EIA Report for Integrated Solid Waste Management, Berhampur, Odisha

November-2014

Prepared by

Global Experts

C-23, BJB Nagar

Bhubaneswar-751014

Email- globalexperts@rediffmail.com

consult@globalexperts.in

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FAX : 2562822/2560955
TEL : 2562368/ 2561909
EPABX : 2561909 / 2562847

STATE LEVEL EXPERT APPRAISAL COMMITTEE,ODISHA

(Constituted vide order No. S.O.1899 (E) dated 17th August 2012 of Ministry of Environment & Forests, Govt. of India ,)

Paribesh Bhawan, A/118, Nilakanthanagar,Unit-VIII,
Bhubaneswar - 751 012, ODISHA

BY REGD. POST

No. 1543 / SEAC -191 Date 05.09.13

To

To,
Dr. Ajit Kumar Mishra, Municipal Commissioner
Berhampur Municipal Corporation,
Near Town Plice Station, Berhampur-760002

Sub: Terms of Reference (ToR) for preparation of Environmental Impact Assessment Report (EIA) - Reg

Ref :- i) **YOUR APPLICATION FOR ISSUE OF "TOR" FOR INTEGRATED SOLID WASTE MANAGEMENT PROJECT OVER AN AREA OF 33.62 ACRES at Mohuda FOR BERHAMPUR BY BERHAMPUR MUNICIPAL CORPORATION (BMC), BERHAMPUR(TOR).**

ii) SEAC, Odisha meeting held during 17th , 19th and 20th August, 2013.

Sir,

In inviting reference to the above, the State Level Expert Appraisal Committee (SEAC), Odisha prescribed the following Terms of Reference (TOR) for undertaking detailed EIA study for **development of integrated municipal solid waste management facility at Mohuda over an area 33.62 ACRES and operation for 20 years and sanitary landfill for accumulated waste at the existing dumpsite at ChandaniaPahad and environmental monitoring 15 years With following activities:**

- **Processing (composting) of 150 TPD of mixed MSW**
- **Recovery of 28 TPD of Manure**
- **Sanitary landfill for inerts and processing rejects (50 TPD)**
- **Sanitary landfill for accumulated waste (90000 m^3)**

Considering the information furnished in the Form-I, presentation made by the **consultant M/s SENES Consultants India Pvt. Ltd** on behalf of the proponent and the TORs suggested by the proponent.

1. Land use plan of the project area should be prepared to encompass pre-operational, operational and post operational phases and furnished.
2. Land requirement for the project including its break up for various purposes, its availability and optimization.
3. Details on each unit in the facility describing its operations.

4. Details on site investigations – topographical surveys, geotechnical investigations(soil bearing capacity, permeability, *etc*).
5. A buffer zone of no-development shall be maintained around landfill site and shall be incorporated in the Town Planning Department's land use plans.
6. Landfill site shall be fenced or hedged and provided with proper gate to monitor incoming vehicles or other modes of transportation.
7. The landfill site shall be well protected to prevent entry of unauthorized persons and stray animals.
8. Approach and other internal roads for free movement of vehicles and other machinery shall exist at the landfill site.
9. Details of the proposed solid waste management system covering following:
    i. Coverage area for collection of MSW including ULBs, if any
    ii. Population projections
    iii. Current waste generation rates and projections
    iv. Expected quantity of MSW generation
    v. Current quantity of MSW collection
    vi. Physical and chemical characteristics of MSW
    vii. Details on MSW collection network
    viii. Transportation of MSW – type of vehicles, frequency of transportation, distanceof transportation
10. The plastic waste shall be segregated at source and the inert waste shall be distributed to local people for land filling.
11. The landfill site shall have wastes inspection facility to monitor wastes brought in for landfill, office facility for record keeping and shelter for keeping equipment and machinery including pollution monitoring equipments.
12. In order to prevent pollution problems from landfill operations, the following provisions shall be made :-
    a. Diversion of storm water drains to minimize leachate generation and prevent pollution of surface water and also for avoiding flooding andcreation of marshy conditions;
    b. Construction of a non-permeable lining system at the base and walls of waste disposal area.
    c. The highest level of water table shall be at least two metre below the base of clay or amended soilbarrier layer ;
    d. Provisions for management of leachates collection and treatment shall be made. The treated leachates shall meet the standards specified in Schedule–IV appended with the Municipal Solid Wastes (Management & Handling) Rules, 2000.
    e. Prevention of run-off from landfill area entering any stream, river,lake or pond.Specifications for land filling given in the Municipal Solid Wastes (Management & Handling) Rules, 2000 shall be followed.
13. A vegetative cover shall be provided over the completed site in accordance with the following specifications, namely :-
    - Selection of locally adopted non-edible perennial plants that are resistant to drought and extreme temperatures shall be allowed to grow;
    - Selected plants shall have ability to thrive on low-nutrient soil with minimum nutrient addition;
    - Plantation to be made in sufficient density to minimize soil erosion.
14. The post closure care of landfill site shall be conducted for at least fifteen years and long term monitoring or care plan shall be proposed.
15. Collection of one season (non-monsoon) primary baseline data on ambient air quality, water quality, noise level, soil and flora and fauna and site-specific meteorological data should also be collected and furnished. The location of the monitoring stations should be

justified. Prediction of impacts on ambient air quality water quality, noise level, using appropriate mathematical models should be furnished.

16. Impact of the project on the water quality both surface and groundwater should be assessed and necessary safeguard measures, if any required, should be provided.
17. Impact on local transport infrastructure due to the project. Projected increase in traffic as a result of the project in the present road network (including those outside the project area) and whether it is capable of handling the increased load. Arrangement for improving the infrastructure, if contemplated including action to be taken by other agencies such as State Government, if any, should be covered.
18. Phase-wise plan of greenbelt development, plantation and compensatory afforestation clearly indicating the area to be covered under plantation and the species to be planted are to be specified. The details of plantation already done should be given.
19. Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife corridors, Tiger/Elephant reserves (existing as well as proposed if any), and existence of rare and endangered flora and fauna if any, within study area should be clearly indicated. Necessary clearance, if any, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above under the Wildlife (Protection) Act, 1972 and rules framed thereunder and co thereof, may be furnished
20. Detailed environmental management plan to mitigate the environmental impacts due to the project is to be given.
21. Risk assessment and Disaster management should be provided which includes preparedness, management of disasters, awareness prevention and mitigation, response and relief.
22. Occupational health impact and remedial measures thereof for the project may be studied.
23. Socio-economic impact due to project activity may be assessed and based on the study, developmental activity proposed to be undertaken by the project proponent to be specified and as far as possible, quantitative dimension to be given. Study should include Corporate Social Responsibility (CSR) and it should be carried out as the entry point activity as trust building measures.
24. Points raised in public hearing and commitment of the project proponent on the same are to be given.
25. Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the project should be furnished.
26. CSR activities including awareness should be taken up.
27. **This Terms of References (TORs) is valid for a period of two years from the date of issue of TORs for submission of the EIA/EMP report after public consultation.(This is in conformity with the MoEF, Govt. of India office memorandum No. J-11013/41/2006-IA II(I) dt. 22.3.10).**

Accordingly you are required to prepare the draft EIA report in the prescribed format given in Appendix-III of MoEF Govt. of India, Notification dt.14.09.06 and submit the EIA report including the summary EIA to the SEIAA, Odisha with a copy to the SEAC, Odisha for necessary action on this matter . You are also required to take necessary steps for public consultation in respect of your above mentioned proposed project.

Yours faithfully

SECRETARY
State Level Expert Appraisal Committee

Compliance to the Conditions of Terms of Reference (ToR) vide Letter No.1543/SEAC-191 dt.05.09.2013

Sl. No.	Conditions	Action taken in EIA & EMP Report	Reference Page no. in EIA report
1.	Executive summery	Chapter-0	1-9
2.	Land use plan of the project area should be prepared to encompass pre-operational, operational & post operational phases & furnished	Given in CH-2 & CH-3	Page 33-53 & page 64-68
3.	Land requirement for the project including its break up for various purposes, its availability & optimization	Given in CH-2 & CH3	Page 46, 49, 64
4.	Details on each unit in the facility describing its operation.	Given in CH-2	Page 27-48
5.	Details on site investigations-topographical surveys, geotechnical investigations(soil bearing capacity, permeability, etc)	CH-3	Page-80
6.	A buffer zone of no-development shall be maintained around landfill site & shall be incorporated in the Town Planning Department's land use plans.	There is no habitation within 500 m radius. No-development around the landfill site will be incorporated in the Town Planning Department's land use plans.	
7.	Landfill site shall be fenced or hedged & provided with proper gate to monitor incoming vehicles or other modes of transportation	Given in CH-2 CH-5	Page 36, 168
8.	The landfill site shall be well protected to prevent entry of unauthorized persons & stray animals.	Given in CH-5	Page 155, 168
9.	Approach & other internal roads for free movement of vehicles & other machinery shall exit at the landfill site.	Given in CH-2	Page 36
10.	Details of the proposed solid waste management system covering following: i. Coverage area for collection of	Given in CH-2	Page 19-20

	MSW including ULBs, if any ii. Population projections iii. Current waste generation rates & projections iv. Expected quantity of MSW Generation v. Current quantity of MSW generation vi. Physical & chemical characteristics of MSW vii. Details of MSW collection network viii. Transportation of MSW-type of vehicles, frequency of transportation, distance of transportation		 Page 16-17 Page 16-19 Page 16-17 Page 18-19 Page 22-23 Page 19 Page 19-20
11.	The plastic waste shall be segregated at source & the inert waste shall be distributed to local people for land filling.	No segregation at the source is proposed , segregation of waste will be through centralized facility at the treatment & disposal site	
12.	The landfill site shall have waste inspection facility to monitor wastes brought in for landfill, office facility for record keeping & shelter for keeping equipment & machinery including pollution monitoring equipments.	Given in CH-2	Page 36, 38, 45
13.	In order to prevent pollution problems from landfill operations, the following provisions shall be made:- a. Diversion of storm water drains to minimize lechate generation & prevent pollution of surface water & also for avoiding flooding and creation of marshy	Given in CH-2	Page 36

	conditions. b. Construction of a non-permeable lining system at the base & walls of waste disposal area. c. The highest level of water table shall be at least two meter below the base of clay or amended soil barrier layer d. Provisions for management of leachates collection & treatment shall be made. The treated leachtes shall meet the standards specified in Schedule-IV appended with the Municipal Solid Wastes(Management & Handling) rules, 2000 e. Prevention of run off from landfill area entering any stream, river, lake or pond. Specifications for land filling given in the Municipal Solid Wastes (Management & handling) Rule, 2000 shall be followed.	Given in CH-2 Given in CH-3 Given in CH-2, CH6 Given in CH-6	Page 44-45 Page 108 Page 38-40 Page 171 Page 163-164,& Page 171-172
14.	A vegetation cover shall be provided over the completed site in accordance with the following specifications, namely:- • Selection of locally adopted non-edible perennial plants that are resistant to drought & extreme temperatures shall be allowed to grow; • Selected plants shall have ability to thrive on low-nutrient soil with minimum nutrient addition; • Plantation to be made in sufficient density to minimize soil erosion	Given in CH-6	Page 173-174
15.	The post closure care of landfill shall be conducted for at least fifteen years & long term monitoring or care plan shall be proposed	Given in CH-6, CH 8	Page 168-174 Page 216-224
16.	Collection of one season (non-monsoon) primary baseline data on ambient air quality, water quality, noise level, soil & flora & fauna & site specific	Given in CH-3	

	meteorological data should also be collected & furnished. The location of the monitoring stations should be justified. Prediction of impacts on ambient air quality, water quality, noise level, using appropriate mathematical models should be furnished.		
17.	Impact of the project on the water quality both surface & groundwater should be assessed & necessary safeguard measures, if any required, should be provided.	Given in CH-5 & 6	Page 151-154 Page 163-164
18.	Impact on local transport infrastructure due to the project. Projected increase in traffic as a result of the project in the present road network (including those outside the project area) and whether it is capable of handling the increased load. Arrangement for improving the infrastructure, if contemplated including action to be taken by other agencies such as State Government, if any, should be covered.	Given in CH- 5 & 6	Page 153, 155 & 166
19.	Phase-wise plan of greenbelt development, plantation and compensatory afforestation clearly indicating the area to be covered under plantation and that species to be planted are to be specified. The details of plantation already done should be given.	Given in CH-6	Page 173-174
20.	Location of National parks, Sanctuaries, biosphere reserves, Wildlife corridors, tiger/elephant reserves (existing as well as proposed if any), and existence of rare and endangered flora & fauna if any within study area should be clearly indicated.Necessery clearance, if any, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above under the wildlife (Protection) Act, 1972 & rules framed there under and thereof, may be furnished.	Given in CH-3	Page-55 &64
21.	Detailed environmental management to mitigate the environmental impacts due	Given in CH-6	162-174

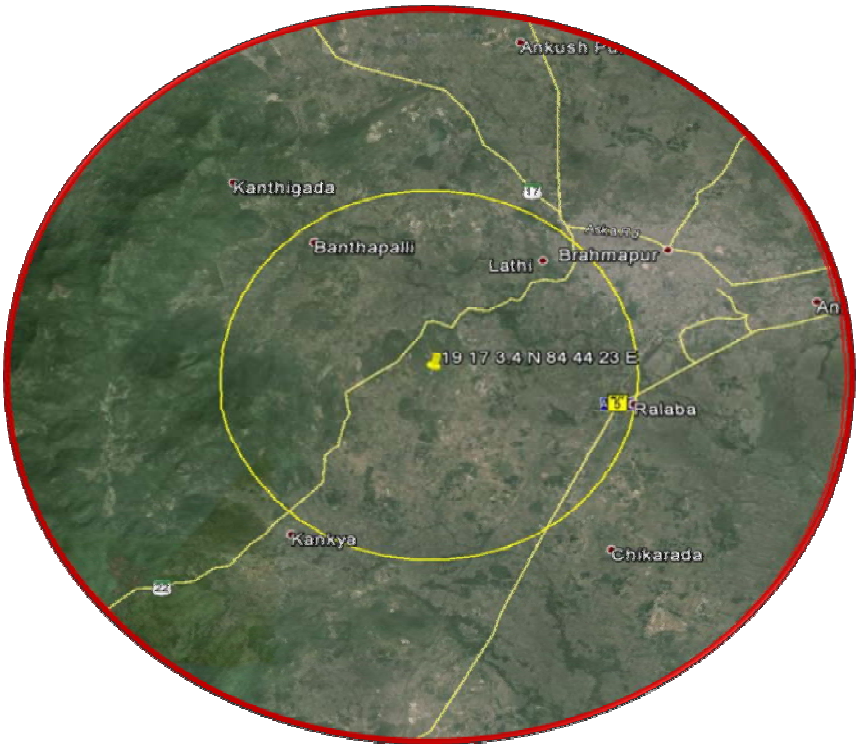
	to the project is to be given		
22.	Risk assessment & Disaster management should be provided which includes preparedness, management of disasters, awareness prevention & mitigation, response & relief.	Given in CH-9	225-228
23.	Occupational health impact & remedial measures thereof for the project may be studied.	Given in CH-5 & 6	Page 152, 155 Page 166-168
24.	Socio-economic impact due to project activity may be assessed & based on the study, developmental activity proposed to be undertaken by the project proponent to be specified & as far as possible, quantitative dimension to be given. Study should include Corporate Social Responsibility (CSR) and it should be carried out as the entry point activity as trust building measures.	Given in CH-3,9	Page 132-147 & page 229-230
25.	Point raised in public hearing & commitment of the project proponent on the same is to be given.	CH-7	Page-214-215
26.	Details of litigation pending against the project, if any with direction/order passed by any Court of Law against the project should be furnished.	NA	
27.	CSR activities including awareness should be taken up.	Given in CH-9	Page 229-230

EXECUTIVE SUMMARY

Executive Summary

Introduction of the Project	Berhampur Municipal Corporation (BMC) in Berhampur city of Ganjam District is taking steps to improve the municipal solid waste management services in the city, and in this regard, BMC intends to develop an integrated solid waste management system including collection, storage,transportation and development of a treatment and disposal facility on a PPP basis in compliance with the Municipal Solid waste (Management and Handling) Rules, 2000, under the aegis of the Environmental Protection Act, 1986. The objectives of BMC through this project include: • To improve the efficiency of SWM collection and transportation system in the city of Berhampur • To introduce scientific treatment and disposal of the SWM • To comply with the MSW Rules 2000 BMC has identified a site in Mohuda village (Latitude: 19° 17' 03.4'', Longitude: 84 ° 44' 23.0'') of Ganjam district, spread over an area of 33.62 acres for designing and operating a sanitary landfill facility (SLF) of 150 TPD and scientific closure and decommissioning of the existing dumping site has been proposed at Chandania Pahad.The location (Mohuda) will have the facility of receiving, segregation and taking up waste for further processing. The handling and processing of Municipal Solid Waste will result in substantial reduction in the quantity of waste, reduction in green house gas emission and generation of value addition products. The proposed project is required to obtain environmental clearance from the State Environmental Impact Assessment Authority (SEIAA) based on recommendation of the State Expert Appraisal Committee (SEAC) as per the EIA Notification September, 2006. Behrampur Municipal Corporation/UPL Environmental Engineers Limited has hired Global Experts to carry out the EIA study in accordance with the prescribed ToR issued by SEAC, Odisha vide letter No.1543/SEAC-191 dated 5th September 2013. Global Experts (GE) has carried out detailed (primary and secondary) studies for preparing this EIA report. GE employed Spectro Analytical Labs Ltd. for providing services related to sampling and analysis of environmental components. Spectro lab is recognized by the Ministry of Environment and Forests, Govt. of India and accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL). .
Project description	The proposed landfill site is located in the Mahouda Village of Ganjam District in south of Odisha, approximately 8 km from Berhampur city. Berhampur is located close to the shores of Gopalpur.

	Geographically, Mohuda village, where the project site is located is at following coordinates: **Latitude**: 19° 17' 03.4'' **Longitude**: 84 ° 44' 23.0'' A few villages near site at Mahouda Village are Bendalia, Goshain Nuagan, Lathi, Barapalli, Narshingpur, Medinpur etc Other main features of the site are described below: • The site has undulating terrain with hilly surrounding, especially on the north and north-eastern side • The average height of ground surface at the proposed project is approximately 90 m above mean sea level.The site and its surrounding consist of grassland characterized by short grass with a few trees and shrubs. Entire north and north-eastern boundary is hill. • There are two quarries on the left hand side of this approach road to the proposed site. Another quarry is present outside the south-western part of the site. • Area around the proposed project site in Ganjam district receives approximately 1492.8 mm rainfall annually. • There is no archaeological monument or cultural property near immediate vicinity of the site. • Site is not located in a flood plain.The area falls in Seismic zone II – low risk category • There are no endangered species of flora and fauna in the area. • There are no habitation or sensitive receptors within 500 m of site. A Quarry is operational within 100 m of site. An undercosntruction house was observed close to site within 200 m and reportedly that belonged to the Quarry operator.
Site Setting	The site is surrounded by hillocks north and north-eastern side and is approachable from south-western side. Site is full of bushes and scrubs.

