presently, the traffic load on nearest road is limited and proposed load will easily get accommodated. But, it will add noise to some extent and cause minor negative impact in the vicinity.

## 6.0 FIRE PROTECTION SYSTEM

Fire protection system shall be provided in accordance to PESO, OISD-117 and LPA regulations. The fire- fighting system will consist of a hydrant network, piping etc.

### 6.1 Safety Aspects through Design and Engineering

All design will be as per BIS specification and drawings are to be approved by factory/electrical inspectorate /safety inspectorate weights & measurement inspectorate etc.

### 6.2 Plant Lighting

Flameproof light fittings conforming to IS 2148 shall be provided for hazardous areas, particularly in distillation & storage section, while non-flame proof fittings in other areas. Plant building lighting will be as per norms & as per Electrical inspectorate / factory inspectorate norms.

## 7.0 ENVIRONMENT MANAGEMENT PLAN

Table 8: Environment management plan: operation phase

Aspect	Impact causing factor	Control/Mitigation Measures
Air Environment	<p>Generation of Particulate Matter (PM), SO<sub>2</sub>, NO<sub>x</sub> during incineration</p> <p>Generation of Carbon dioxide from fermentation, Odour from spent wash storage</p> <p>Handling of coal and ash</p>	<ul style="list-style-type: none"> <li>• ESP to control ash emission through stack with height 57 m</li> <li>• CO<sub>2</sub> scrubbing and separation unit</li> <li>• Mechanized system for coal and ash handling</li> <li>• Fugitive dust control/suppression for coal yard will be done properly</li> <li>• Wind breaks for ash storage area</li> <li>• Online emission monitoring system will be installed</li> <li>• Development of greenbelt</li> </ul>
Water Environment	<p>Effluent generation from processes, cleaning, blow down water &amp; condensate. Storage of spentwash, its treatment and disposal</p>	<p>'Zero liquid discharge' will be achieved by implementing -</p> <ul style="list-style-type: none"> <li>• Integrated and stand-alone evaporation (using MEE) as a primary treatment to reduce the spentwash volume</li> <li>• Incineration of concentrated spentwash by burning with coal/bagasse in furnace</li> <li>• Spentlees, condensate of MEE and other effluents will be treated in condensate polishing unit (CPU) and treated water will be reused in distillery.</li> <li>• All the effluent will be properly treated/ utilized/disposed within the premises</li> </ul>

Aspect	Impact causing factor	Control/Mitigation Measures
		<ul style="list-style-type: none"> <li>• Separate lagoons for storage of raw and concentrated spentwash.</li> <li>• Lagoons will be made impervious as per CREP guidelines</li> <li>• Fresh water requirement will be reduced by recycling of water (treated water), using rain water during startup period</li> <li>• Piezometric well, in downstream area of spentwash storage to monitor ground water quality</li> </ul>
Soil Environment	Boiler Ash	<ul style="list-style-type: none"> <li>• Sold to nearby brick manufacturing unit</li> </ul>
	Sludge from Fermentation unit and CPU	<ul style="list-style-type: none"> <li>• Sludge is degradable, organic in nature hence, mixed into soil</li> </ul>
	Excavated fertile soil	<ul style="list-style-type: none"> <li>• Stacked separately and reused for greenbelt development</li> <li>• Stones and excess soil will be used for foundation or internal roads or leveling purpose within premises</li> </ul>
Noise	Increase in noise level due to operation of machines, motors, vehicular movement, DG set etc.	<ul style="list-style-type: none"> <li>• Regular maintenance of machines and vehicles</li> <li>• provisions of separate parking for goods and other vehicles</li> <li>• Internal roads will be either asphalted or RCC, leveled, illuminated and will be maintained</li> <li>• Safety sign boards will be placed at strategic locations within premises</li> <li>• Provision of adequate personal protective equipment for workers</li> <li>• Job rotation for high noise level work places, if required</li> <li>• Regular health checkup for workers</li> <li>• Acoustic enclosure will be provided to DG set</li> </ul>

Aspect	Impact causing factor	Control/Mitigation Measures
Ecology and Biodiversity	Air, water, soil and noise pollution Tree cutting felling, disturbance to wildlife due to project	<ul style="list-style-type: none"> <li>• Adequate preventive, control and mitigation measures for air, water and soil pollutants</li> <li>• No tree cutting/ felling involved since project is on barren land</li> <li>• No wildlife sanctuary, national park or biosphere reserve within 10km radius, site is not in migratory route of any wildlife, no rare and endangered species of plants/animals reported from the region</li> <li>• Development of greenbelt will help to enhance the biodiversity and will provide habitat to many species</li> </ul>
Socio-economic Environment	Rehabilitation and Restoration (RR), pressure on available manmade infrastructure/resource due to population flux	<ul style="list-style-type: none"> <li>• No rehabilitation and restoration issue involved since site is already under the possession of project proponent</li> <li>• Local candidates will be preferred for employment. Skilled work force is available at nearby towns and cities</li> </ul>
Safety and Occupational health	Accidents, improper work practices	<ul style="list-style-type: none"> <li>• Safety officer and safety committee will be formulated</li> <li>• Provision of adequate safety gears</li> <li>• Insurance policy for workers</li> <li>• Regular health check-up</li> </ul>
Risk and disaster management	Fire, accidents, earthquake, etc.	<ul style="list-style-type: none"> <li>• The entire premises will be declared as 'no smoking zone'</li> <li>• Lightning arresting system will be installed</li> <li>• Ethanol vapor condensing system will be installed at storage area</li> <li>• Proper storage of molasses, ethanol and coal</li> <li>• Ethanol storage as per PESO guidelines</li> <li>• Firefighting system as per OISD and local authority guidelines</li> <li>• Earthquake resistant construction</li> </ul>