	Satellite view of Mohuda site (Proposed landfill site)  The settlements at Mahuda village are at an aerial distance of about 1.1 Km from the boundary of the proposed site. In fact, the settlement is at the other site of the hillock at the base of which the proposed site is being planned. The office and residential campus of GRAM VIKAS - an NGO is located at a distance of approximately 900 m from the boundary of the proposed site. The residential campus has about 70 inhabitants. Site is outside municipal limits, sufficiently distant from major settlements, visually screened due to presence of hillocks; any significant visual impact is not envisaged. No airports are located within 3 Km of the site and No perennial stream is located within 300 m (down gradient) of the site.
Environment Setting in area	No water bodies utilized for private/public drinking, irrigation, or livestock water supply are located within 500 m from the site. The nearest water body is a pond at about 1 Km from the northwestern side of the proposed site. The typical species of flora and fauna found near the landfill are widely spread in the district and are not considered in the endangered species category.
Land requirement	The site is located on 33.62 acres of land. Entire land has been allotted by state government to the project developer. The site is bounded by small hillocks with undulating lands in between. Area slopes towards southern side.The area mostly comprises of fallow land bounded by hillocks in the northern and north eastern part

Baseline Environmental Conditions	
The field studies carried out during November, 2013 to January 2014 for the Environmental Impact Assessment (EIA) study to provide the baseline data for the present environmental scenario at and within 10 km radius of the proposed site. Data collection survey for the study, which included,geology, hydrology, meteorology, ambient air quality, water quality and soil characteristics, noise level, flora and fauna, land use pattern, demography, amenities and infrastructure was undertaken by the field team of global experts as well as Spectro analytical lab who have been outsourced the base line data sampling and analysis work.	
Topography	The proposed project site and surrounding areas has irregular terrain with altitude ranging between 25-850 m. Hill and table lands are characteristics of the Study area. The elevation of the proposed project site ranges between 75-100 m above msl. Within the proposed area the highest elevation is 100 m; which is located towards north and shows reduction in altitude towards south i.e 75 m indicates undulation in the project area.
Geology	Major part of the area is underlain by hard crystalline rocks of the Archean age. Minor laterites also occur in the area as capping over the older formations i.e. Granite gneiss and its khandalitic variants. In the study area, sporadic outcrops of Porphyritic granite, Augen gneisses and granite gneisses are found to occur separated by fallow lands with lateritic capping. Joints, lineation and foliations are present within the porphyritic granites.
Geo-hydrology	A major portion of the study area in the eastern part is covered by the sea (Bay of Bengal). In general, the rest of the area presents a highly undulating topography with scattered isolated hillocks and mounds, narrow & shallow intermontane valleys, gently undulating narrow plains covered by Quaternary sediments deposited by tributaries of Rushikulya river. Transported laterites, near the coast, form low uplands. The coastal aeolian dunes occupy considerable area. The major geomorphic feature of the study area are the Buried Pediments, Younger Coastal Alluvium(flood plains), mudflats(not very pronounced) and beach ridge complex, sand dunes, denudational hills & residual valley hills, pediment – inselberg complex(not pronounced), Older alluvium & channel bars(not very pronounced) and water bodies
Soil	The soil type of the Core zone of the study area is Coastal Alluvial soil in nature. They are mostly silty in nature and rests over the older alluviums. It covers more than 70 % of the study area. These types of soils are characterised by dominance of mineral soil materials and absence of distinct pedogenic horizons. The proposed site is dominated with red loamy soil and characterized by the presence of organic matter and nitrogen.
Water Quality	The analytical results of surface water samples at different location for various parameters reveal that all the parameters comply with IS: 2296 (Class 'C') standards indicating their suitability for drinking and other purposes after conventional treatment followed by disinfection. In the study area, ground water potential varies from poor to good reserve of ground water. The project site has good ground water reserve. However, ground water reserve decreases towards the western pattern of study area. Ground water quality in the study area is mostly meeting the requirement of Potable water standard as per IS:10500, except for total dissolved solids and hardness. This

	may be due to local geological condition and soil strata thereof.
Ambient Air Quality Monitoring	Ambinet air quality at the site is well within the prescribed norms of NAAQS. However, on other locations near habitation, concentration of PM_{10}, $PM_{2.5}$ are sometimes high which may be due to windblown dust from unpaved roads and burning of fuels for cooking.
Noise	The site is located in a very quite area with least human interference which has resulted in low noise level at and near site. A relatively high value of noise level was observed in Madanmohanpur Viilage i.e. 52.6 dB which may be because of different human activities and vehicular movement but it is within the noise standard level. All other location the noise level was found to be well within the prescribed noise standard of SPCB.
Flora & Fauna	The study area comperis 10 km radius around the solid waste dumping site.The vegetation types of the study area shows in three different strata, i.e Top, Middle And Ground on the basis of their height. The top strata comprises of trees, Middle strata plants includes Shrubs and the ground or herbaceous specie. The vegetation recorded in the Berhampur city and its surrounding areas are classified as open scrub forest, bock plantation (Cashew and Casuarina), fruit orchard, naturally grown Kewda (Pandanus odoratissimus) and riparian forest. The study area mainly comprises of three reserve forest namely Ramgruha R.F, Rampali R.F & Dhanarasahi R.F present in the South- west & North-west side of the study area.
Socio-economic Profile of The Area	Socio economic profile of the area around the site can be categorized as rural and urban mix. The rural population is mainly involved in agricultural activities and small trading activities. The proposed project is not likely to adversely affect the socio economic conditions of area.
Impact Assessment	
Construction Phase	**Water Quality:** Since there is no water body existing close to the site, this impact is not likely to affect the water environment. Further, impacts will be temporary in nature and can be controlled by suitable environmental management plan, to be prepared and implemented by the Project developer. **Air Quality**: Air quality impact will be temporary in nature and will stop when construction is over. A dust and emission control plan will be prepared and implemented by the project developer. **Noise:** Noise in and around the construction site may affect the animal and residents in the surrounding areas. However, habitation around site is very less and animals in the area will have tendency to move away from the noise and eventually return to the area when construction is complete. A noise control and management will be prepared and implemented by the project developer. **Quarries/ Borrow Pits:** Some potential quarry sites/borrow pits may be identified as sources of construction materials.Opening of the quarries in hilly terrain will cause visual impacts because they remove a significant part of the hills,however,since there is already a quary operational in the surrounding of the site,that can be utilized for supplying the demand of the project. In case, project developer decids to go for another

	quarry/borrow pit then a quarry/borrow pit management plan will need to be prepared and implemented by the contractor. **Labour Camp Issues:** Potential impacts from the workforce and the work camps in all construction areas, will be in terms of additional pressure on land and natural resources. There will be generation of solid and liquid wastes. Additionally, the spontaneous development near the construction camps could create public health risks. Wastewater from the work camps could cause water quality problems in the adjacent water body. Inappropriate solid waste disposal could lead to the contamination of the soil and surface water body, and the spread of communicable diseases. Project developer will prepare a plan for managing work camps and labour force. **Public Health:** More traffic on the roads during construction could increase accidents within communities living adjacent to the roads.Aquatic invertebrates known to be vectors of disease could inhabit stagnant water created during construction. The increased prevalence of such diseases may impact the health of communities and the construction workforce. **Damage to Physical cultural and archaeological resources:** There is no physical cultural resource within the site and hence this issue is not significant **Traffic related Impact** There may be increase in accidents on road due to movement of vehicle with heavy load and increased number of vehicles. This may also create social problem in case there is conflict between transport drivers and the local community.
Operation Phase	As per MSW Rules, only inert material is supposed to be disposed off. However looking to the current situation, the landfill gas generation has been considered. Environmental and social impacts during operation phase of the project are mainly divided into six categories: (1) Impacts from Compost/RDF plant;(2) impacts from landfill gas emissions ;(3) emissions form the operation of DG set and use of fuel to RDF plant (4) Handling and storage of oil/chemicals and fuels;(5) Handling and disposal of domestic liquid and solid waste;(6) Impact from landfill leachate. These impacts are discussed in detail in following sections. **Impacts from Compost/ RDF plant** ▪ Odour nuisance in the surrounding ▪ Noise pollution in the close vicinity ▪ Air pollution is not likely to be significant although small effect is foreseen ▪ Visual impact for local habitants **Impacts from landfill gas** Many constituents of landfill gas are hazardous and pose potentially significant risks to human health and the environment. Some other risks result from the process of flaring. **DG set:** DG set will emit air pollution during its occasional operation in times of power failure.

	Spillage and leakage of oil/chemicals: Oil and chemical spillage during handling and storage process may lead to water and land contamination in the immediate vicinity of the activity area. During rains, water contamination may extend to larger distance. **Discharge of domestic liquid & solid waste:** Office setup and daily routine activities at the site will generate domestic wastewater, which if discharged without proper treatment and disposal, will cause pollution of nearby surface and ground water body. Municipal solid waste, generated from daily activities, will require proper collection and disposal for good housekeeping and sanitation purposes. **Leachate from landfill:** Leachate from landfill operation has great potential to cause damage to water receiving bodies.Proposed site faces the same issue and project developer shall have to plan leachate management in adequate manner.
Closure and post closure phase activities	It has been experienced that occasional explosion takes place in closed landfill site due to methane gas release. This causes accident and health impact on the local people who may be there at the location by chance. There may be possibility of similar occurrence at proposed site Decommissioning of the landfill site alongwith compost/RDF plant will generate dust, noise and debris, which may create pollution if not handled properly. After the closure of the landfill, there can still be need for continuing operation of leachate treatment plant until a time by when it could be established that leachate is no longer an issue at the site.

Community Issues	**Breeding of mosquitoes,vectors and flies** This will be an adverse impact, as landfill site will be cause risk of breeding. **Littering of waste in residential and commercial area** Littering of waste from the waste transport vehicles may cause nuisance to local public whose houses and shops may be located on the sides to road for transport of garbage vehicles. **Unauthorized entry in landfill** Operation of the landfill site may cause unauthorized entry which may lead to accidents and health impact of intruders. **Increase in disease occurrence rate in local community** Currently there is no significant settlement around the site, however,it may increase after the landfill site is operational. In that case,there will be chances of disease in local people from the impact of landfill.A bufferzone must be developed around site to prevent local settlement around site. **Social conflict among construction workers and labour camps** Migrated workers may create law and order problems with local community in the area.However, this is not anticipated to be severe issue because there not much settlements at and around site. **Health impact from landfill gas** Unauthroised persons in the landfill site may be exposed to the health impact from landfill gas. **Health and safety of scavengers** Scavenging activity if done in uncontrolled manner without PPEs(Personal Protective Equipment) will cause health and safety concerns for scavengers**.**
Environmental Management Plan	
Environmental Management Plans	Sound environmental management plans will be prepared and implemented to mitigate potential adverse impacts and enhance positive impacts. The EMPs have been developed for the following stages of the plant activities at the site. ▪ Project preparation stage ▪ Project construction stage ▪ Project operation stage ▪ Plant closure and post closure stage To support implementation of EMPs, regular monitoring of environment quality (ambient air, Ground water, noise and waste water) will be undertaken by project developer during construction as well as operation of the plant.
Institutional Framework for Implementation & Monitoring of Mitigation Measures	Environment Management Plans will be incorporated as key points of discussion in the tender document. Prospective construction contractors will be asked to submit, in their proposal, the implementation response to various requirements of EMPs and health and safety plan along with budget allocation for the same. Selection of the contractor will be influenced by their response to the EMPs and proposed budget. Once finalized, the contractor will be required to implement EMPs as defined in their proposal and approved by project developer, and BMC will monitor the process of implementation. All the necessary components of EMP and Health and Safety Plan will be operational before starting pre construction work. ESMP and Health and Safety Plan for operational stage of the project will largely be

	taken care of during design and siting of the landfill plant. A few residual plans related to the process like waste handling, handling and storage of fuels, etc will be implemented under routine activities within operational activities. In order to streamline environmental activities, project will implement environmental management system compatible with ISO-14001 standard. The system will have number of process monitoring steps vis-à-vis safe and environment friendly operation of the plant. The Environment officer of BMC will regularly undertake internal monitoring and supervision.
Corporate Social Responsibility (CSR)	Under CSR the company shall spent 1% of its project cost, which comes 35 lakhs; this will fulfill public demand and bring about the overall improvement of the locality and shall be spent in 5years of time for overall development of the locality and local people.Some of the community developments plans can be considered by the project developer as part of corporate social responsibility
Conclusion	The proposed project is timely intervention in the affairs of Chandania Pahad dumpsite, for handling deteriorating environmental conditions. Environmental issues are similar to those of any other landfill site. However, severity of their significance is less at this site since site is much away from residential area and sensitive environmental receptors. To further strengthen the environment management and monitoring, it is recommended that the project operator should design and implement an environmental management system compatible with ISO-14001 for the plant, once it is operational. A CSR plan is to be developed by BMC that will be based on consultation with the local community.BMC intends for sustainable development of the area and community benefit plan will go a long way in fostering strong relation ship between local community and BMC. This relation ship is the foundation over which the proposed landfill project is likely to succeed in Behrampur and bring benefits to the local people and state in general.

Chapter 1
INTRODUCTION

1.1 INTRODUCTION

About Project and Project Proponent:

Berhampur Municipal Corporation (BMC) in Behrampur city of Ganjam District is taking steps to improve the municipal solid waste management services in the city, and in this regard, BMC intends to develop an integrated solid waste management system including collection, transportation and development of a treatment and disposal facility on a PPP basis in compliance with the Municipal Solid waste (management and handling) Rules, 2000, under the aegis of the environmental protection Act, 1986.

The objectives of BMC through this project include:

- Improve the efficiency of SWM collection and transportation system in the city of Behrampur
- Introduce scientific treatment and disposal of the SWM
- Comply with the MSW Rules 2000

In order to alleviate the financial burden of the project on BMC's budget,the project has been selected by H&UD to receive funding from the Odisha Urban Infrastructure Development Fund (OUIDF). OUIDF has agreed in principle to provide support to the project. The project will be governed by a concession agreement and the agreement will be executed on a build own operate transfer (BOOT) model, i.e. concession will be granted to the Concessionaire to implement the project with BMC acting as the administrative authority overseeing the implementation of the project.
Scope of the project includes developing and implementing an integrated waste management system for Behrampur Municipal Corporation including collection, transportation, segregation, processing and scientific disposal of waste and decommissioning of existing and new sites in environment friendly manner in accordance with applicable laws and standards.

1.1.1. Importance of the Project:

Berhampur is one of the oldest and most populous cities in Ganjam district with an area of 37 sq.km. Like most urban cities, this city too is marred with lack of treatment or processing facility for treating municipal solid waste generated in the city. The entire quantity of waste from the city currently is disposed at a place called Chandiania Pahad without any scientific treatment. This disposal site running overcapacity and has caused much pollution in the surrounding environment. There is an urgent need for alternate treatment and disposal site designed in scientific manner.

BMC has identified a site in Mohuda village of Ganjam district, spread over an area of 33.62 acres for designing and operating a sanitary landfill facility (SLF) of 80 TPD and scientific closure and decommissioning of the existing dumping site has been proposed at Chandania Pahad. Landfill site spread over 33.62 acres will also house a Compost plant of 150 TDP.The location will have the facility of receiving, segregation and taking up waste for further processing. The handling and processing of Municipal Solid Waste will result in substantial reduction in the quantity of waste, reduction in green house gas emission and generation of value addition products.

1.2. PURPOSE OF THE EIA REPORT

The purpose of the EIA study is to understand the baseline environmental condition of the project site and its surroundings; assessing the nature and extent of potential environmental impacts that can occur due to construction, operation and decommissioning of the project; and to recommend the management measures to prevent or mitigate the potential impacts. Report will also capture environmental monitoring need at several stage of project implementation.

1.2.1. Regulatory Framework and Requirement for EIA:

As per the Environmental Impact Assessment (EIA) Notification issued by the Ministry of Environment and Forests, Govt. of India in 2006 (and amended thereafter), Common Municipal Solid Waste Management Facilities (CMSWMF) will be considered as Category "B□ projects will require prior Environmental Clearance. The proposed project is required to obtain environmental clearance from the State Environmental Impact Assessment Authority (SEIAA) based on recommendation of the State Expert Appraisal Committee (SEAC) as per the EIA Notification September, 2006.

Behrampur Municipal Corporation/UPL Environmental Engineers Limited has hired Global Experts to carry out the EIA study in accordance with the prescribed ToR issued by SEAC, Odisha. Global Experts (GE) has carried out detailed primary and secondary studies for preparing this EIA report. GE employed Spectro Analytical Labs Ltd. for providing services related to sampling and analysis of environmental components. Spectro lab is recognized by the Ministry of Environment and Forests, Govt. of India and accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL). The EIA study has been done as per the approved TOR provided by SEAC vide letter No.1543/SEAC-191 dated 5th September 2013.

1.2.2. Scope of the EIA Study

The EIA study has been carried out with the purpose of understanding (a) the baseline environmental conditions of the project site and its surroundings; (b) assessing the nature and extent of potential environmental impacts that can occur due to construction, operation and decommissioning of the project; and (c) recommending management measures to prevent/mitigate the potential impacts. The more specific scope of the Environmental Impact Assessment study is explained below:

- Establish the baseline environmental conditions of parameters in the areas such as meteorology, ambient air quality, ambient noise levels, surface and groundwater quality, soil quality and ecology;
- Establish the positive/beneficial impacts of the project in the current scenario of MSW management in the study area
- Establish the design measures for protecting the soil, surface water and groundwater from contamination; for controlling noise and vibration generation from operating machines and equipments;
- Identify the impacts of the project on the environmental and socio-economic environment in the project area;

- Formulate an Environmental Management Plan for management and mitigation of potential adverse impacts; and
- Identify the potential disasters that can affect the facility and surrounding community, and formulate a Disaster Management Plan to reduce risks for loss of life and property.

  The specific scope of the work has been laid down in the TOR issued by SEAC. The details of the same and the fulfilment of compliance have been detailed out in the beginning of the report in a tabular form.

1.3. BRIEF DESCRIPTION OF THE SITE

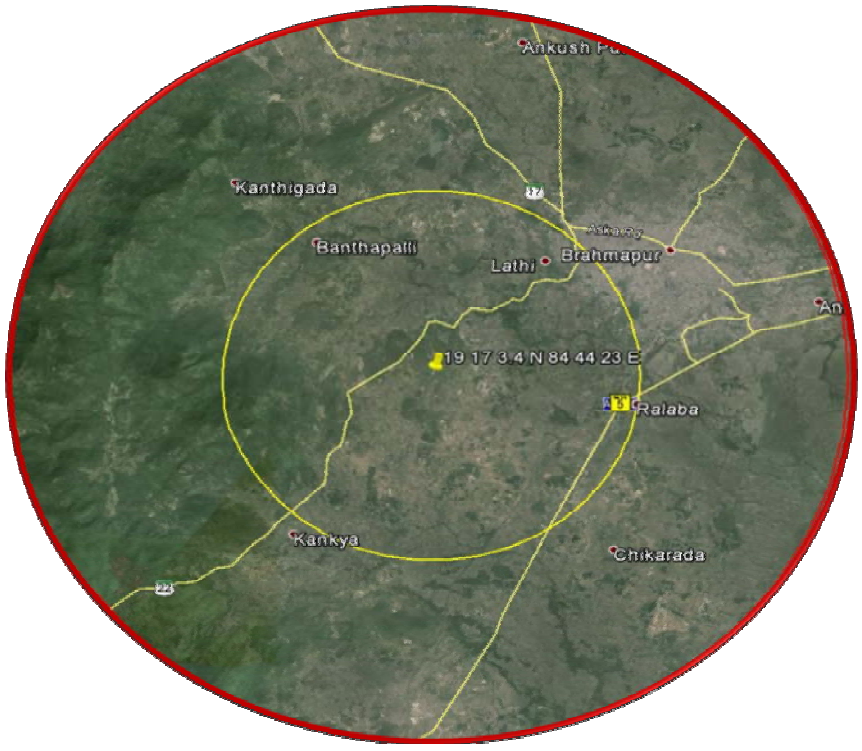
1.3.1. Site Location:

The proposed landfill site is located in the Mahouda Village of Ganjam District in south of Odisha, approximately 8 km kilometers from Behrampur city. Behrampur is located close to the shores of Gopalpur.

1.3.2. Details of the Site

The site is surrounded by hillocks north and north-eastern side and is approachable from south-western side. Site is full of bushes and scrubs. Satellite map of the proposed site is shown in the **figure 1.1**. The location of Behrampur on Odisha map and India map is displayed in **figure 1.2**. A few pictures of the proposed site are displayed as **figure 1.3**

Figure-1.1 *:* Satellite view of proposed Project site at Mahuda village



Geographically, Mohuda village, where the project site is located is at following coordinates:
Latitude: 19° 17' 03.4''
Longitude: 84 ° 44' 23.0''

A few villages near site at Mahouda Village are Bendalia, Goshain Nuagan, Lathi, Barapalli, Narshingpur, Medinpur etc

Other main features of the site are described below:

- The site has undulating terrain with hilly surrounding, especially on the north and north-eastern side
- The average height of ground surface at the proposed project is approximately 90 m above mean sea level.
- The site and its surrounding consist of grassland characterized by short grass with a few trees and shrubs. Entire north and north-eastern boundary is hill.
- There are two quarries on the left hand side of this approach road to the proposed site. Another quarry is present outside the south-western part of the site.
- Area around the proposed project site in Ganjam district receives approximately 1492 mm rainfall annually.
- There is no archaeological monument or cultural property near immediate vicinity of the site.
- There are no endangered species of flora and fauna in the area.
- There are no habitation or sensitive receptors within 500 m of site. A Quarry is operational within 100 m of site. An undercosntruction house was observed close to site within 200 m and reportedly that belonged to the Quarry operator.

Figure-1.2 **Location of Berhampur on Odisha Map and India map**

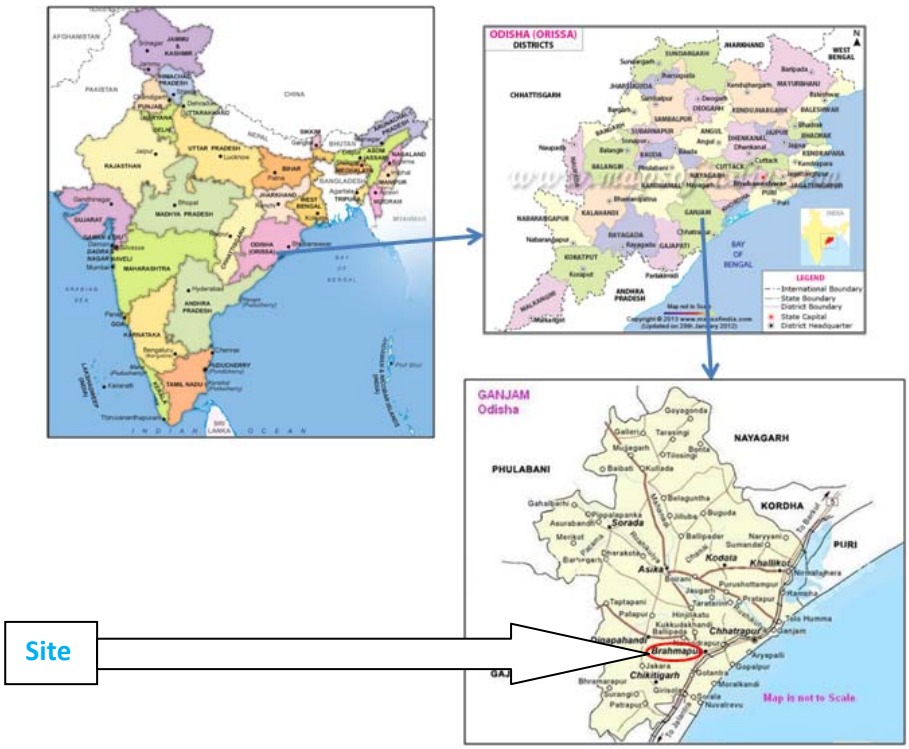


Figure 1.3: Site picures with the direction of the location os the site

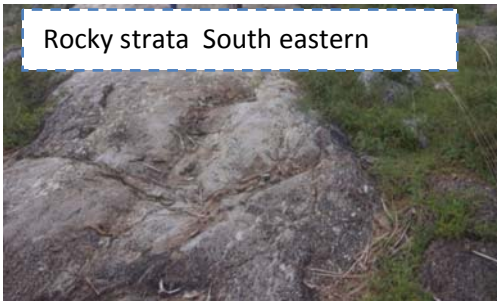
Temporary Road to the site (south)

Entry point of the Project site (South)

Quarry Near the site (North West)

Borewell in the site

Rocky strata South eastern



FAEs visit to proposed site

Road connecting SH22

Collage near the Project Site (Noth East)

Accessiblity of the proposed site

The site is readily accessible by the existing road network. The landfill site is located to the south east of Berhampur City, about 08 km from the City Center. The present access to the site from Behrampur city is through State Highway (SH-22), branching off to the left at approximately 6 km distance and following the gravel road going to site (about 0.5 km from SH-22).

The nearest railhead is Berhampur which is 17 km away from the proposed site. The nearest air strip is at Rangeilunda which is about 30 km away from the site.

CHAPTER-2
PROJECT DESCRIPTION

2.1 INTRODUCTION

Solid Waste Management is one of the most essential services for maintaining the quality of life in the urban areas and for ensuring better standard of health and sanitation. Municipal solid waste generation in a city is directly proportional to the growth in population. In the last three decades, there has been substantial growth in area and population of Berhampur city. This has been as a result of rapid industrialization and influx of sub-urban and rural population to the city. Given below is trend of population growth in berhampur over last three decades.

Table- 2.1: Growth trend in population in Berhampur over last three decades

YEAR	POPULATION	Decadal Growth (%)
1971	117662	
1981	162550	38.15
1991	210418	29.45
2001	307792	46.28
2011	355823	15.6

Table-2.2: Table showing the population and waste quantitiy projection

Sr. No.	Year	Population	Waste quantity in TPD
1	2011	355,823	138
2	2012	363,167	142
3	2013	370,634	146
4	2014	378,228	151
5	2015	385,950	156
6	2016	393,803	162
7	2017	401,789	167
8	2018	409,911	173
9	2019	418,171	179
10	2020	426,571	184
11	2021	435,116	191
12	2022	443,806	197

13	2023	452,646	203
14	2024	461,637	210
15	2025	470,784	217
16	2026	480,088	224
17	2027	489,554	232
18	2028	499,184	239
19	2029	508,982	247
20	2030	518,951	255
21	2031	529,094	264
22	2032	539,415	272
23	2033	549,919	281
24	2034	560,608	290
25	2035	571,486	300
26	2036	582,558	310
27	2037	593,827	320

2.2 EXISTING SOLID WASTE MANAGEMENT SCENARIO

Solid waste is a heterogeneous mixture with physical composition mixture of paper, plastic, cloth, metal, glass, organic matter, etc. generated from households, commercial establishments and markets. The proportions of different constituents of wastes vary from season to season and place to place, depending on the lifestyle, food habits, standards of living, and extent of commercial and recreational activities in the area. Generation is also from various sources such as residences, institutions, markets and commercial establishments, hotels, hospitals and some industries. Sources ans characterstics of MSW generated from Berhampur is explained below in Table 2.3.

Table- 2.3: Sources and Characteristics of MSW

Sl. No.	Type of Solid Waste	Description	Sources
1	Food waste (garbage)	Wastes from the preparation, cooking and serving of food Market refuse; waste from handling, storage and sale of produce, meats and vegetables	Households, institutions and commercial establishments such as hotels, stores, restaurants, markets etc.
2	Rubbish	**Combustible** (primarily organic) like paper, cardboard, cartons, wood, boxes, plastics, rags, cloth, bedding, leather, rubber, grass, leaves, yard trimmings **Non-combustible** (primarily inorganic) like metal tin cans, metal foils, dirt, ceramics, crockery, glass bottles, other mineral refuse	
3	Ashes and residues	Residue from combustion processes for cooking, heating buildings, cinders, clinkers, thermal power plants	
4	Bulky waste	Large auto parts, tyres, stoves, refrigerators, other large appliances, furniture, large crates etc.	
5	Street waste	Street sweepings, dirt, leaves, animal droppings, contents of litter receptacles, dead animals	Streets, sidewalks, alleys, vacant lots etc.
6	Dead animals	Small animals like cats, dogs, poultry etc; large animals like cows horses etc.	Slaughter houses, streets etc.
7	Construction & demolition waste	Lumber, roofing and sheathing scraps, rubble, broken concrete, plaster, conduit pipe, wire, insulation etc.	Construction and demolition sites, remodelling, repairing sites
8	Horticultural waste	Tree-trimmings, leaves, waste from parks and gardens etc.	Parks, gardens, roadside trees etc.

At present the solid waste generation in Berhampur city is around 138 TPD of MSW out of which around 78 TPD of waste is collected and transported for disposal. There is a significant amount of variability in the estimated waste generated in Berhampur city (138 TPD) and quantity of waste disposed at the disposal site (78 TPD) indicating a collection efficiency of only 57%. (Source:DPR for Integrated waste management project in Berhampur,Odisha)From the total generated waste and the population of BMC for the year 2011, the per capita waste generation of the Berhampur is estimated to be 388 g/person/day. The studies conducted to date by MoUD suggest that waste generation in Indian municipalities ranges between 200 and 600 grams per person per day in cities with population ranging from

100,000 to 5,000,000. Therefore, for planning purposes and infrastructure assessment, a per capita waste generation rate of 390 grams per person per day has been considered.

Sr. No.	Item	Quantity (TPD)
A	Primary Waste Quantification Results	
1	Waste quantity estimated at residential household	116
2	Waste quantity estimated at bulk generators	14
3	Waste Quantity estimated from commercial activities:	
	(a)Hotels	0.32
	(b)Restaurants, tiffin corners	7.5
	Total Waste Generation	**138**
B	Average waste quantity reaching disposal site	78
C	Collection efficiency of SWM in the city	57%

Source: DPR for Integrated Waste Management Project in Berhampur, Odisha

Currently, solid waste management in the city is executed by both Berhampur Municipal Corporation (BMC) and private agencies engaged by BMC. There is no waste segregation system. Majority of the waste is generated by household population which comprises High Income Group (HIG), Middle Income Group (MIG), and Low Income Group (LIG). There are about 110 slums in the city which covers more than 30% of city's population. Waste management is not present in the slum areas such as Hareda Kandi, Dharmera Street, Harijan Street, Janji Palli, etc. The city has a large number of vegetable and fruit markets which also generate a significant quantity of green organic waste. Issues of siltation and choking of open drains add further challenges to managing municipal solid waste in the city. The rapid increase in urban & semi-urban set up, substantial numbers of commercial establishments and vehicular congestion on the road are key challenges for BMC to manage solid waste. Current waste management practices in the BMC are briefly discussed below.

2.2.1 Existing Collection and Transportation System

The responsibility for primary waste collection lies with Berhampur Municipal Corporation (BMC) and is accomplished by BMC through its own manpower in 18 wards and also by engaging private contractors bound by annual contracts and NGO. There are 18 privatized Wards (3, 5, 9, 10, 13, 14, 18, 21, 22, 23, 24, 25, 26, 28, 29, 30, 32 and 36) where 5 private agencies extend their services and in Ward number 31, Vedic (an NGO) collects wastes at household level. The primary collection of waste is carried out by using tricycles having capacity to hold six (6) bins of 10 liters each.

Waste collected from households is transferred to a designated secondary collection point of respective Wards. In Wards where there is no formal door-to-door collection programs, generators either carry their waste to a secondary collection point or leave their waste on the street where it is collected as part of the municipal street sweeping service. There are 3 types of secondary collection points in the city. These are – 1) 3 MT containers, 2) 9 MT containers and 3) open dumps. The Berhampur city has twenty 3 MT containers, sixteen 9 MT containers and 27 open dumping points. Depending upon the location and filling status, containers are lifted at these intervals-daily or on every alternative day or once in three days. Facilities are not available to promote direct loading of large bins or transportation vehicles.

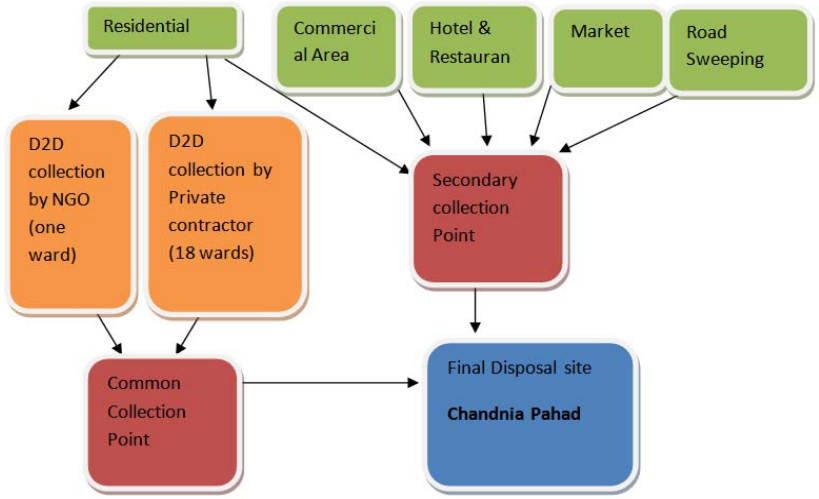
The transportation of wastes from secondary collection points to disposal sites is carried out by BMC. From the secondary collection points, waste containers (3 MT) are hauled by dumper placers (truck mounted and tractor mounted). 9 MT containers are transported to disposal sites by using hook loaders. Wastes from open dump SCPs are lifted daily by means of skid loaders (0.4 m3 capacity) or backhoe loaders and transported to disposal sites in tractor trailers (3 m3), refuse compactors (3 MT) or dumper trucks (Tata 407 and TATA 709).

Depositing waste in open drains is also very common in Berhampur. Street sweepers are responsible for not only cleaning roads and footpaths of dirt and silt, but also for collecting rubbish deposited by businesses and residents. In some areas, where there is no door-to-door waste collection system, BMC has provided community bins for residents to deposit waste generated by them.

2.2.2 Existing Solid Waste Treatment and Disposal

At present, Berhampur Municipal Corporation does not have any waste treatment or processing facility for treating the Municipal Solid Wastes generated in the city. The entire quantity of waste which is collected is sent for open dumping at the disposal site at Chandania Pahad at a distance of 15 Km from the city. This site is being used for disposal of municipal solid waste for the last three years. On an average, each of the 9 MT vehicles makes 2 trips and 3 MT vehicles makes 3 trips to the dumping site daily. Similarly, tractors carrying waste from open dump SCPs, make 2 to3 trips daily to the site. It was found that the part of the present disposal site is District Level Committee land and thus cannot be used for the proposed solid waste management site. A new site has been thus identified by BMC at Mahuda Village for which this EIA study has been commissioned. Presently, there is no systematic treatment and disposal system of MSW generated in the city. The existing management system is presented in the following Figure: 2.1.

Figure 2.1: Existing Solid Waste Management in Berhampur Solid Waste Characterization



2.3 WASTE COMPOSITION

2.3.1 Solid waste characterization for Berhampur

Physical composition of the waste during primary studies conducted by SENES during March 2012 revealed that the percentage of the food waste is high at the source of generation i.e. households (75%) and vegetable/ fruit market (80%). However, this get reduced to 45% at secondary collection points and 25% by the time it finally reaches the disposal site indicating high level of intrusion of inert material from street sweeping and drain silt. Similarly, the percentage of inert materials is low at the source of generation and subsequently increase as it moves down the chain from secondary collection points to the disposal site. The recyclable portion of the waste stream (paper, plastic and metal) is quite small. Typical physical composition of waste at various locations in Berhampur is provided in **Table 2.4**.

Table 2. 4: Summary of physical composition of the MSW of Berhampur City

Sampling Locations	Physical Composition (%)					
	Food/ Organic waste	Wood & wood product	Paper & cardboard	Textile	Park & Garden waste	Glass, plastic, metal, other inert
Residential Household	75.20	3.81	6.16	0.69	1.66	12.47
Secondary Collection Points	45.64	9.01	7.40	2.43	10.51	25.12
Vegetable & fruit markets	80.82	3.43	2.23	0.24	3.15	10.12
Landfill	24.76	15.66	2.53	3.70	6.83	46.52

(Source: Preliminary Environmental and Social Impact Assessment Report of Berhampur 2013 by SENES)

The results of chemical analysis show that the moisture content is high (75%) from residential sources at the point of generation and reduced to 25% at the disposal site. A similar trend is observed for the organic content is high at the residential sources (54%) and 28% at the disposal site. The C/N ratio of the waste samples indicates good compostable material. The average net calorific value of the waste is around 1429 kCal/kg. Chemical characterization of waste at various locations is provided in **Table 2.5**.

Table 2.5: Chemical Characterization of the MSW of Berhampur City

Sampling Location	Moisture Content	Bulk density (Ton/m^3)	Organic matter (%)	C/N Ratio	Net Calorific value (kCal/Kg)
Residential Household	75.59	0.23	54.59	34.56	2,264
Secondary Collection Points	39.17	0.17	34.85	36.50	1,189
Vegetable & fruit markets	57.58	0.21	30.73	29.89	1,231
Landfill	35	0.20	28	42	1,031

(Source: Preliminary Environmental and Social Impact Assessment Report of Berhampur 2013 by SENES)

2.3.2 Solid waste characterization for Existing dumpsite at Chandania Pahad

The physical composition of the waste reaching the disposal site at Chandania Pahad indicates a low percentage of food/organic waste (24.76%) whereas quite a high percentage of inert material (46.52%). Chemical characterisation of the waste reveals low moisture content (35%), Organic Matter of 28% and Net Calorific Value of 1031 Kcal/Kg. It can be observed from the above table that the calorific value of waste is decreasing from the source of generation to collection, storage and disposal point indicating that the recyclable materials such as paper, plastic, etc. are being segreted at various stages.

2.4 PROPOSED INTEGRATED SOLID WASTE MANAGEMENT SYSTEM

The proposed integrated solid waste management system for Berhampur is designed for a period of 20 years. The proposed system comprise of following three components: i) Primary waste collection ii) Secondary wastestorage and iii) Treatment and disposal. The highlight of each of the components is provided in the following section.

2.4.1 Primary Waste Collection

Primary waste collection from households and market/commercial areas is proposed in a manner that is operationally efficient, convenient for residents and minimizes nuisance and public health risks through effective waste containment and reduced waste handling. Provision of primary collection services is necessary to ensure that waste is not disposed of on the streets, in drains or in bodies of water.

BWMCPL will be responsible for primary collection (door to door) of waste from households and hotels & restaurants in the BMC area and for collecting waste from other generating sources including but not limited to fruits & vegetable markets and commercial areas through suitable mechanism. Waste collected will be temporarily stored at Secondary Collection Points (SCP) from where it will be transported to the processing and disposal facility. Existing contracts between BMC and private waste collection companies for door to door collection and transportation in 18 wards will be terminated by BMC as a condition precedent to Commencement Date. BWMCPL may elect to sub-contract the collection services, on a back-to-back basis, including to the existing private waste collection companies, under separate agreements to be negotiated between the parties. In any case, BWMCPL would remain responsible for performing as expected under the standards set up in the Concession Agreement. BMC will be responsible for street sweeping and bush cutting and subsequently depositing the waste at designated secondary collection points, from where BWMCPL will be responsible for transport and disposal. BMC will be responsible for drainage cleaning, collection and transportation to the processing and disposal site. The system proposed for primary collection is summarized below and is planned to service the entire city.

- Door-to-door collection service supplemented with community bin services for slum areas;
- Provision of tricycles with containers as primary collection vehicles for residential sources;
- Provision of Auto tipper as primary collection vehicles for hotels/ restaurants; and
- No source segregation system is proposed. Segregation of waste will be through centralized facility at the treatment & disposal site.

Door-to-door collection of waste will be carried out through Tricycle Rickshaw and Tata Ace / Mahindra Maxximo / Ashok Leyland Dost or similar vehicles from House Holds and Hydraulic automobile vehicles like Auto Tipper from Commercial Establishments and in slum area it will be covered through Tricycles. This work will commence early in the morning, a team of workers with proper uniform, safety gloves and sanitary gear will move from house to house and adopt bell ringing methodology to signal households of their presence. The waste in the buckets in the Tricycle will be unloaded into bins of 1.1 m^3 installed at the SCPs provided at various locations in the city. Containers of 3.5 m^3 capacity shall be installed in slums and at markets and other commercial establishments, which shall have the necessary provision for unloading into dumper placers / tippers.

2.4.2 Secondary Waste Collection, Storage & Transportation

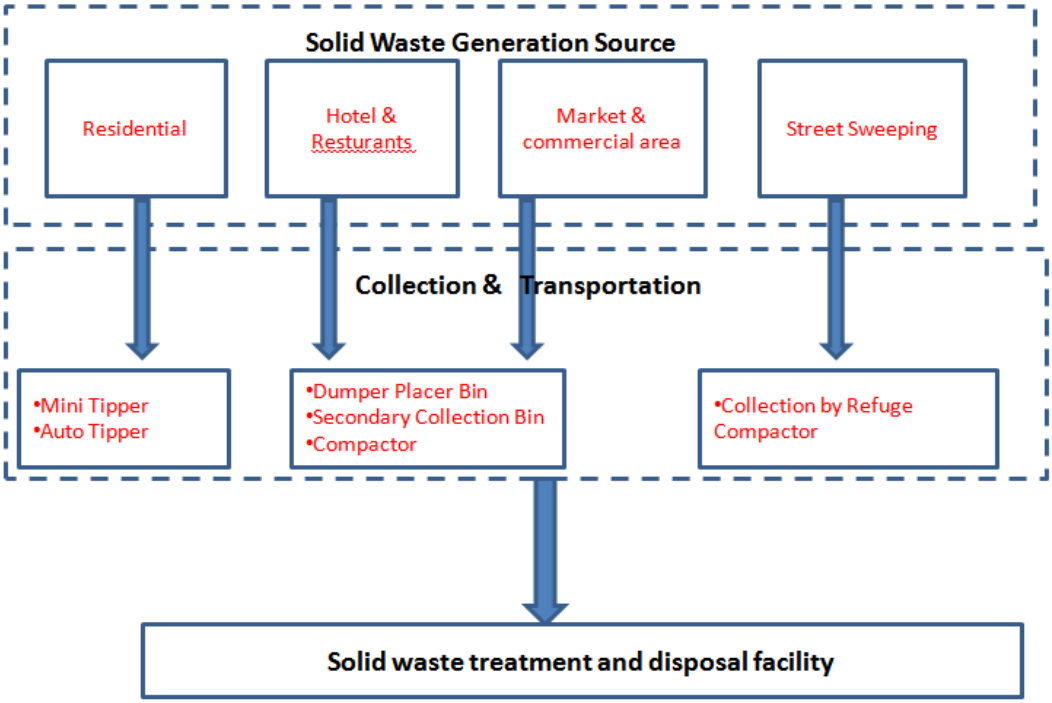
Secondary collection system has been proposed to consolidate and store the waste collected by the primary collection system prior to transport to processing and disposal site. Additionally the SCPs provide collection capacity for municipal wastes generated that are not captured by the primary collection system. Presently, majority of the SCPs are open dumps located across the city and transportation system is also inadequate as on an average approximately 57% of the total waste generated is collected on a daily basis for disposal. The system proposed for secondary collection of waste will provide for containerized bins at all SCPs and adequate transportation vehicles synchronized with the storage containers for transfer of waste on a daily basis to the processing and disposal facility. The proposed system is described below.

- Dumper placers / Tippers for Stationary Bins of 1.1 m^3 from residential areas and 3.5 m^3 containers from Slums, Markets and commercial area
- Collection of street sweeping waste using tractor trailer/ tipper trucks. BWMCPL will be responsible for developing the most suitable number of secondary collection points at appropriate locations mutually agreed between BMC and BWMCPL. GPS enabled dumper placers / tippers shall be deployed for collection of MSW from the SCPs and transportation to the processing & disposal facility.

BWMCPL will designate Dumper Placer arm to pick up waste from a circular route covering 5 to 10 existing SCPs. The large vehicles so designated shall go round and report at the same place at an interval of every 30 minutes. The sanitation workers shall need to be asked to go to the same SCP and wait for on an average 15 minutes at the SCP to deposit the waste directly into the designated vehicle when the said vehicle shall arrive at the SCPs. By adopting this system the level of service will improve considerably and the number of the existing SCPs will eliminate gradually. Direct transfer of waste collected during street sweeping and drain cleaning into the large vehicle will require proper routing of the vehicle and its optimum use to keep the cost under control. This system may therefore be introduced in a phased manner beginning with congested city areas within 2 months and gradually cover remaining wards in a phased manner over a period of 5 years to make the city gradually bin-less. BWMCPL will deploy covered Tipper for direct transfer of street sweepings and silt from drains from the pre designated points and ensure that as soon as a vehicle gets full the replacement shall be provided to avoid any gap in the service. The number of vehicles will be as per requirement.

Proposed scheme for primary, secondary collection, storage and equipments deployed for collection and transportation is explained in Figure 2.2

Figure-2.2: Proposed Scheme for Collection & Transportation



2.4.3 Waste Segregation & Material Recovery

Waste transported to the treatment and disposal facility will be segregated to remove recyclables; primarily glass, PET bottles, plastics, metals, etc. along with toxic components and inert fractions. The segregation system shall be both manual and mechanical, and may comprise conveyors, trommel screens and magnetic separators. The organic fraction of the waste shall be composted; inert components shall be landfilled; high calorific value components such as paper, plastics, wood, etc. shall be converted to RDF and other recyclables shall be stored and removed at regular intervals or sold directly to buyers.

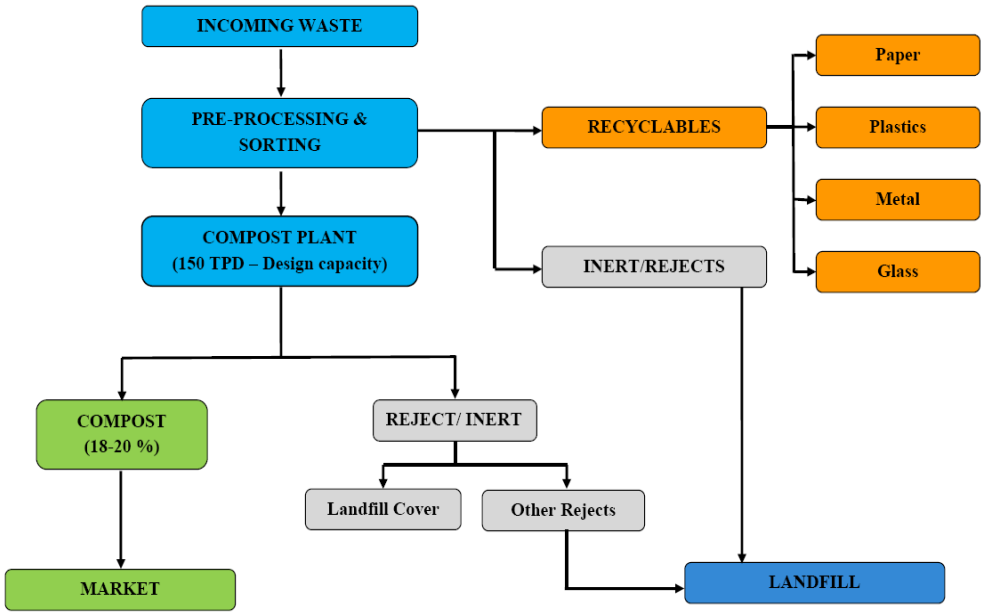
2.4.4 Treatment and Disposal

Berhampur does not have any waste treatment and disposal facility and waste is presently being openly dumped at site located at Chandania Pahad. This necessitates the development of treatment facility along with the disposal facility. The physical composition of the MSW at Berhampur indicates that approximately 70% of the total MSW generated is bio-degradable and it is envisaged that compost generated from the plant shall be in the range of 15 -18% of the input waste and around 25-30% of the total waste generated will find its way to the landfill which includes inert and rejects from the treatment process. Engineered land filling is proposed for disposal of non-biodegradable, inert waste and other waste that are not suitable for recycling or for biological processing including residues and pre-processing rejects.The sanitary landfill shall include non- permeable lining system at the base and walls of waste disposal area, provisions for management of leachates collection and treatment system and provision for prevention of run-off from landfill area.