## 8.0 SAFETY, OCCUPATIONAL HEALTH MANAGEMENT

Following applicable national or international standards shall be followed

- Use of flameproof and standard electrics
- Standard operating procedures (SOP) will be developed as per the manual of respective equipment and machines. These SOP will be strictly implemented to ensure safety, health and environment throughout the premises
- Provision of safety gears such as safety shoes, gloves, goggles, helmets, masks, ear plugs, etc. is made for workers
- Noise proof cabins will be provided to controlling operators
- Workers working in high noise/ high risk areas will be rotated to other areas
- Smoking and other igniting activities shall be strictly prohibited in the distillery/ parking areas
- Work entry permit system will be implemented
- Necessary data and transport emergency (TREM) card must be available with the all vehicles used for transportation of finished products as well as raw material.
- Only well-maintained vehicles to be used for raw material and finished product transport

### Facilities proposed by the Management

- Separate parking facility for private vehicles (non-goods), Drinking water facility, Canteen
- Toilet and bathrooms, First aid facility, Safety gears

The above mentioned facilities will be made available to construction workers, harvesting labours as well as to the visitors and transporters.

### Schedule of medical check-up during operational phase

- Comprehensive pre-employment medical checkup for all employees
- General checkup of all employees (including contractual employees and casual labour) once every year (the industry is doing it for existing unit)
- Local hospitals and Govt. health monitoring system will be engaged

## 9. MANAGEMENT PLAN FOR SOCIAL ENVIRONMENT/ ENVIRONMENT RESPONSIBILITY OF THE INDUSTRY

Table 9: Financial provision for CER activities planned for next five years

CER activity head	Year					TOTAL
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	
	Budgetary provision (Rs. in lakhs)					
Rainwater harvesting in local schools & hospitals	20	20	20	20	20	100
Provision of clean drinking water to school/hospitals (if needed)	5	5	6	6	7	29
Training to local youth/ skill development	5	5	7	7	9	33

Plantation in command area	5	5	6	6	7	29
<b>TOTAL BUDGETARY ALLOCATION FOR NEXT FIVE YEARS</b>						<b>191</b>
(1.5% of the capital budget = Rs. 191 lakhs)						

These activities will also include

- Conservation of fresh water resources and implementation of rain water harvesting in the project and surrounding area
- Proper implementation of schemes for employee's health, insurance, welfare, etc.
- Pay special attention on schemes for women and child welfare
- Policy under Public Liability Insurance Act, 1991 is mandatory
- Help to strengthen the other infrastructures such as school, medical facilities, drinking water, sanitation, etc
- Help to maintain and improve social harmony in the region

**Table 10: Estimated Capital & Recurring Expenses for Environment Management**

#	Particulars	Amount (Rs. in Lakhs)
<b>Capital Expenses</b>		
1.	Standalone Multiple Effect Evaporation Unit	650.00
2.	Incineration boiler with electrostatic precipitator and dump condenser	2250.00
3.	Fuel handling system	150.00
4.	Ash handling system	80.00
5.	Stack	90.00
6.	Spentwash storage lagoon	40.00
7.	Condensate polishing unit	510.00
8.	Sewage Treatment Plant	50.00
9.	Environmental monitoring and management	50.00
10.	Greenbelt development	20.00
11.	Rainwater harvesting	30.00
<b>TOTAL</b>		<b>3920.00</b>
	Additional provision towards CSR/CER (1.5 % of capital investment)	<b>191.00</b>
<b>Recurring Expenses/Annum</b>		
1.	Salaries and wages	25.00
2.	Maintenance (@ 5% on capital investment of Rs. 3920 lakhs) of pollution control devices e.g. ESP, etc.	196.00



3.	Fuel (incineration activity)	1314.67
4.	Miscellaneous	15.00
	<b>TOTAL</b>	<b>1550.67</b>

## 10.0 CONCLUSION

Proposed distillery unit of **M/s. NKJ Biofuel Pvt. Ltd (NBPL)** at village Ramhepur, Bodla tehsil of Kabirdham district in Chhattisgarh. This region is industrially backward. There is no rehabilitation or restoration issues involved with the project. The basic infrastructure such as roads, electricity, transportation, drinking water supply, health centers and hospitals, school, colleges, sanitation facilities are available in the vicinity. Baseline environmental quality data was collected for pre-monsoon season during March to May 2018. The unit will implement 'Zero liquid discharge' for all its wastewater stream.

It is an agro based project. Hence, it will be beneficial to local cane growers. The proposed project will be generating 164 direct employment opportunities. Thus, it will help in raising standard of living of locals. The potential environmental, social and economic impacts of the above project have been assessed during the environmental impact assessment study and described in this EIA report. The proposed distillery unit will have certain levels of negative impacts on the local environment. It has been endeavored to minimize the negative impacts by addressing them through environmental management plan. Necessary control measures have been suggested to meet with the norms and safeguard the environment. The implementation of this project will definitely improve the physical and social infrastructure of the surrounding area. Adequate financial provision is made by the project proponent for EMP and CSR activities (i.e. for upliftment of the local people). The proposed project will contribute to economic growth and help in generating Government revenue. Therefore, it will promote sustainable development.