Figure 2.3 Existing Open Dumping site at Chandania Pahad

The summary of the proposed treatment and disposal system is provided below and the flow chart for the proposed treatment and disposal system is shown in **Figure 2.4**.

Figure 2.4: Proposed Scheme for Waste Treatment and Disposal



(Source: Technical Proposal- Solid Waste Management project of the city of Berhampur by UPEEL)

- Pre-sorting facility for segregation of waste and recovery of recyclables;
- Windrow composting system for processing of organic waste; and
- Sanitary landfill for disposal of rejects and inert material.

Considering the composition and quantity of waste as per RFP and adhering to the MSW Rules-2000 an integrated system for the processing and disposal of Municipal Solid Waste (MSW) is the most efficient and viable option. Efficient collection system established by ULBs is one of important mile stone in this direction.

Given below are two major technological description for proposed Municipal Solid Waste Management Facility

A. Proposed Technology for Treatment, Recycle and Reuse of MSW
B. Proposed Technology for disposal of Inert or Rejects

A. Proposed Technology for Treatment, Recycle and Reuse of MSW

(1) PLASTICS RECYCLING

Before recycling, plastics will be sorted according to their density; the plastic recyclables will then be shredded. These shredded fragments then undergo processes to eliminate impurities like paper labels. This material will be melted and extruded into the form of pellets which will then be used to manufacture other products. Following steps will be taken before recyclable plastics are sent to market.

- **Washing & Soaking:**

Washing cleans the feedstock and separates the dirt out. This wet process is subdivided into three steps. Long soaking cycles reduce the mechanical energy usage of the plant. A not continuous material flow is made possible by buffering the different plant components. Dirt particles are removed by constant turning of the material in a Jatka machine.

- **Separation**

Dirt is separated from the goods to be cleaned by sedimentation in the sump (the lower part of the container) or by clarification fins. Washing of the feedstock is often done in special aggregates.

- **Drying:**

Seperation will be followed by drying

(2) COMPOSTING

Composting is a natural biological process, carried out under controlled aerobic conditions (requires oxygen). In this process, various micro-organisms, including bacteria and fungi, break down organic matter into simpler substances and stabilize it to a state in which it can be applied onto the land without any adverse effect to the environment.

Process Details

The effectiveness of the composting process is dependent upon the environmental conditions present within the composting system i.e. oxygen, temperature, moisture, material disturbance, organic matter and the size and activity of microbial populations.

The decomposition process takes place in the presence of air and results in elevated process temperatures, the production of carbon dioxide, water and a stabilized residue, known as humus. Generally, only material of biological origin (Wood, Paper, Food residues) is directly subjected to biological degradation. It results in volume reduction of up to 50% and consumes about 50% of the organic mass on a dry weight basis. A high degree of stabilization can generally be achieved in 3-6 weeks, however further 'curing of the humus is normally carried out. For composting to occur in an optimum manner, five key factors need to be controlled; temperature, moisture, oxygen, material porosity and Carbon: Nitrogen ratio.

Aerobic composting will be done in the proposed project using windrow composting process as described below.

Windrow composting

In Windrow composting process, material be piled in elongated rows and aerated through either turning of the windrows or through air forced through the material by blowers. This may take place in buildings or externally.

Windrow composting has got distinctive advantages over the oar ones, as:

- Can handle large quantity of solid waste
- Low cost intensive
- Easier operation as lesser controlling parameters require to handle
- Acceptable worldwide,

Shape of Windrow

The optimum shape of the windrow will depend on the selected compost system. The windrows formed will allow proper gas exchange and therefore, the height of the windrow will normally be restricted to not more than 2 meters. Usually, the following windrow types are used:-

- Layer windrow
- Delta Windrow
- Trapezoidal Windrow

Amongst the above mentioned windrow types, the most preferred for the proposed project is the delta windrow, which has a base width of 2.5 to 3 meters with a height of 2 meters.

Design of proposed compost plant and its element

(a) Waste Receiving Platform

Raw municipal solid waste will be received on Waste Receiving Platform, where the waste will be spread on the platform with and height of approx 2 feet for manual shorting and after that it will be fed on a belt conveyor where manual sorting of big size rags, glass and stones etc will be removed. From here waste will be sent to segregation and sorting unit.

(b) Pre-sorting system:

The waste from the waste receiving platform will be subjected to first coarse screening in a 75 mm trammel with a set of conveyors- feeding, under size and over size. The -75 mm screened material will be transferred and stacked in the Windrow Platform. The oversized +75 mm content will be transferred to the RDF Section.

A magnetic separator on the rejects line will help removal of ferrous contents.
Pre-Sorting system equipment have been explained in table 2.6 below

Table 2.6: Pre-sorting system equipment and application

Sl. NO.	Equipment Description	Application
1.	Feeding Chain conveyor with hopper, Manual Sorting Station and Bins/trolleys	Hopper minimizes spillage of waste. Manual sorting helps removing visible large rejects (inert) and bulky combustible material from the stream. The heavy duty chain conveyor feeds the decomposed waste to 75 mm primary sieve with ease. Bins/trolleys would be used for temporary storage of material picked out of the stream
2.	Trammel-75 mm with structural support	The trumbling action of the trammel opens the inter-locked lumps. Sieving segregates the under sized organic material.
3.	Reject Through Conveyor	carrying the rejects of both modules up to RDF Section
4.	Accept Through Conveyor	Carrying undersized screened material (-75 mm)
5.	Local Electrical control Panel with complete cabling	To energize and control operation of Pre-Sorting Section

(c) Segregation and Sorting Unit

To separate out organic materials, segregation will be carried out by passing the waste through feeder conveyor and Trammel with suitable mesh size. The waste will then be subjected to manual sorting to take care of any leftover plastics or other recyclables.

(d) Windrow Platform (Composting)

The organically rich waste from the Pre-Sorting area will be transported to windrow area and placed in the form of windrows in height 1.5m. The windrows will be turned every 4 days over a period of 28 days operations. Provision for moisture control and temperature monitoring will be provided. The windrow turning will be undertaken by suitable mechanical means. After segregation of non-organic fraction, it is estimated that about 75 tons of waste will be placed on the windrow platform. An area of 7745 sq.mt will be provided. The process comprises of simply piling up wastes in pits/platforms on confined cells, spraying of water, if required, to maintain proper moisture level. Aerobic decomposition of organic solids using micro-organisms and fungi takes place within the piles. The method of composting necessitates careful monitoring of temperature to ensure that the outside of the pile heats up as the core. The collected leachate will be suitable treated in leachate treatment plant.

(e) Rain Shed/ Curing Section

The fermented waste from windrow platform will be kept in the Curing section for 14 days for further stabilization and moisture control. Additives may be added to improve the quality of the final product. Area provided for curing unit is 576 Sq. mt.

(f) Preparatory and Refinement

The stabilized waste will be subjected to further in rotary sieves of 35 and 16 mm followed by refined sieving in a 6 mm trammel to remove impurities. Ferrous content from the finished product are removed with the help of a magnetic separator. The size of the finished product

will be maintained below 4 mm as per compost norms. Area provided for refinement section is 540 Sq.mt

Preparatory and refinement equipments and application are explained in table 2.7 below.

Table 2.7: Preparatory and refinement equipments and application

Sl. No.	Equipment Description	Application
1.	Feed Trough Conveyor	Feeding digested waste from curing section to Trommel 35
2.	Tromell-35 mm with structural support	Secondary Screening of material
3.	Reject conveyor for T-35	Removing oversized material from the stream
4.	Process Conveyor 1	Feeding <35 mm material to Trommel 16
5.	Trammel-16mm with structural support	Weeding our impurities by further sieving
6.	Reject conveyor for T-16	Handling oversized rejects of Trommel 16
7.	Process Conveyor 2	Feeding Trommel 6
8.	Trammel 6mm with structural support	Final sieving of finished product
9.	Reject conveyor of T 6	Carrying rejects of Trommel 6
10.	Process Conveyor 3	Feeding the De-stoner
11.	Over band Magnetic Separator on Process Conveyor 3	Separation of ferrous content
12.	De-stoner with Dust collection unit	Separation of left out impurities pebbles etc. and dust collection
13.	Reject conveyor of De-stoner	Carrying rejects of de-stoner
14.	Compost Conveyor	Carrying finished compost
15.	Local panels with complete cabling	Controlling the functioning of the entire preparation shed.

(g) Packing and Storing

The processed compost thus produced will either be packed in bags of appropriate weight, suggested 50 kgs, or can directly be loaded to tractor trolleys. Packed bags shall be sealed using portable stitching machine and finally stacked in the finished goods store room with a thirty day storage facility.

A well-equipped lab to test all relevant parameters, standards specified for leachate and compost manure shall be put in place at the facility.

(h) Mechanical Treatment

Mechanical treatment is primarily based on the theory that Organic material present in the waste is digestible and after digestion it decomposes into smaller fractions, thus, can easily be screened, but the inorganic material present in the waste is indigestible and cannot be converted into smaller fraction. Due to this difference in characteristic these two fractions of the waste can be segregated. The main aim of the mechanical treatment is to recover organic

fraction of the waste so that it can be utilized as an Organic Manure. For this, the waste material is subjected to various section of the Mechanical Treatment.

Advantages of Composting

Composting of Organic (bio-degradable) MSW brings low-cost soil fertility and also helps in,

- Reducing load of land fill site
- Food self-sustainability
- Improving Economy
- Generate Employment Opportunity

The other benefits that Composting offers are as follows:

- ✓ Cost effective Implementation
  - Low/moderate startup costs
  - Minimal operating costs
- ✓ Environmentally sound
  - Natural recycling of organic materials
  - No odors generated when property composted
  - Good soil conditioner
  - Elimination of Pathogens and weed seeds
  - Problem of rodents and insect pests is avoided
- ✓ Suppresses soil-borne diseases and plant pathogens
- ✓ Improve Soil Quality by:
  - Moisture Retention
  - Increased Aeration
  - Heat Absorption Increased
- ✓ Acts as a glue and makes soil resistant to erosion.
- ✓ Binds itself to polluting metals, pesticides and other contaminants to prevent them from washing into waterways or being absorbed by plants

(3) R.D.F Plant

MSW received (above 75 mm size) at RDF Plant input will be subjected to manual inspection for removal of the following type of materials

- Objectionable objects like large stones, metallic objects etc.
- Over-sized objects like large wood cutting, tyres, rags etc.

Table- 2.8 below exhibits components of a standard R.D.F. Plant

Table-2.8: Components of R.D.F Plant

Sl. No.	Description	Qty.
1	Feed conveyor to Shredder	1
2	Over Band Magnetic Separator on feed Conveyor	1
3	Shredder with control panel	1
4	Feed conveyor to trammel 6	1
5	Sand removing trammel 6	1
6	Trrommel output conveyor	1
7	Reject conveyor	1
8	Control panel	1

(a) MSW loading and magnetic screening

- MSW will be loaded into the inclined pickup conveyor system through pay-loaders.

(b) The big size inert materials like stones, boulders, tires, bulky material are removed manually from the MSW on the horizontal belt conveyor. MSW passes through a magnetic screening system for separation of iron pieces, blades, nails etc.**Primary shredding and refuse derived fuel (RDF) fluff**

- MSW will be conveyed to a dual shaft shredder for the size reduction to about 50-60 mm to get a homogenized MSW for a better MSE+W processing,.
- The shredded material will be conveyed from shredder to Trommel-6mm for the removal of organic fines and sand is separated at this stage. Horizontal conveyor will be used to remove the fines separated.
- The processed material is termed as the refuse derived fuel (RDF) fluff.

(c) Application of RDF plant for MSW Processing

- 35 to 40% sorted combustible waste will be processed for producing RDF.
- To get higher calorific value the machineries like trammel and shredder are used.
- The length of one stream is 36 m and proposed project is considering one stream.
- Density of RDF fluff is 0.35T/m^3 (Approx.) the storage area is required for at least 7 days.
- For RDF processing, 324 sq.mt area has been provided.

B. Proposed Technology for Disposal of Inert or Rejects

Sanitary Landfill

The disposal of waste on land should be so as to minimize the impact on surrounding environment. Sanitary landfills are designed and constructed with this objective by incorporating essential components such as a liner system at the base and sides of the landfill to prevent migration of leachate or gas to the soil and ground water, a leachate and gas collection & control system, a final cover system, a surface water drainage system and an environmental monitoring system. As per the provisions Municipal Solid Waste (Management & Handling) Rules 2000, MoEF, it is mandatory that new landfills are developed with all the above mentioned components.

(a) Design of the Landfill

The design of the said facility has been prepared as per norms specified by Municipal Solid Waste (Management & Handling) Rules 2000, and/or internationally accepted engineering standards so as to satisfy best development mechanisms. The landfill design will be as per the Geo Technical investigations keeping in view all the aspects such as characteristics of soil, water table, area available and will be in accordance with MSW Rules, 2000.

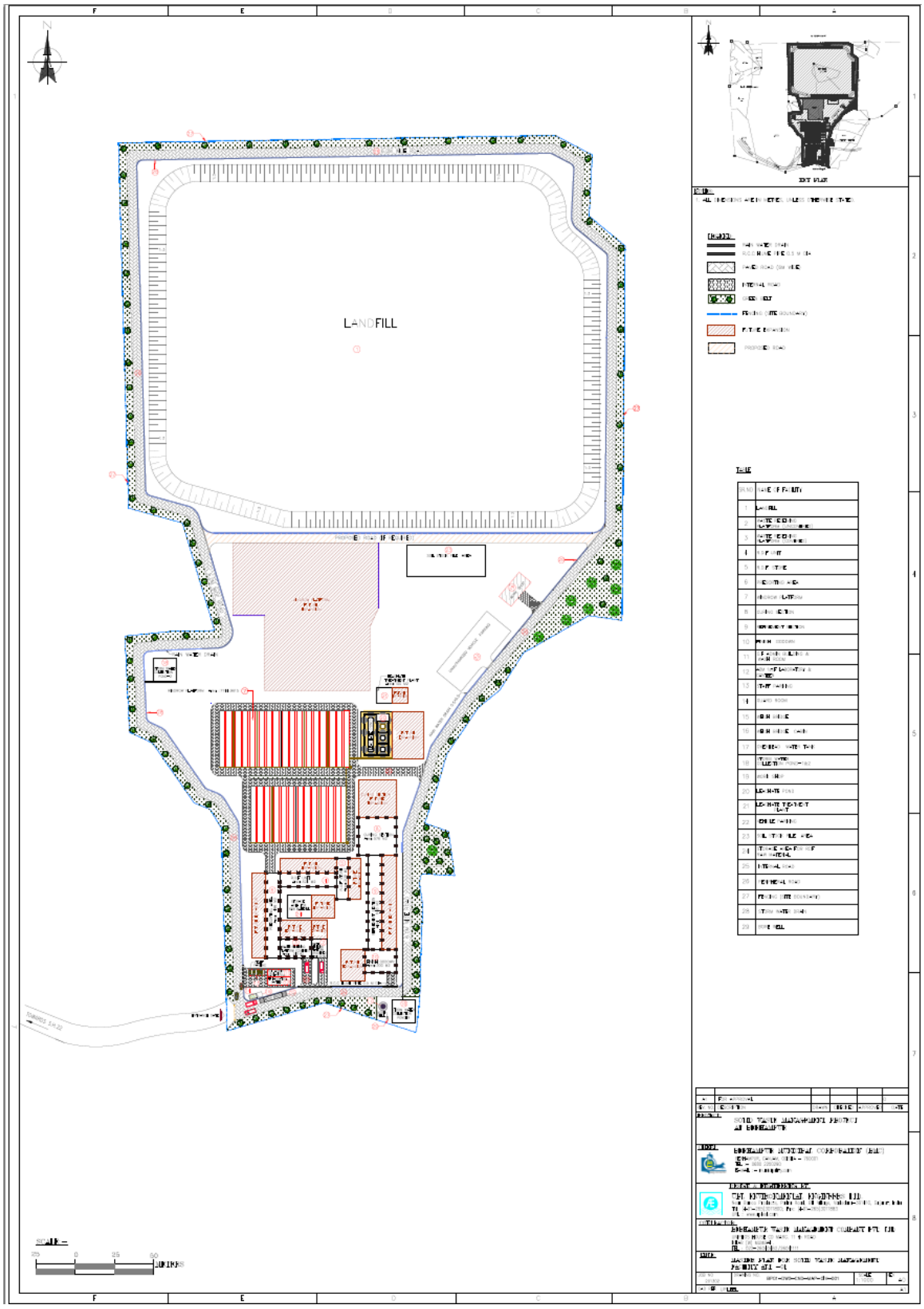
Landfill facility includes liner system, drainage, storm water drains, etc. We discuss here our strategy to execute all the activities related to the design, engineering & construction of the proposed landfill facility.

(b)Landfill Layout

The Layout map of the proposed land fill site at Mohuda is shown **Figure 2.5**.

The area will be mainly allocated for landfill facility, Soil storage facility, Leachate disposal and storage facilities- The landfill will be developed in an area of approximately 4-5 hectors to accommodate inert from the processing facility, which are estimated at about 20% of the daily incoming raw MSW. Simultaneous closure of the cell getting filled up shall also be carried out. The subsequent phases would be progressively extended along the width to reach the full estimated capacity of the landfill.

Figure-2.5: Layout for integrated waste processing and disposal facility for Berhampur near Mohuda village



The salient feature of the lay out solid waste management facilities at Mohuda are provided as under:

- Landfill facility will be provided on north side of the site, while waste processing facility is provided on the south side of the site.
- Adminstrative facility such as weigh Bridge, Administrative building, and laboratory will be located near the entrance to avoid movement of unauthorized persons within the wase management facility.
- Waste processing facilities including Presorting Plant, Compost Plant and RDF Plant will be provided with provision at suffient space for future expansion.
- Landfill is divided in 5 cells from north to south. The filling of waste will be started from north side.
- Soil stock pile area is located in the south- eastern corner of the landfill.
- The green belt of about 5 m width has been proposed around the landfill site, which will act as preliminary buffer zone.
- 6 m wide road is provided in the periphery of the site for easy movement of the waste management and other vehicle.
- Windrows platform is provided with north to south side orientation in order to drain the leachate along the nature gradient of site.
- Natural gradient of the site is form north to south, so strom water collection pond (SWCP) will be located in the south- eastern corner of the site. The gradient of the strom water drain will be proposed in such a way that water of entire site will be collected in SWCP.
- Vehicle Parking and workshop will be provided on north side of water processing facility.
- 3 Nos. emergency exit gate will be provided on north side of the site.
- Security watch tower of 3 m height is proposed in the buffer area of green belt at regular interval for iunspection of the waste management facility.
- Wheel was facility proposed on exit remap for waste transfer vehicles.

Design concept for engineered sanitary landfill covers the following points;

1. Capacity requirement of sanitary landfill cell.
2. Volume calculation of the Sanitary Landfill.

1. Capacity requirerment of the sanitary landfill

It is ancipated that during twenty years of operations there will be settlement of the waste causing significant volume reduction hence while calculating the capacity of the landfill, volume reduction due settlement should be considered. But the volume reduction has not been considered in the calculation given in Table 2.9 below which gives the detailed volume calculation of the landfill for 20 year design period.

Table 2.9: Waste quantities for design requirement- 20years

SN	Duration	Waste generation average 5 years (TPD)	Landfill capacity	
			Reject for landfill (TPD)	Design capacity (TPD)
1	2014-18	157	49	50
2	2019-23	185	57	60
3	2024-28	217	67	70
4	2029-33	256	80	80

Table 2.10 below gives design capacities of the landfill divided into 5 cells for 20 years.

Table 2.10: Design capacities of the land fill (divided in to five 5 cell) for 20 years

years	**Design capacity of the landfill**	**Duration of cell**	**Design capacity (TPD)**	**Capacity of each cell (MT/cell)**	**Waste capacity of cell (M^3/cell)**
2014-15	Construction phase waste will be dump at old site	-	-	-	
2016-18	Cell -1	3 years	50	54,750.00	57,631.58
2019-23	Cell-2	5 years	60	109,500.00	115,263.16
2024-28	Cell-3	5 years	70	127,750.00	134,473.68
2029-33	Cell-4	5 years	80	146,000.00	153,684.21
2034-35	Cell-5	2 years	90	65,700.00	69,157.89
				503,700.00	530,210.53

(C) Design calculation for proposed sanitary landfill

Design consideration

- For designing, 30% of total waste will be landfilled which will include processing rejects and inert.
- The estimated waste density is considered as 0.95 tons per cubic meter.
- A provision of 15% of volume is considered for daily and intermediate cover.
- 5% volume for liner system is considered for volume estimation
- As per MSW rule 2000, final cover slope 25% (4 horizontal :1 vertical) on the top 3-5% slope is proposed on the top for proper surface water drainage.
- With the consideration of the above capacity calculation and the location restriction criteria, the sanitary landfill will be designed for the volume of 636,252.63 m^3. Break-up of this calculation has been explained in Table 2.11

The salient features of the landfill structure are as follows:

- Maximum height of landfill above average ground level is 18 m
- Depth of landfill below average GL is 1.5 m. approximately 8.5 m above the post monsoon water level on site.
- Two berm at 7 m height with slope of 25 % (1 vertical:4 horizontal)
- The height difference between the 2nd berm and top of landfill 2 m with average slope of 5%
- Total area of landfill on ground level including peripheral bund is 63,623 m^2 for 20 years life span.
- Entire landfill is divded in different cells. First cell will be started from North side.
- For ease of construction, cell will be divided further smaller size sub cell of say 2 years or less so to less so to avoid high intial investment.
- Aministrative facilities such as weigh Bridge, Adminstrative Building and laboratory

For desidn of the landfill, standard design criteria prescribed in MSW rule 2000 and CPHEEO manual has been proposed and the key components of sanitary landfill are:

- Cover and liner system for adequate landfill cell protection, bottom lining, intermediate and final cover;
- Leachate collection, control and treatment system;
- Landfill gas collection/venting system; monitoring systems: monitoring wells and basic laboratory.
- The depth of the landfill has been proposed at 6 m from the ground level approximately 4 meters high from the post monsoon water level on site.
- The design of the liner system has been proposed based on the criteria provided n MSW rules 2000. The Rules primarily prescribe construction of a non-permeable lining system at the base and sides of waste disposal area having a composite barrier of 1.5mm. High Density Polyethylene (HDPE) geo-membrane or equivalent, overlying 90 cm of soil (clay/amended soil) having permeability coefficient not greater than 1x10-7cm/sec.

The leachate collection system is proposed to be designed to meet the hydraulic performance standard of maintaining less than 30 cm depth of leachate or head above liner. Feeder pipes (160mm) and header pipes (315 mm) have been proposed for collection and conveyance of leachate. The drainage layer has been proposed as 300 mm thick rubble having permeability not less than 10 -2 cm/sec.

It is proposed to construct collection/Equalization tank to receive leachate. This will provide the holding capacity and uniform inlet characteristics for aerobic feed. In addition, coarse pH neutralization shall be taken up in this tank. Before equalization tank screen andde-gritting facility will be provided.

The equalization tank will be provided with air arrangement. This tank has level instrument shall provide annunciation at high, low & very low levels and trip proposed equalization pumps at very low level.

The primary treated leachate will be sent to the Facultative Aerated Lagoon. This Facultative Aerated Lagoon will have float type aerators, which will supply O2 in the upper zone for degradation of BOD and for nitrification of nitrogen in the extended aeration. In the lower zone of the Lagoons, facultative and anaerobic zone will be developed for further degradation

of BOD and denitrification. This system will reduce the O2 requirement, i.e. capacity of aerators and also the amount of stored digested sludge will be reduced. In the Facultative Aerated Lagoon, aerators will be operated according to the requirement.

Treated effluent from the Facultative Aerated Lagoon will be transferred by gravity to the Facultative cum Sedimentation Pond for further treatment. Usually BOD & COD degradation, Nitrification and part removal of SS will take place in Facultative Aeration Lagoon and in the Facultative/Sedimentation pond BOD & COD degradation, denitrification and removal of SS will further take place to meet the permissible discharge limit.

After filling up of 1(one) m from the bottom of the Lagoons and pond with the sediments and digested sludge, it will be cleaned. The estimated cleaning frequencies of the Lagoons are once in 5 to 6 years and for facultative pond it is once for 3 years. During dry season ponds will be cleaned one at a time and other will be operative and sludge will be discharged in the active landfill site or in composting plant. For cleaning and maintenance operation, by-passing arrangement of the Lagoons and ponds will be provided.

Water balance for landfill

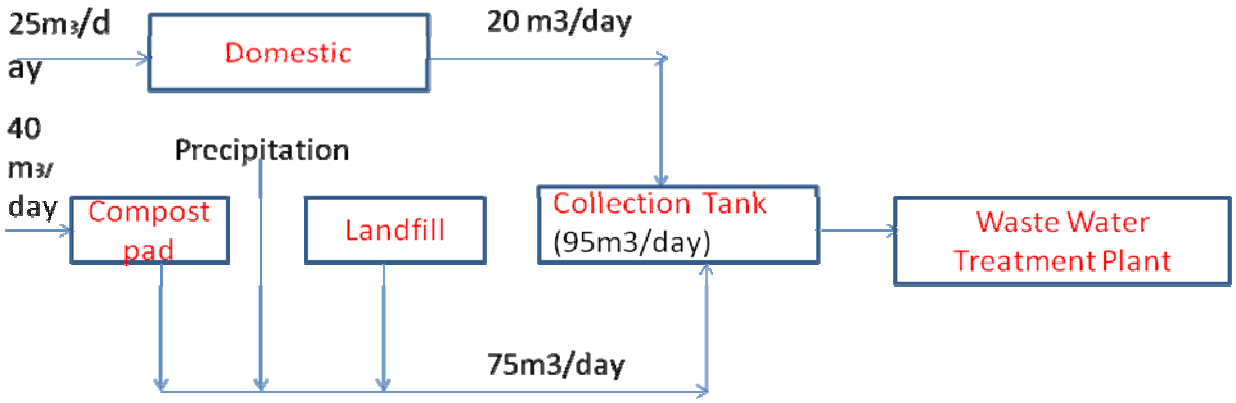
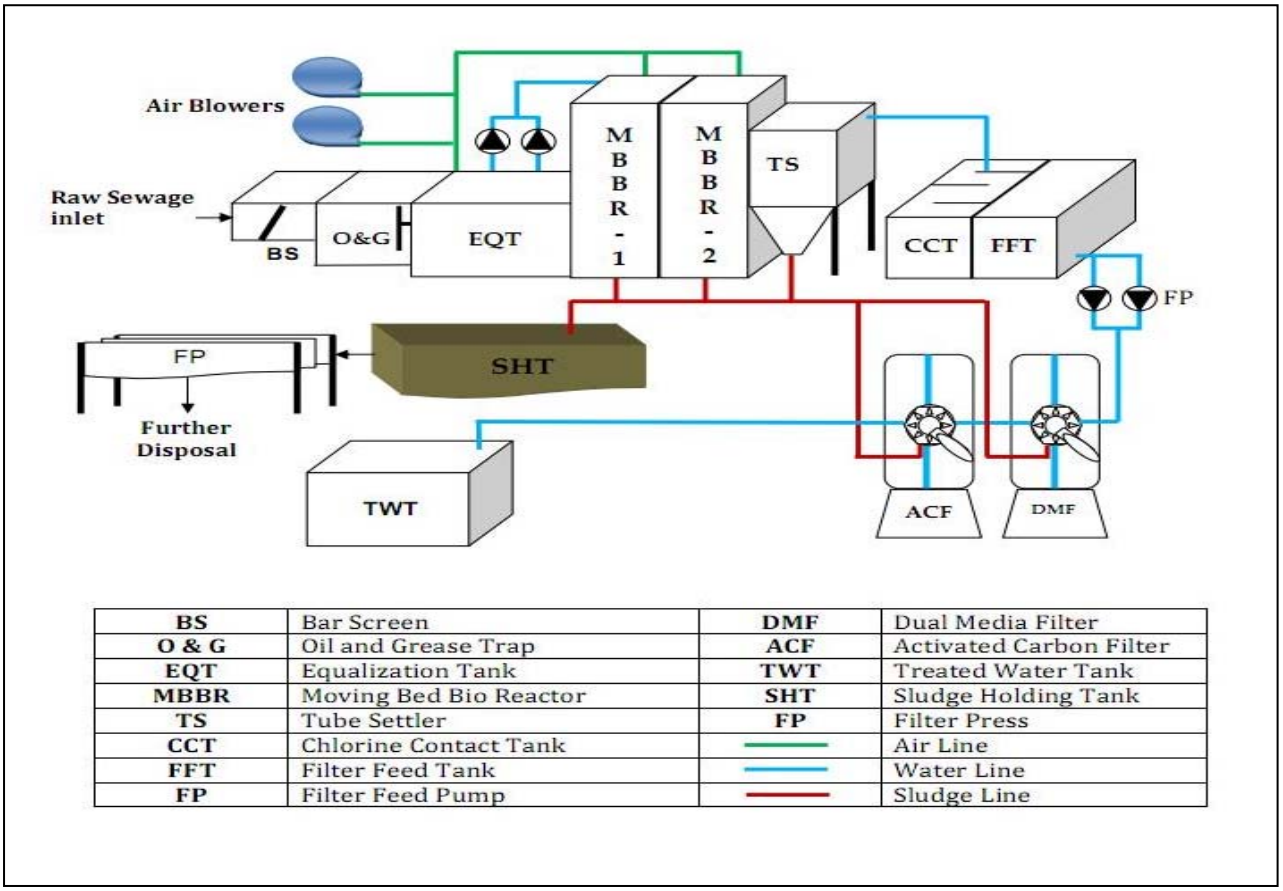


Figure-2.6 Schematic diagram of Waste Water Treatment Plant



BS	Bar Screen	**DMF**	Dual Media Filter
O & G	Oil and Grease Trap	**ACF**	Activated Carbon Filter
EQT	Equalization Tank	**TWT**	Treated Water Tank
MBBR	Moving Bed Bio Reactor	**SHT**	Sludge Holding Tank
TS	Tube Settler	**FP**	Filter Press
CCT	Chlorine Contact Tank		Air Line
FFT	Filter Feed Tank		Water Line
FP	Filter Feed Pump		Sludge Line

Table-2.11 Table showing the lechate generation calculation

Lechate Generation Calculation

Landfill Total Area in m2= 63623.12

Year of operation	Landfill phase development	% Area to be constructed	Cumulative % area	Total landfill Area in m2	Covered Area in m2	Active Area in m2	Effective area for leachate generation (m2)	Average annual rainfal (mm)	Total Volume of lechate (m3)	Rainy Days	Lechate Flowrate (m3/day)
0 to 5	Phase -1	35.00	35.00	22,268.09	-	22,268.09	5,567.02	1,492.00	8,306.00	90.00	92.29
5 to 10	Phase -2	25.00	60.00	38,173.87	21,207.71	16,966.16	7,422.70	1,492.00	11,074.66	90.00	123.05
10 to 15	Phase -3	25.00	85.00	54,079.65	42,415.42	11,664.23	9,278.37	1,492.00	13,843.33	90.00	153.81
15 to 20	Phas							00	14,238.85	90.00	158.21

The cover system proposed for the project is in line with the specifications provided in MSW rules and comprise of barrier soil layer comprising of 600 mm of clay or amended soil with permeability coefficient less that 1 x 10-7 cm/sec; on top of the barrier soil layer there shall be a drainage layer of 15 cm; and on top of the drainage layer there shall be a vegetative layer of 45 cm to support natural plant growth and to minimize erosion. Passive vents is proposed to be provided at the time of final cover placement over the cells to ensure that excess gas pressures do not build up below the landfill cover.

Table 2.12 : Calculation for capacity requirements

	year	Waste Generation (TPD)	30% of will be sent to landfill (TPD)	30% of waste will be sent to landfill (TPY)	Design of landfill	Design capacity (TPD)	Capacity of each cell (MT/Cell)	Waste capacity of cell m^2/cell
0	2014	151	-	-	Waste will be dump at old site	-	-	
0	2015	156	-	-				
1	2016	162	49	17,739.00	3 years	50	54,750.00	57,631.58
2	2017	167	50	18286.50				
3	2018	173	52	18,943.50				
4	2019	179	54	19,600.50	5 years	60	109,500.00	115,263.16
5	2020	184	55	20,148.00				
6	2021	191	57	20,914.50				
7	2022	197	59	21,571.50				
8	2023	203	61	22,228.00				
9	2024	210	63	22,995.00	5 years	70	127,750.00	134,473.68
10	2025	217	65	23,761.50				
11	2026	224	67	24,528.00				
12	2027	232	70	25,404.00				
13	2028	239	72	26,170.50				
14	2029	247	74	27,046.50	5 years	80	146,000.00	153,684.21
15	2030	255	77	27,922.50				
16	2031	264	79	28,908.00				

17	2032	272	82	29,784.00				
18	2033	281	84	30,769.50				
19	2034	290	87	31,755.00	2 years	90	65,700.00	69,157.89
20	2035	300	90	32,850.00				
							503,700.00	530,210.53

Table 2.13: Landfill capacity calculation for 20 years

Sr. No.	Capacity Calculations	Units	Quantity
1	Total waste quantity (20 years)	Mt	530,700.00
2	Density of waste (Average)	Mt/m^3	0.95
3	Volume ofwaste	m^3	530,210,53
4	Volume of daily cover and intermediate cover (15 % of total waste)	m^3	79,531.58
5	Volume liner system (5% of total waste)	m^3	26,510.53
	Total volume of requirement of landfill (3+4+5)	m^3	636,252.63

Total capacity requirement of proposed landfill for 20 years is = 636,252.63 m^3.

STATEMENT

Following are design assumption consider for design MSW Processing Facilities.

1. Assuming Plant will work in one shift & effective running hours=8 hrs. (1 hour for maintenance and cleaning in shift)
2. Density Consideration:
   a. Bulk density of incoming waste is considered 0.5MT/m^3
   b. Bulk density of processing waste in curing section is considered 0.7 MT/m^3
   c. Bulk density of final product (Compost) is considered 0.8 MT/m^3
   d. Bulk density of final product (RDF) is considered 0.35 MT/m^3
3. Waste detention time in Window Platform will be 28 days.
4. Waste detention time in curing section will be 14 days.
5. Finish product storage capacity
   a. For compost is for 30 days
   b. For RDF fluff is 7 days.

The salient features completing the process of Compost Plant can be sumarised as:

1. Receipt of Municipal Solid Waste (MSW)
2. Weighing of incoming vehicle to determine the quantity of waste
3. Unloading the waste on the Waste Reception Area
4. Manual Sorting of large non-combustible recyclables and inert material.
5. Waste feed to Presorting Plant for primary segregation.
6. Pre-Processing Mechanical Screening: <75mm to compost line while>75 to RDF
7. Waste below 75mm size is sent to windrow Composting Retention time-28 days to Curing Shed- Residence time 14 days.
8. Processing & Refinement of fermented material: Screening by means of on line Rotary Trommels of 35 and 16 mm and 6 mm respectively.
9. Enriching the end product (compost) with additives, if required.
10. Bagging & Storage of compost.

Liner System for Leachate Control

The leachate control in the landfill involves two steps:

(a) Prevention of migration of leachate from landfill sides and landfill base, to the subsoil by a suitable liner system: and

(b) Drainage of leachate collected at the base of a landfill to the side of the landfill and removal of the leachate from within the landfill.

Before the construction of clay liner/GCL, following operation will be undertaken for quality control.

- All loose particles like boulders, lumps, tree roots, rubbish or any organic deleterious matter shall be removed and base layer shall be compacted by roller/vibratory roller to achieve maximum dry density.
- After achieving maximum dry density clay line shall be constructed. Bottom liner system also consist emended clay layer or GCL with equivalent or better impermeability.

Leachate Collection Layer

This specification is for constructing the Leachate Collection and Removal System (LCRS) at the base of the landfill over the composite liner. The Leachate Collection and Removal System shall include the following:

- Granular Drainage Layer with Aggregates or Crushed C&D of required size or Geo-net Geo Composite
- Soil Fitter
- Perforated Pipe network.
- Leachate Sump

Specifications

The leachate collection system shall be placed over the landfill liner system. The bottom liner shall have the necessary slopes. Material for High Permeability Drainage Layer shall meet the following specifications.

- A leachate drainage layer consisting of 300 mm thick gravel/aggregate material of permeable value of 1x 10^{-2} cm/sec with a slope of 2%.
- HDPE feeder pipes of required capacity with a maximum lateral spacing of 30m.
- HDPE header pipes of required capacity.
- The leachate collection sump will be comprises of a well and pumps of required capacity.
- Leachate collection tanks and a Leachate collection network.

Laying of Perforated Leachate Collection Pipes

During the installation of the leachate collection pipe following points will be taken in to account.

- Perforated piping system shall be laid in the drainage layer to rapidly transmit the leachate to a sump and removal system.
- The diameter, thickness and Standard Dimension Ratio (SDR), material of construction (MOC) and size of perforations of the pipes shall be as per normal engineering practice. The upper half portion of the pipe above the spring line shall be perforated, whereas the lower half of the pipe shall remain imperforated.
- We shall provide details of supplier of the HDPE pipes along with the following three pipe parameters:

1. Compressive yield strength
2. Wall crushing
3. Wall buckling

- The perforated pipes shall be laid out in "Y" trenches and the trenches shall be backfilled with gravel / sandy gravel same used for leachate collection layer. The trench shall be cut true to the line and level as par the drawings.
- All the perforated pipes shall be connected to a solid HDPE header pipe, through a Standard UT-joint.

Project shall follow all required procedure for transporting, storing, laying and joining of HDPE pipelines from the manufacturer.

(E) UTILITIES

Utilities required for the facility operation and their sizing will depend upon the quantities of the wastes to be treated and disposed. Various utilities required for the proposed landfill are given below

The civil structures designed in the compost plant are as follows,

- Entry Gate
- Security Office at Entrance
- Weighbridge at Entrance
- Control Room
- Waste Receiving Platform (Covered and Uncovered)
- Presorting area
- Curing Section
- Compost Pad
- Workshop
- Packing Facility and Finished Product Storage Godown
- Administration Building and Staff Parking
- Refinment section
- Laboratory
- Cateen
- Diesel Filling Facility
- Green Belt

(f) Land Use Requirement

The proposed project site will be developed in planned manner so that it can be used for 20 years. Details of land break up for present and for catering future needs are given in Table 2.12 below.

Area allocation for different facilities in 15 TPD MSW processing plant for Berhampur Project is explained in table 2.14 below:

Table 2.14: Area allocation for different facilities in landfill at Mohuda

Sr. No.	Items	Unit	For 150 TPD area	Future Expansions Area	Total Area
1.	Waste Receiving Platform (uncovered)	m^2	120.00	120.00	240.00
2.	Waste receiving platform (covered)	m^2	240.00	240.00	480.00
3.	Presorting Area	m^2	486.00	486.00	972.00
4.	RDF Unit	m^2	324.00	324.00	648.00
5.	RDF Storage	m^2	208.00	208.00	416.00
6.	Windrow Platform	m^2	7,745.00	7,745.00	15,490.00
7.	Leachate Treatment Plant	LOT	100.00	100.00	200.00
8.	Curing Section	m^2	576.00	576.00	1152.00
9.	Refinement Section	m^2	540.00	540.00	1,080.00
10.	Finish Godown	m^2	300.00	300.00	600.00
11.	Admin building, Laboratory, Canteen & Wash room	m^2	150.00		150.00
12.	Staff parking	m^2	40.00		40.00
13.	Leachate pond	m^2	600.00	600.00	1,200.00
14.	Guard Room	m^2	15.00		15.00
15.	Weigh Bridge	m^2	37.50		37.50
16.	Weigh Bridge Cabin	m^2	9.00		9.00
17.	Wheel Wash Pit	m^2	48.00		48.00
18.	Work Shop	m^2	200.00		200.00
19.	Vehicle parking	m^2	1,000.00		1,000.00
20.	Storm Water Collection Pond	m^2	100.00		100.00
21.	Storage area for RDF Raw Material	m^2	225.00		225.00
	Total		12,838.00	11,239.00	24,302.50

(g) Water Requirement

A limited water quantity will be required for construction works which will be independent of community water sources. Water will be procured from local surface water sources in the vicinity. There are several water ponds available nearby. Similarly, drinking water will be procured through local sources. On an average $50m^3$ per day water requirement is estimated during construction activities, while during operation stage water requirement will be approximately 65 $m^{3/}$day. Source of water will be bore well.

(h) Power Requirement

Electrical power will be required for the operation of conveyers, shredding and compaction equipment, compost plant, tube well, pollution control devices, lighting and for administration building. Total power load of 90 KW proposed for site operation is envisaged to be met through grid power supply of Odisha State Electricity Board. In case of grid power failure, provision of DG set of 10 KW capacity will be kept at the site to meet the power requirement.

(i) Manpower Requirement

- Garbage Tippers- each garbage tipper will have one driver and two attendants. The attendants will collect the segregated waste from every household and unload the same in a tipper vehicle. Further they will return the empty bin to the householder.
- 4.5 cum. capacity Truck - each truck will have one driver and one attendant. The attendants will see that waste is properly unloaded in a truck. Further he will accompany the vehicle up to landfill site. At landfill site, he will unload the waste at a designated place for biodegradable waste and at storage space for inert waste.
- Refuse compactors. - each compactor will have one driver and one attendants/cleaner. The duties of attendant/cleaner will be to operate the hydraulic system with the help of driver.

2.4.5 Activities at Proposed Site

Activities at the proposed site will be undertaken in three phases as detailed below:

- Step I will address site preparation and construction;
- step-II involves operation and management of the compost cum landfill facility at the site; and
- Step-III will cover closure and post closure requirements of the compost cum landfill facility.

Environmental aspects associated with these activities will be suitably addressed by proper design of the facility and implementation of Environmental Management Plan (EMP). **Table 2.15** summarizes the activities in these phases.

Table- 2.15: Summary of Activities at the Proposed Site

Sl No.	Activities	Description and Potential Environmental Effects
1	**Construction Phase**	
i.	Site Clearing and leveling	As the site is undulating barren land with shrubs all round the site, the construction activities will require site clearing and leveling. Movement of heavy earth moving machinery at site for leveling may generate dust, vehicular emissions and high noise levels.
ii.	Excavation of Site	During the construction phase, the site will be excavated for construction of landfill cell, which may cause some dust emissions and noise generation. Excavated soil will be utilized for embankment of landfill cell so disposal excavated soil will not be a significant issue of concern.
iii.	Transportation of	Transportation of material may cause vehicular

Sl No.	Activities	Description and Potential Environmental Effects
	construction material to Site	emissions and noise during construction of site.
iv.	Unloading of construction materials	Unloading of construction material will cause some dust emissions.
v.	Construction Activities	During the construction activities, some residual debris may be generated and need to be managed in environmentally sound manner.
vi.	Landfill Embankment	As per design, construction of landfill will require adequate embankment around the landfill depending upon the capacity of landfill cell.
2	**Operation Phase**	
i.	Transportation of Wastes	Municipal solid waste from the cities will be collected and transported by specially designed vehicles and containers to landfill site for storage, treatment and disposal.transmission dust generation will be there.
ii.	Loading & Unloading	Loading and unloading solid waste from vehicles may cause vehicular and dust emissions..
iii.	Composting	Organic fraction of the Municipal waste will be segregated and composted at the site. Composting will require mixing of waste with vermin culture media and processing. These activities may create odour pollution and shop floor noise and fugitive emissions of dust, which will be only localized one.
iv.	Shredding and compaction of recyclable waste	Recyclable and reusable organic fraction of municipal waste will be segregated and stored. Shredding and compaction will be done for volume reduction and will then be sent for recycling. Dust emissions and particulate matter emission are anticipated during this process.
vii.	Land Fill	Non-compostable organic and inorganic fraction of municipal solid waste will be disposed in a secured landfill. The aim of secured landfill is to avoid any hydraulic connection between the wastes and surrounding environment, particularly ground water and soils. For this purpose appropriate liner system will be provided to the landfill site. Provisions for leachate collection and treatement will be provided as per applicable rules and guidelines.
viii.	Closure and post closure	On filling up to full capacity, landfill cell will need to be capped in accordance with Rules and Guidelines prescribed by the concerned regulatory authorities to minimize the leachate generation and to maintain the integrity of the hazardous substances of waste. On closure of landfill site, monitoring of landfill site will be carried out as per monitoring plan detailed in this report.

2.5 PROJECT TRANSITION PERIOD AND CLOSURE OF EXISTING DUMPSITE AT CHANDANIA PAHAD

At present, MSW of Behrampur city is being openly dumped at the Chandania Pahad site without any protective base liner. The groundwater level at this site is high and the terrain being rocky, there is high possibility of leachate contaminating the groundwater if the site is left unattended. It is therefore recommended that a new landfill cell be constructed at Chandania Pahad for disposal of the accumulated waste. It has been assumed that the landfill cell at Chandania Pahad will accommodate the existing waste and the waste till the development of the landfill at the new site at Mahuda village. The project transition period has been estimated as 1.5 years from the appointed date. The total area of the site is 20.31 acre and part of the site is earmarked as DLC (District Level Committee) forest land. The non-forest part of the existing site will continue to be used for disposal of waste till the new treatment and disposal facility is commissioned. Area allocated for each unit in the cloure plan is presented in **Table 2.16 below**

Table 2.16: Area Allocated for decommissioning at Chandania Pahad

Sl No.	Description of item	Unit	Quantity
1	SLF Site	acres	7
2	Site Infrastructure	acres	1
3	Green Belt	acres	2
4	Total Area Available	acres	20.31

The responsibility of the Concessionaire is to decommission the existing site to scientifically close and dispose of the accumulated waste. The facility has been designed for 90,000 m^3 of waste which includes the accumulated waste and anticipated quantity during the anticipated transition period. The summary of the closure of the existing disposal site is provided below.

- Engineered landfill cell for disposal of accumulated waste and waste generated till the development of the proposed new sanitary landfill i.e. during the transition period.
- Accumulated waste landfill to be developed on the land which not part of District Level Committee (DLC) forest land at the existing site.
- The design of the liner and the cover system has been proposed based on the guidelines provided in CPHEEO manual and have been elaborated in the design for sanitary landfill provided earlier.
- Leachate collection and conveyance system and storm water management system has been proposed for the cell. However, no leachate treatment has been proposed for this cell. It has been assumed that since the cell is closed minimum leachate will be generated from the site and the same can be circulated back to the landfill.
- Post closure monitoring of 15 years as per MSW Rules, 2000. Layout drawing of Chandania Pahad is given in **Figure 2.7**. The cut & fill and proposed section of the landfill cell at Chandania Pahad for accumulated waste is provided in **Figure 2.8 Figure 2.9** and **Figure 2.10** respectively and the closure plan is provided in **Figure 2.11**.

Figure 2.7: Layout drawing of Chandania Pahad Disposal Site

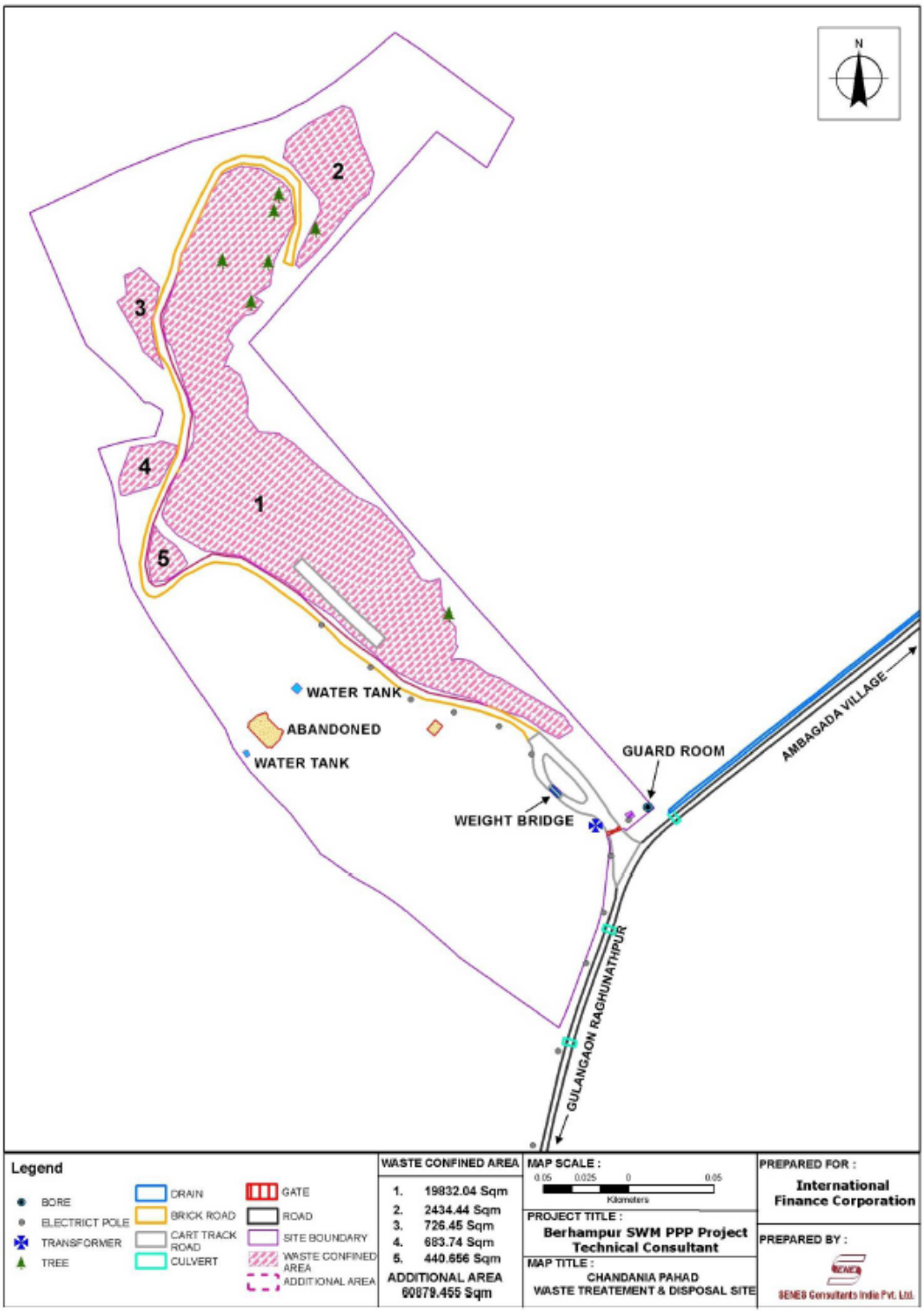


Figure 2.8: Base Section – Chandania Pahad Accumulated Waste Landfill

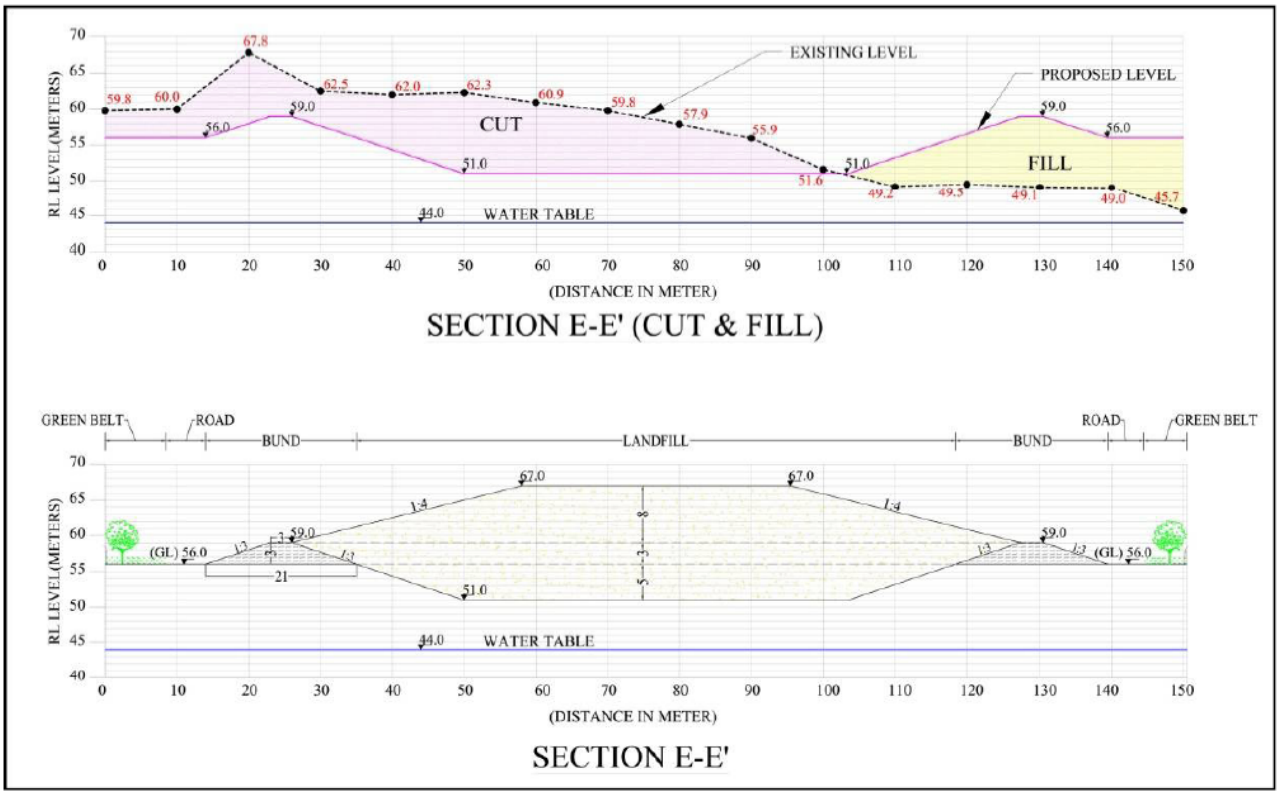


Figure 2.9: Base Section – Chandania Pahad Accumulated Waste Landfill

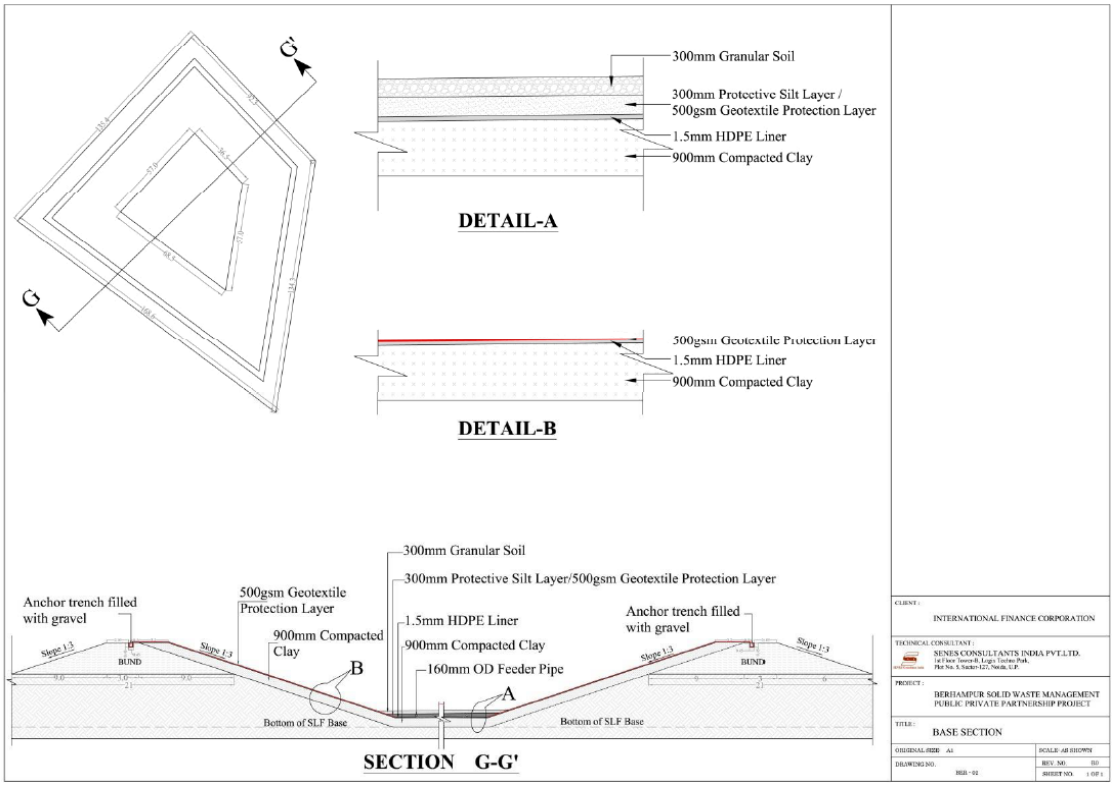
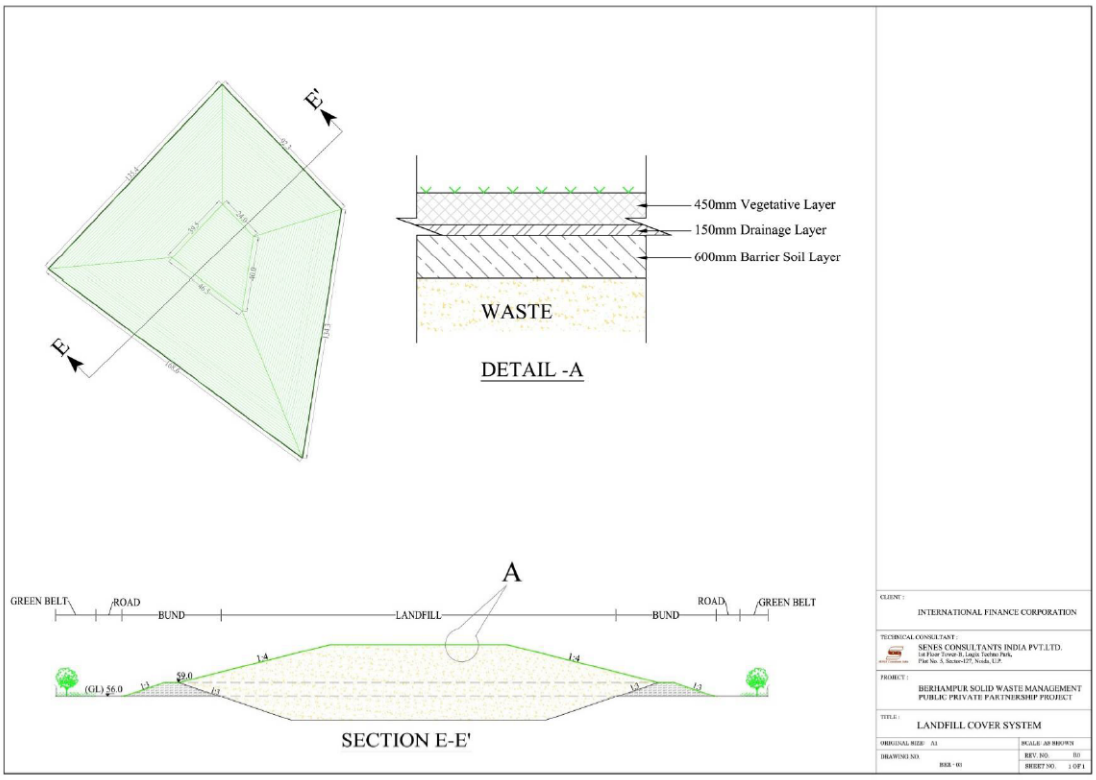


Figure 2.10: Chandania Pahad Accumulated Waste Landfill – Closure Plan



PROJECT COST

Basis of the estimate

The capital cost has been arrived at on the basis of the prices for equipments and facilities, cost of construction work and materials, provisions for equipments and facilities, cost of construction work and materials. Provisions have been made for the other costs ,associated with the project namely land , site preparation, interests on loan during construction, margin money for working capital and start up expenses. The details of total project cost including proposed SLF at Mohuda and closure of Existin Chandania pahad site is presented in table 2.17 below.

Table 2.17: Project Cost of the Proposed Plant

SR No.	Item Description	Rate	Amount in Lakh INR
	Phase I		
A	Hard Cost		
1	Collection and transportation Equipment		300
	Processing Facility		
	Civil works		1,010
	Plant and Machinery for Processing Facility		630
	Landfill at New Site (Mohuda): PhaseI		660

	Sub total (A)		2,600
B	Soft Cost		
4	Design, engineering and projectManagement Expense (including Topographical Survey, geo- technical Investigation, layout, RCC Drawing, E & I drawings, Architectural Drawings etc.)	8%	210
5	Pre-operative Expenses and other Overheads (including telephone, travel, stationery, staff welfare etc)	5%	140
6	Contigencies	5%	140
7	Project Development Fees paid to IFC and BMC		125
8	IDC		200
9	Margin money for working capital and bank guarantee		80
10	Financial Charges		25
	Sub total (B)		920
	Phase-I Total cost (A+B)		
	Phase-II		
	Closure of Dumpsite at chandania Pahad		540
	Phase-II- Total Cost		540
	Total Project Cost-Phase I & Phase II- Total Cost		4060

CHAPTER-3
DESCRIPTION OF ENVIRONMENT

This chapter describes the existing environmental baseline data of the MSW landfill site and surrounding areas. This includes the physical environment (comprising climate & meteorology, air, water and land components), biological environment and socio-economic environment, which may get affected by the proposed MSW treatment and disposal facility. The major purposes of describing the environmental settings of the study area are:

- To understand the project need and environmental characteristics of the area.
- To assess the existing environmental quality.
- To identify environmentally significant factors or sensitive geographical locations.

3.1. BASELINE ENVIRONMENTAL STATUS

To quantify, interpret and communicate the impacts due to installation of the Sanitary landfill (at Mohuda) at a later date, it is necessary to know the present quality of the environment with respect to the various attributes considered under impact identification. The environmental factors include air, water, noise, soil, land use, flora & fauna, socio-economic and demographic pattern. For the preparation of EIA report a monitoring schedule covering winter season of the year was carried out in the month of November 2013 to January 2014.The impact identification starts with collection of baseline data such as ambient air quality, quality of ground water and surface water, soil, noise and meteorological parameters like temperature, humidity, wind speed and direction, cloud cover etc. The field studies/ site survey/ interaction with different government agencies was carried out to collect data/ information pertaining to flora & fauna, climate, socio-economic and demographic factors, land use pattern, forests, geology, geomorphology, hydrology, hydro-geology, soil and agriculture, mineral resources etc. This chapter accordingly describes the present baseline environmental condition in respect of Physio-chemical and Biological environment of the Study area. The environmental status of the study area with reference to the prominent environmental attributes covers about 10 Km radius with respect to the project site.

3.2. SITE DESCRIPTIONS

The site is located at village Mohuda of Ganjam district in the state of Odisha, The location is well connected with road and rail. The SH-22 and NH 5 connects Berhampur with the proposed site. Berhampur town is 8 km away from the proposed site. The nearest railway station is in Berhampur which 17 km away fronm the proposed site. The site is geographically located at 19^0 17’ 03.4”N and 84^0 44’23.0”E.

Municipal Solid waste collected from Berhampur town will be transported through SH 22 road.

The location of the site in the Indian Map of 1: 10, 00, 000 scale followed by 1: 50, 000 for the preparation of 10 Kilometers of terrain features with 100/200 meter contour to generate the 3 dimensional view of the project site which explains physio-geographical condition of the study area
Geographically, Mohuda village, where the project site is located is at following coordinates:
Latitude: 19° 17' 03.4''
Longitude: 84 ° 44' 23.0''

A few villages near site at Mahouda Village are Bendalia, Goshain Nuagan, Lathi, Barapalli, Narshingpur, Medinpur etc
Other main features of the site are described below:

- The site has undulating terrain with hilly surrounding, especially on the north and north-eastern side
- The average height of ground surface at the proposed project is approximately 90 m above mean sea levelThe site and its surrounding consist of grassland characterized by short grass with a few trees and shrubs. Entire north and north-eastern boundary is hill.
- There are two quarries on the left hand side of this approach road to the proposed site. Another quarry is present outside the south-western part of the site.
- Area around the proposed project site in Ganjam district receives approximately 1492 mm rainfall annually.
- There is no archaeological monument or cultural property near immediate vicinity of the site.
- There are no endangered species of flora and fauna in the area.

There are no habitation or sensitive receptors within 500 m of site. A Quarry is operational within 100 m of site. An undercosntruction house was observed close to site within 200 m and reportedly that belonged to the Quarry operator.

The base map of the project is prepared with reference of Topo-sheet of Survey of India bearing no.E45A11, E45A12, E45A15 and E45A16 high resolution of satellite imagery IRS P-6 having high spatial resolution for the study of land use pattern and different physiological features of the land & land mapping purpose.

The prepared base map showing the entire major land use pattern such as settlements, forest, fallow land, agricultural land, water bodies like river, canal, streams, road network, railways networks etc. are illustrated in the Fig-3.2.

3.3. STUDY AREA

The study area comprises three parts for the generation of baseline data collection

- Core zone – The plant site where the proposed plant site will be under taken. The proposed project area covering a total area of 33.62 acres.
- Buffer zone- It consist of 10 km aerial coverage around the core zone.
- Environmental Sensitive zone- it extends up to 15 km aerial coverage around the project site.

The brief description of the present environmental scenario obtained from primary (monitored) data and partly from the secondary source (Govt. office) the description covers the major environmental components like

- Physio-chemical (air, water, soil, noise etc.)
- Biological (flora, fauna & ecology)
- Human (Socio-economic)
- Aesthetics

Figure 3.1 : Map showing district boundaries at scale 1:10,000,00

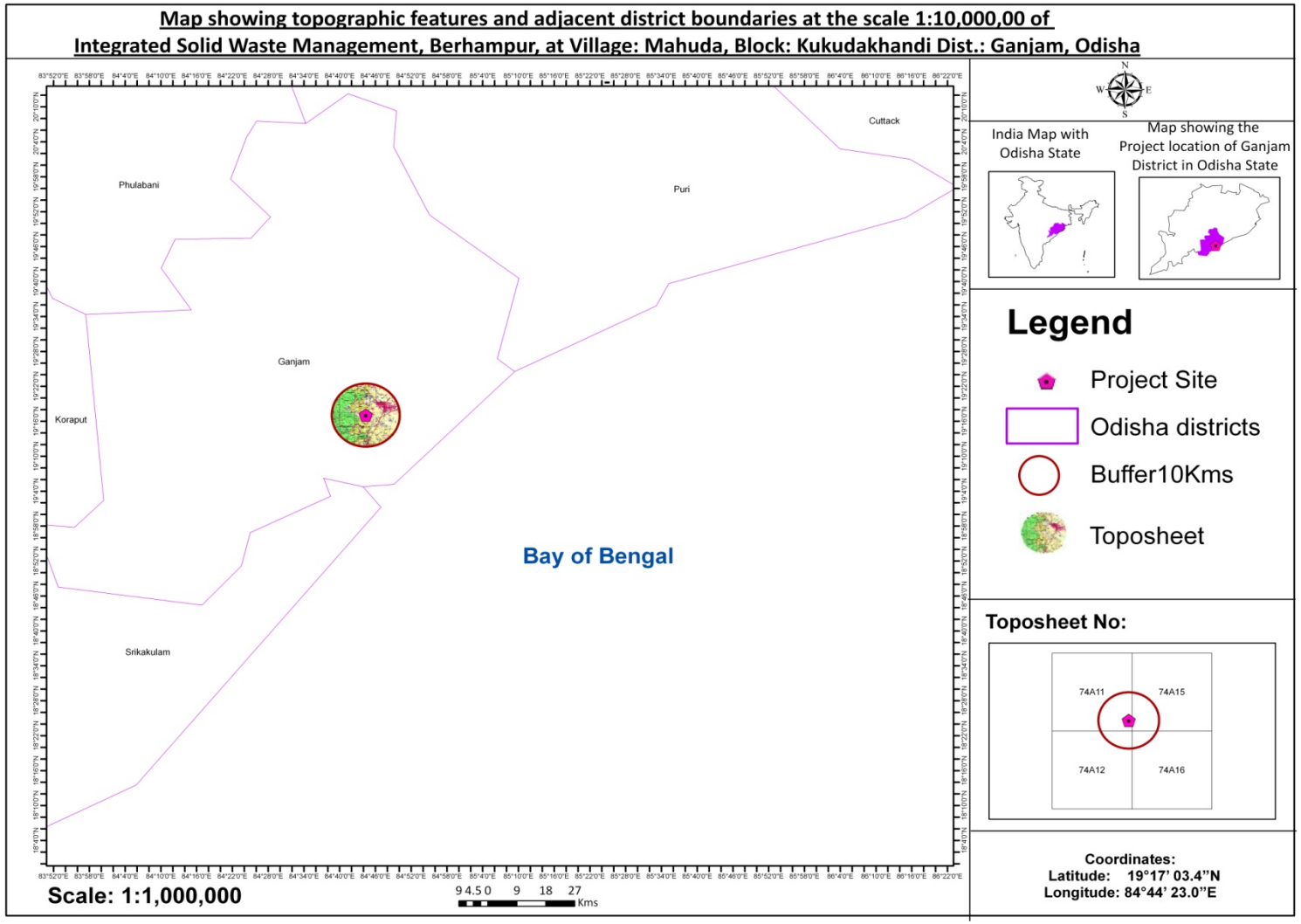


Figure 3.2: Map showing topographic features within 10 kms.

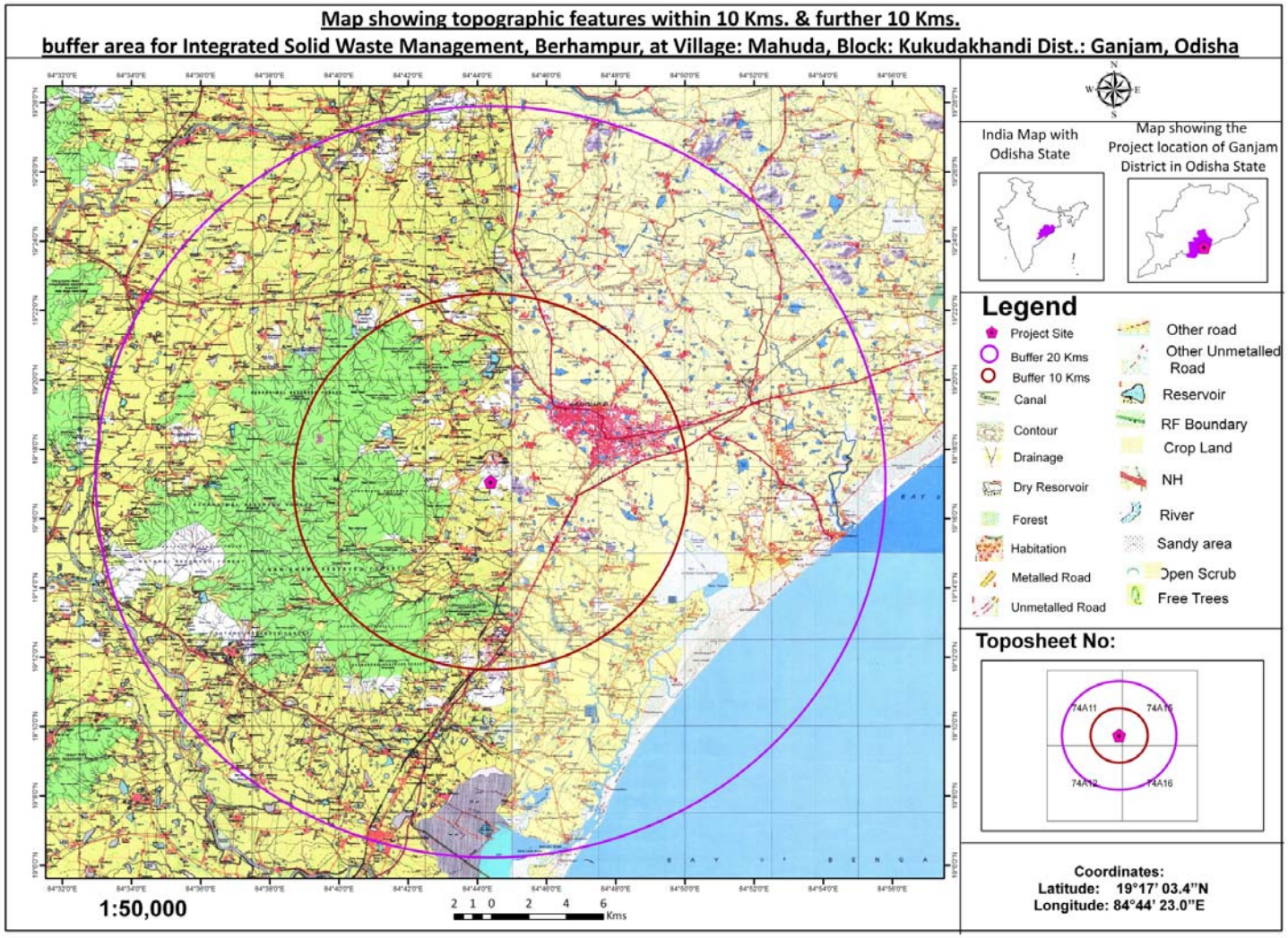


Figure 3.3 : Satellite Imagery within 10 km Buffer zone

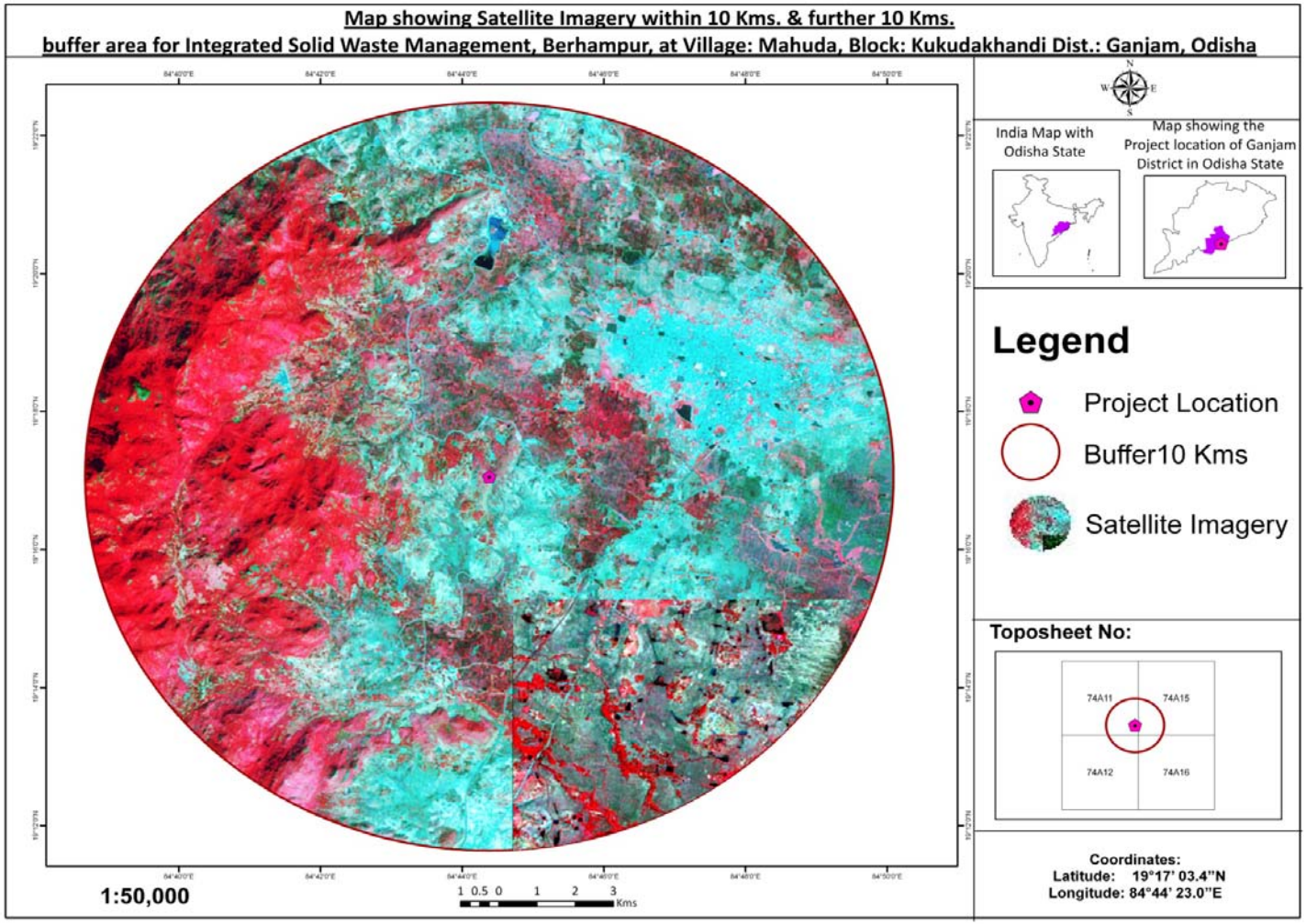
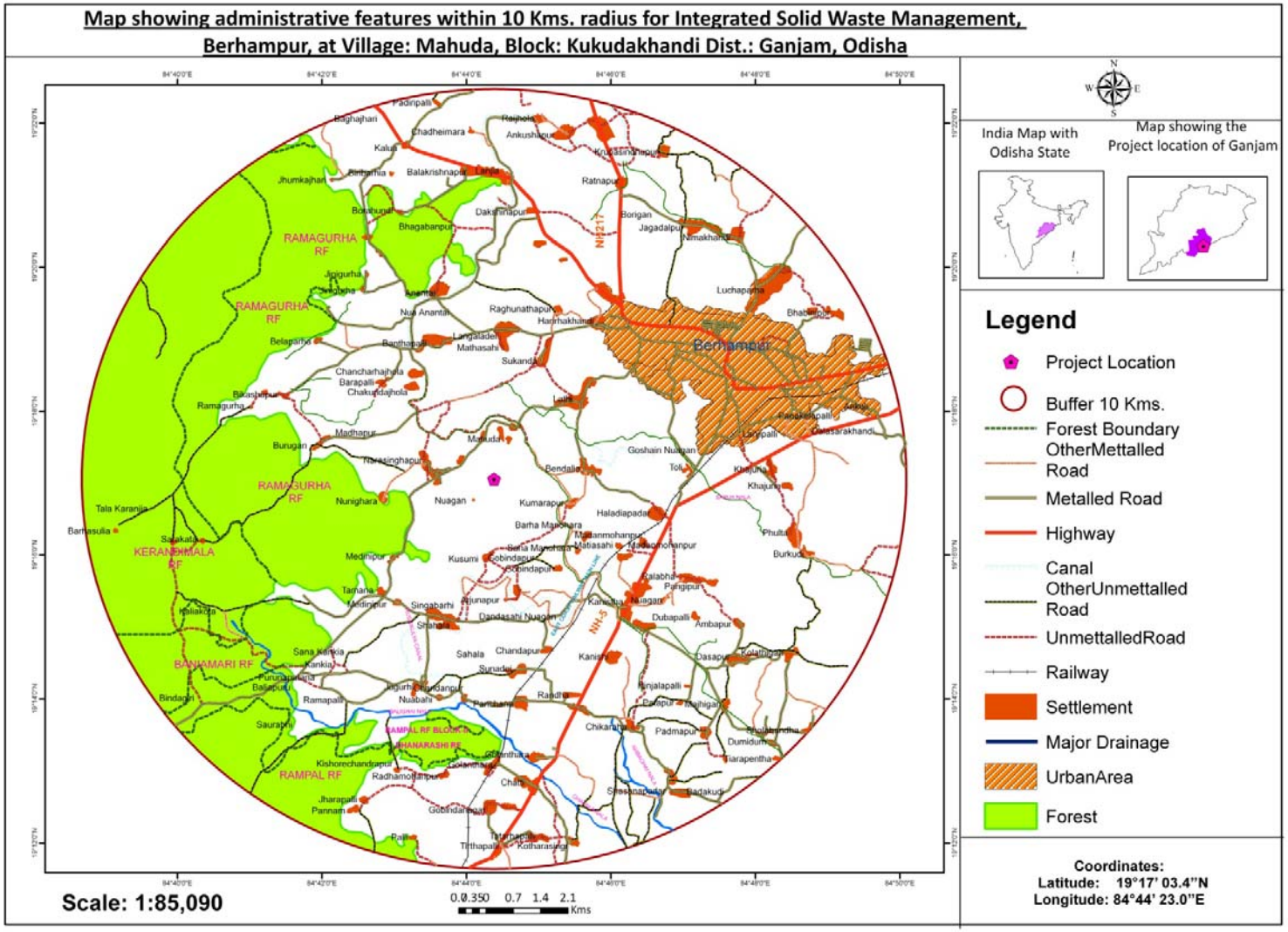


Figure3.4: Base Map of Study Area around 10 KM radius



3.4. TOPOGRAPHICAL FEATURES

Regional Topography

Ganjam district is broadly divided into two divisions, the coastal plains in the east and hill and tablelands in the west. The Eastern Ghats runs along the western side of the district. The plain area lies between the Eastern Ghats and the Bay of Bengal. The plains are narrow because of the absence delta of big rivers. The coastal plains in the east contain more fertile and irrigated lands.

Topography of the proposed project site

The proposed project site and surrounding areas has irregular terrain with altitude ranging between 25-850 m **(Figure 3.5)**. Hill and table lands are characteristics of the Study area. The elevation of the proposed project site ranges between 75-100 m above msl. Within the proposed area the highest elevation is 100 m; which is located towards north and shows reduction in altitude towards south i.e 75 m indicates undulation in the project area.

Figure 3.5: Contour Map of the study area

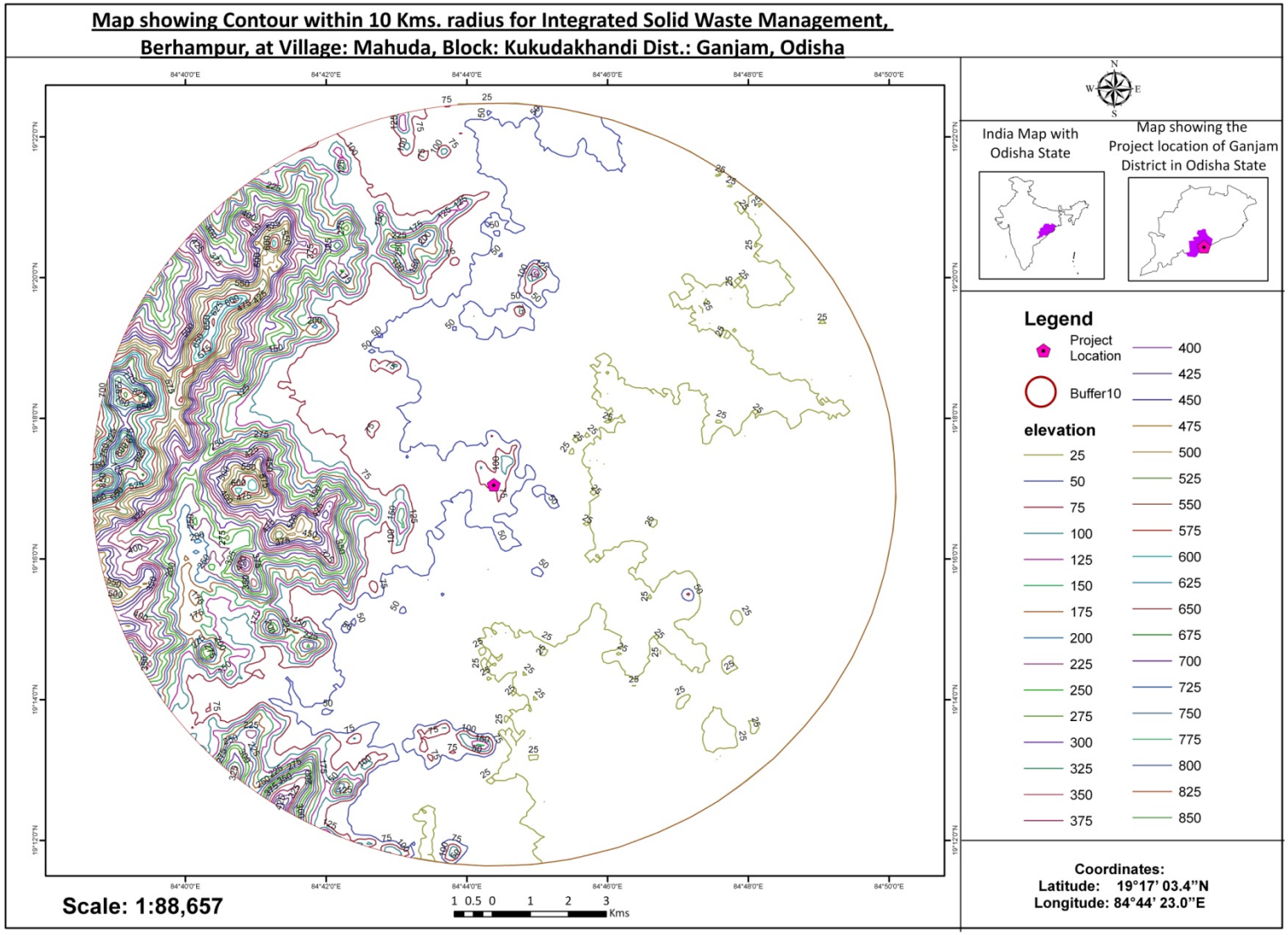


Figure 3.6: Digital Elevation Model map for the Study Area

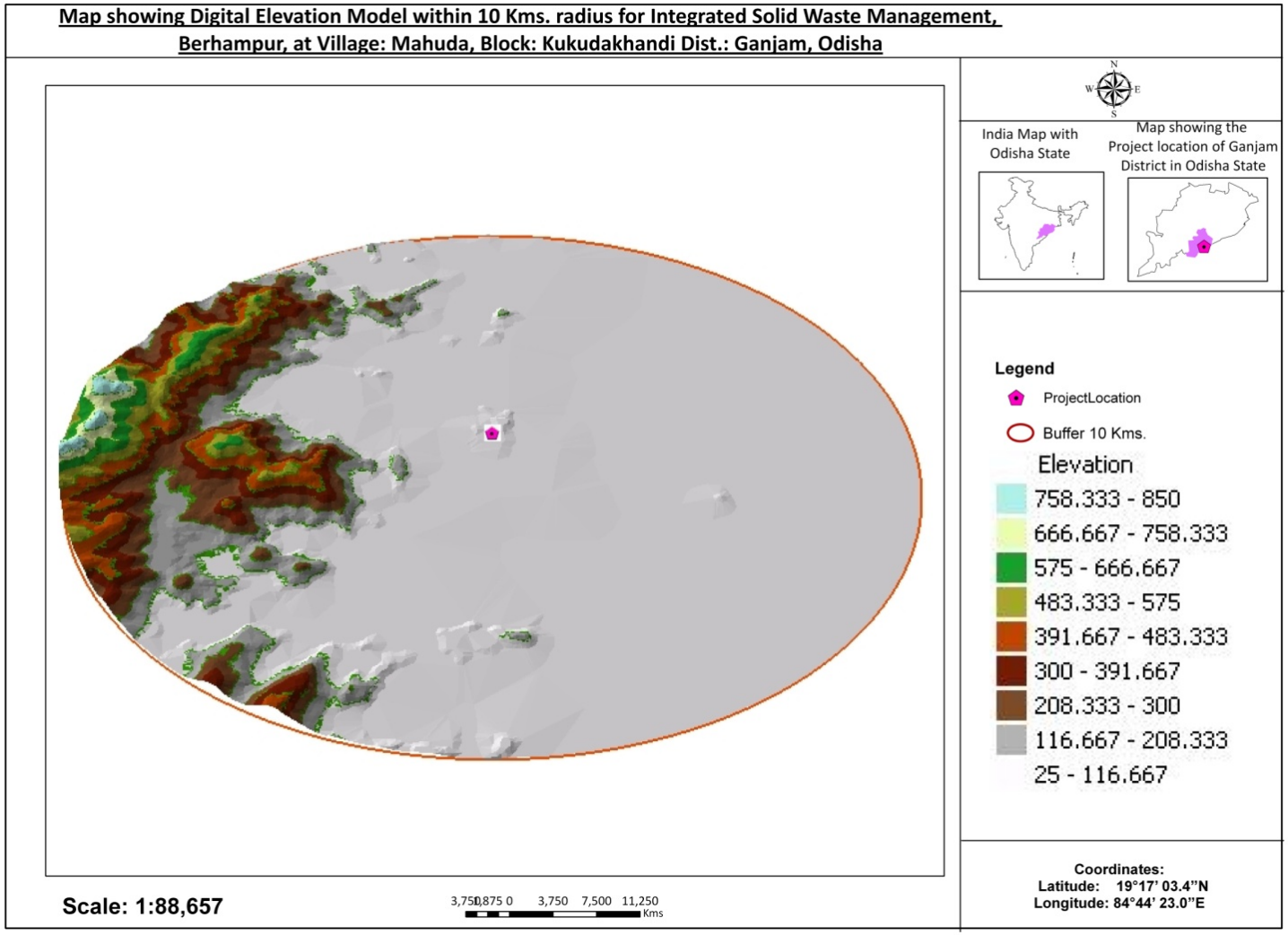
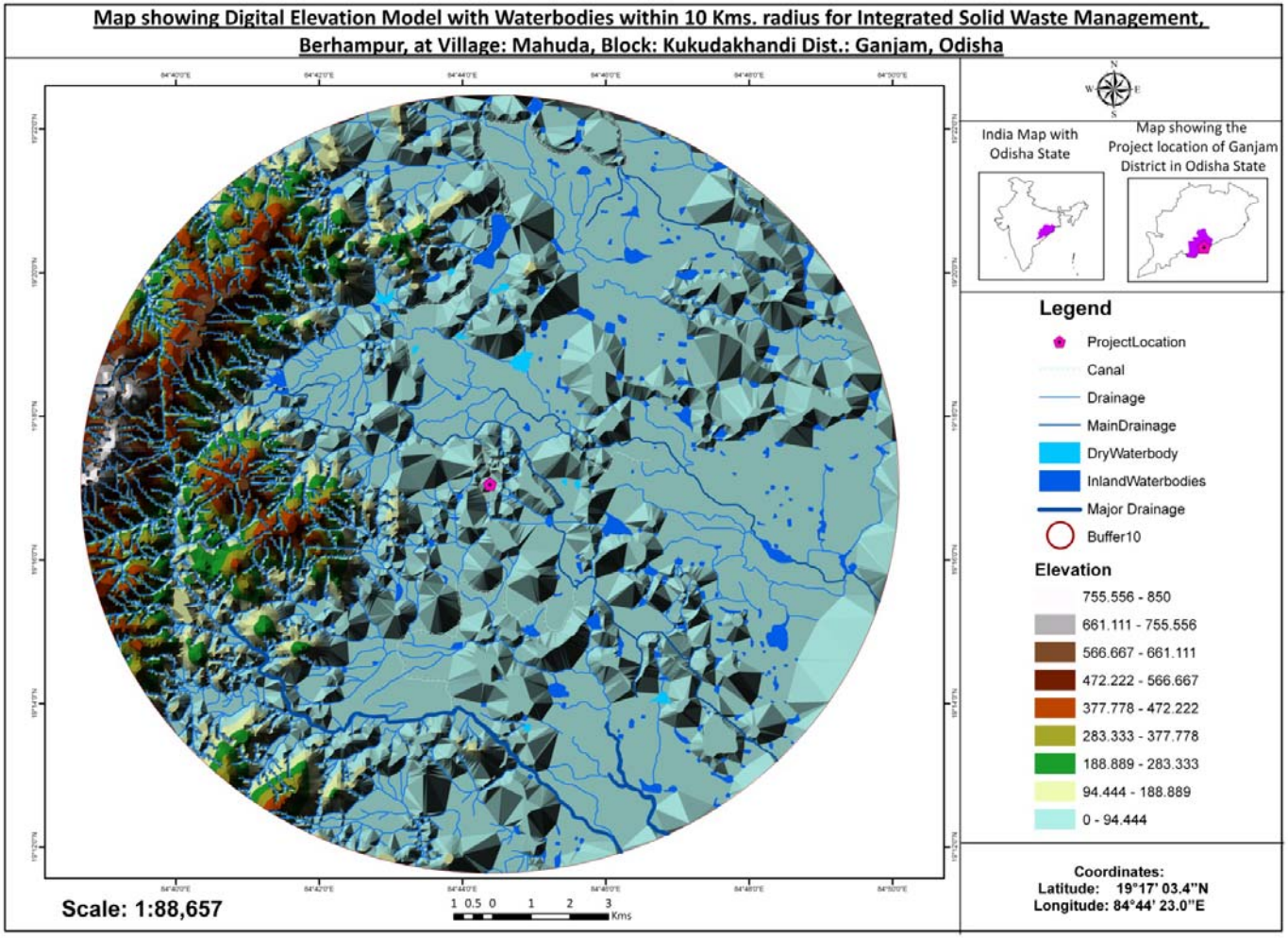


Figure 3.7: Digital Elevation Model map for the Study area



3.5. LAND USE STUDIES BASED ON CENSUS DATA

The land-use and land-cover of the study area has been interpreted from the satellite data, topo-sheet of the area and subsequently by ground truthing during reconnaissance surveys.

The purpose of land use studies is to

- Determine the present land use pattern
- Analyze the impact on the land use pattern
- Give recommendations for optimizing the future land use pattern vis-a vis growth of the industries in the study area and its associated impacts.

3.5.1 Land Use Pattern of Core Zone

The project area is present at village-Mohuda, Ganjam district of Odisha. It is also noted that the core zone i.e. the project boundary or the battery limit does not belong to part of any National Park, wild life sanctuary or Natural/ Biosphere reserve. It also does not contain any features of archaeological/ historical and cultural/aesthetic importance.
Total land aquired for the sanitary landfill site is approximately 33.62 acres. And the Break up for land is given in the table below

Break up of the land use pattern for the proposed site

Description of the items	Unit	Quantity
Compost Plant	Acres	4
Site Infrastructure	Acres	3
Landfill	Acres	10.62
Green Belt	Acres	2
Future Development	Acres	14
Total Area Available	Acres	33.62

3.5.2 Land Use Pattern of Buffer Zone

The land use map around the Project site that is within the buffer zone has been prepared by using 1:50,000 scales Survey of India topomap, remote sensing satellite images and GIS mapping technology.

3.5.3 Data Base Referred

i. Survey of India: Topographical sheets
ii. False color composites of LISS Band 2,3, and 4 India Remote Sensing Satellite
iii. Limited field investigations for ground truth collection

3.5.4 Procedure Followed

The general land use/land cover features that are identified are built up land, agricultural land, vegetation and forest, wasteland, water bodies and wet land, and infrastructure and others. The major land class units (LCU) comprising river, canal, major road, railway line etc. were assessed from the topo map and field investigation with help of toposheets of survey of India. The present distribution of land use unit of the study area is represented in the Table-3.1 and pictorially **by Fig-3.8. And in pie chart-3.9**

Figure 3.8 Land Use Map for the Study Area

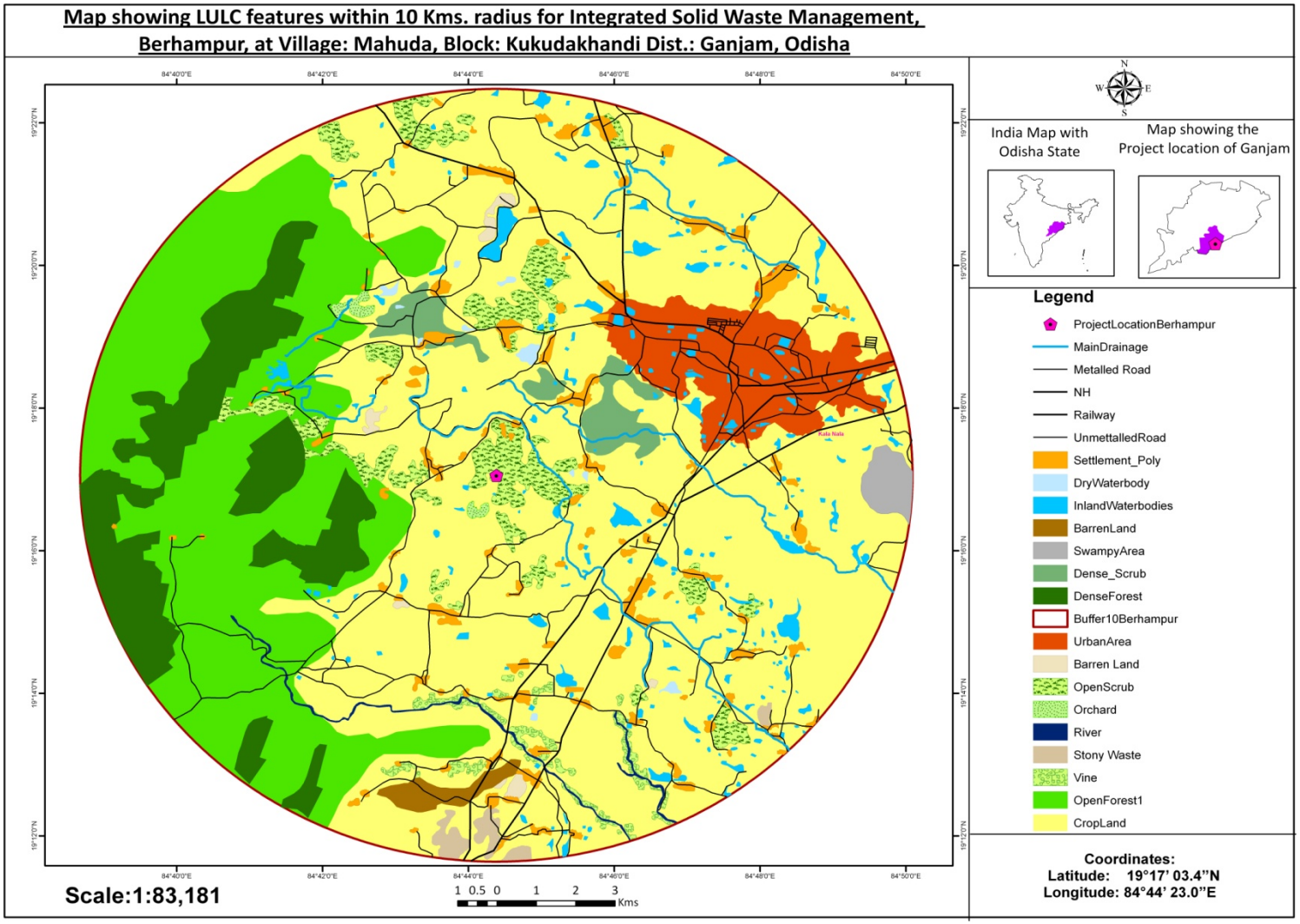
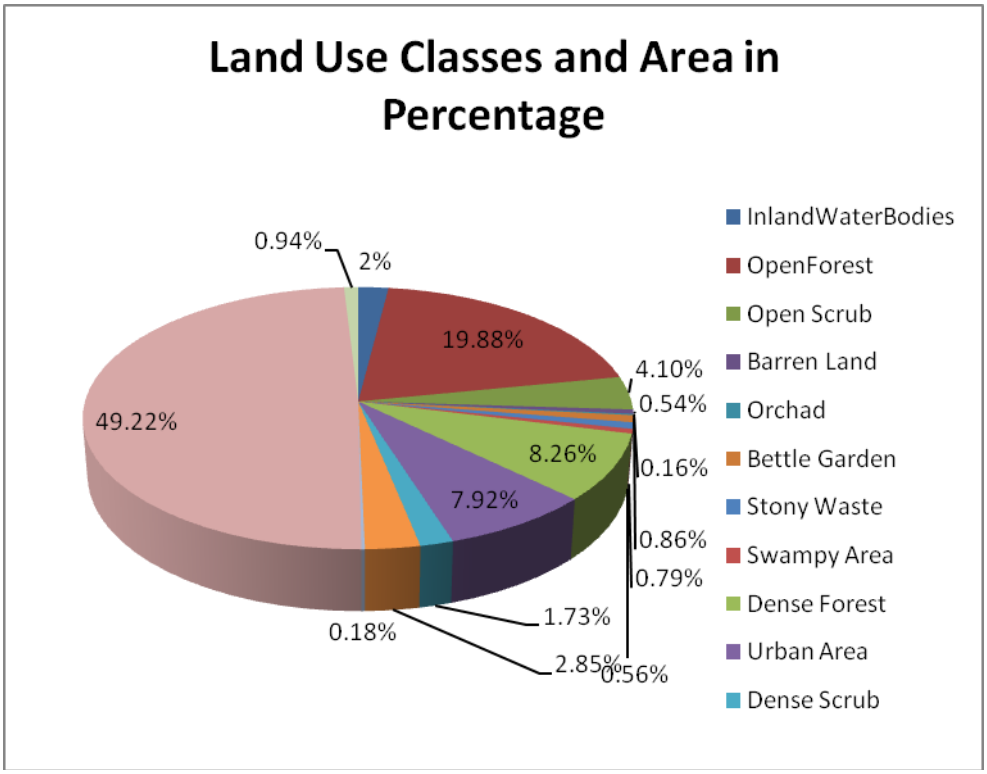


Table-3.1: Land Use Pattern of Buffer Zone.

Sl. No.	**Classes**	Area in Sq. Kms.	Area in Percentage
1	InlandWaterBodies	6.311	2%
2	OpenForest	62.489	19.88%
3	Open Scrub	12.895	4.10%
4	Barren Land	1.684	0.54%
5	Orchad	0.517	0.16%
6	Bettle Garden	2.705	0.86%
7	Stony Waste	2.477	0.79%
8	Swampy Area	1.748	0.56%
9	Dense Forest	25.953	8.26%
10	Urban Area	24.894	7.92%
11	Dense Scrub	5.441	1.73%
12	Village	8.957	2.85%
13	Dry Water	0.565	0.18%
14	Crop Land	154.691	49.22%
15	Communication	2.958	0.94%
	Total	314.285	100%

Figure 3.9: Land Use Pie of Buffer Zone



3.5.5. Existing Land use of Study area

Study area covers an area of approximately 314.2 km^2.Out of the total area, 7.92 % is coming under urban area, 2.85% under village area. Highest percent of the land of the study area is under agricultural use (49%) which is followed by forest land (28%).

3.5.6. Agricultural Land

Almost 50% of the total land in the study area is under agricultural use this indicate that villager are depend mostly agriculture villagers still for their sustenance. The agricultural land is classified into two categories.

i. Single cropped land
ii. Double cropped land

3.5.7 Forest

The forest located in the buffer zone has been classified on the basis of density of canopy cover: The three different categories of forests are

i. Dense forest: Area having more than 30% forest covers.
ii. Open forest : Area having canopy cover within 70% total forest cover
iii. Degraded/ scrub forest: Area having canopy cover is negligible.

Ramagurha R.F (Reserved forest), Banimari R.F, Kerandimala R.F, Rampal R.F, Dhanrashi R.F are some forest found in the buffer zone of the project site.

3.6 GEOLOGY OF THE STUDY AREA

The study undertaken around the site, the following observations were made:

1. The site is bounded by small hillocks with undulating lands in between. Area slopes towards southern side.
2. The area mostly comprises of fallow land bounded by hillocks in the northern and north eastern part. The approach road from SH-22 enters the site from the south eastern part of the area.
3. The vegetation is mostly shrubs and thorny bushes with few cashew plants in the south & south west corner.
4. No water bodies or major water courses within the site. The nearest water body is a pond at 1 Km North West of the area.
5. Site is not located in a flood plain.
6. The area falls in Seismic zone II – low risk category.

3.6.1. Geology of the area:

Major part of the area is underlain by hard crystalline rocks of the Archean age. Minor laterites also occur in the area as capping over the older formations i.e. Granite gneiss and its khandalitic variants. The generalized stratigraphic sequence of the region can be given as below:

Recent to sub recent	Alluvium	Sand, silt, clay in varying proportion
	----------	----------
	Minor laterite & lateritic gravels	
---------- Unconformity ----------		
Archean	Eastern Ghat & Granitic suite	Pegmatite and Quartz veins, Porphyritic and non-porphyritic Granites, Granite gneisses, Garnetiferous granite gneisses.

In the study area, sporadic outcrops of porphyritic granite, Augen gneisses and granite gneisses are found to occur separated by fallow lands with lateritic capping. Joints, lineation and foliations are present within the porphyritic granites. The strike of the granites and granite gneisses is found to be $N15^0W$-$S15^0E$ with sub vertical dip towards west. The joint plains are in an orientation of around $N30^0E$-$S30^0W$ with sub vertical dip towards east.

Table 3.2: Geological Distribution of the Study Area

Sl. No.	Classes	Area in Sq. Kms.	Area in Percentage
1	Basement	174.345	55.48%
2	Charnokite	12.68	4.03%
3	Older Alluvium	125.573	39.95%
4	Khondallite	1.687	0.54%
	Total	314.285	100.00%

Figure 3.10: Pie chart showing the geological distribution of the study area

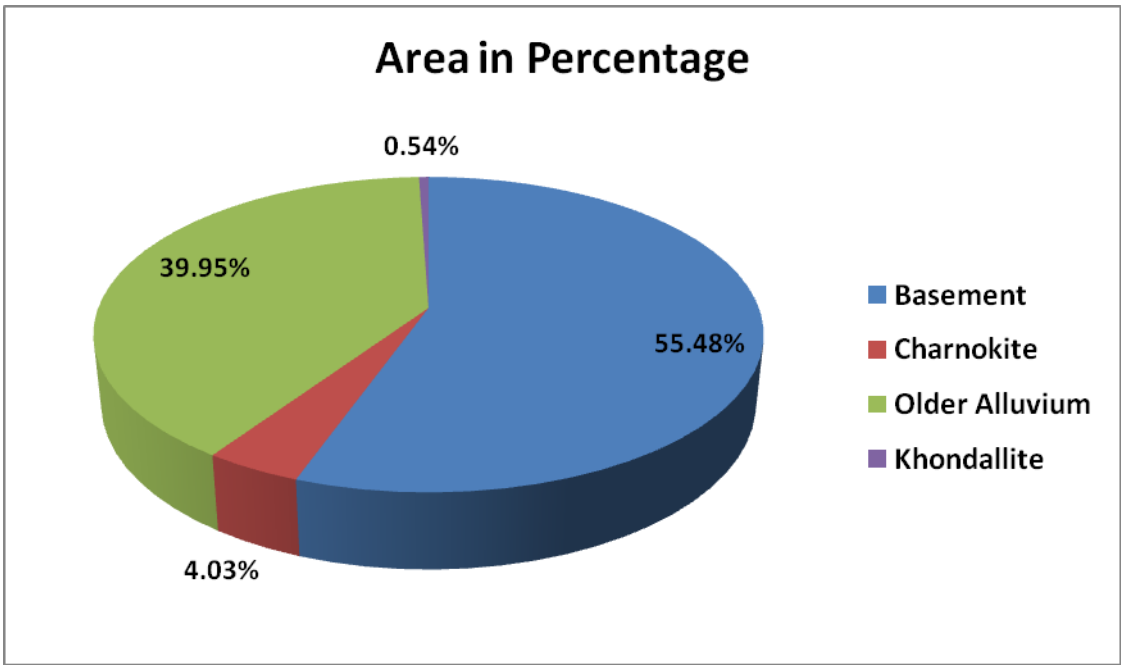
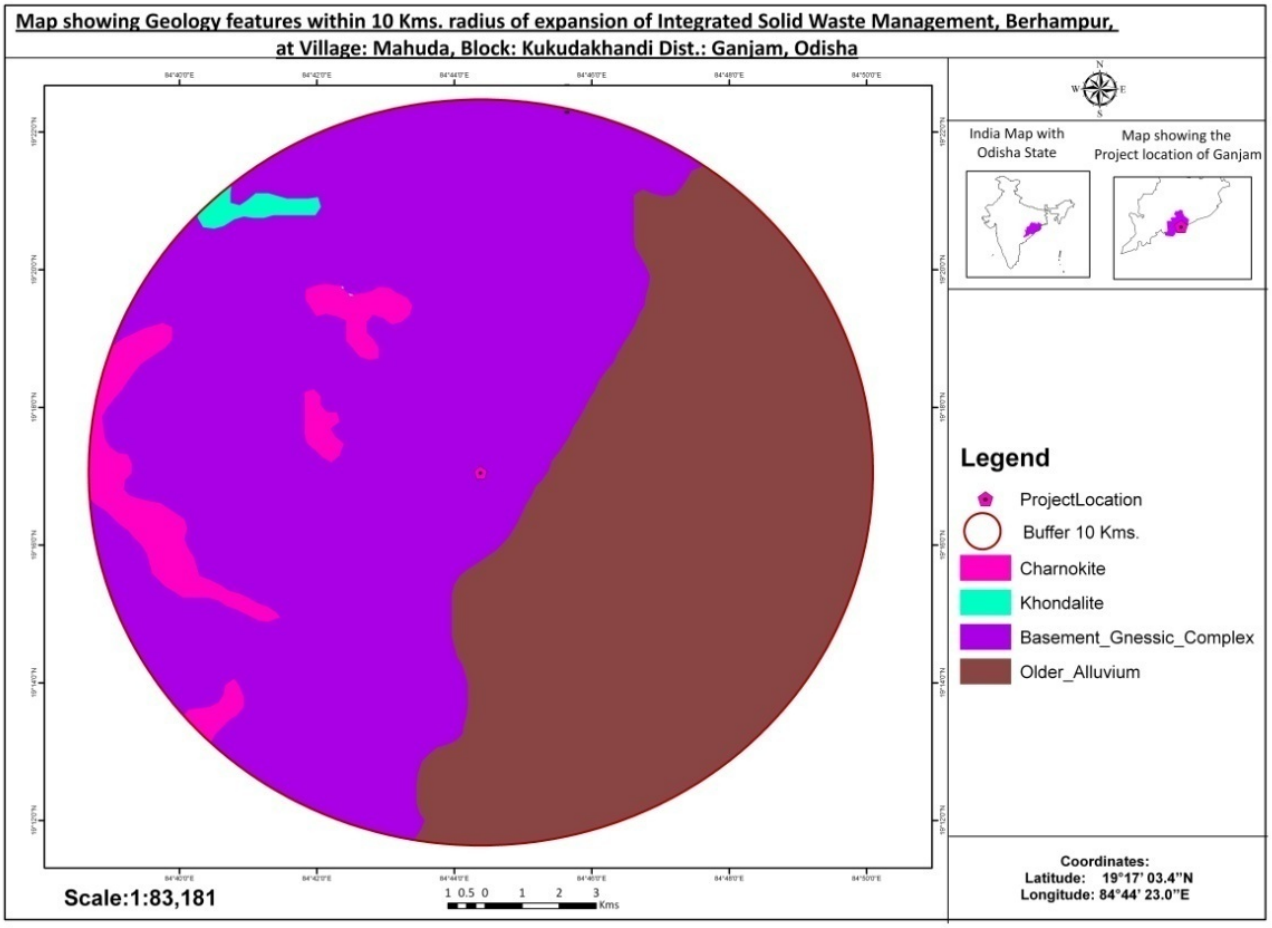


Figure 3.11: Geology Map of Study Area around 10 km radius of the Project Site.



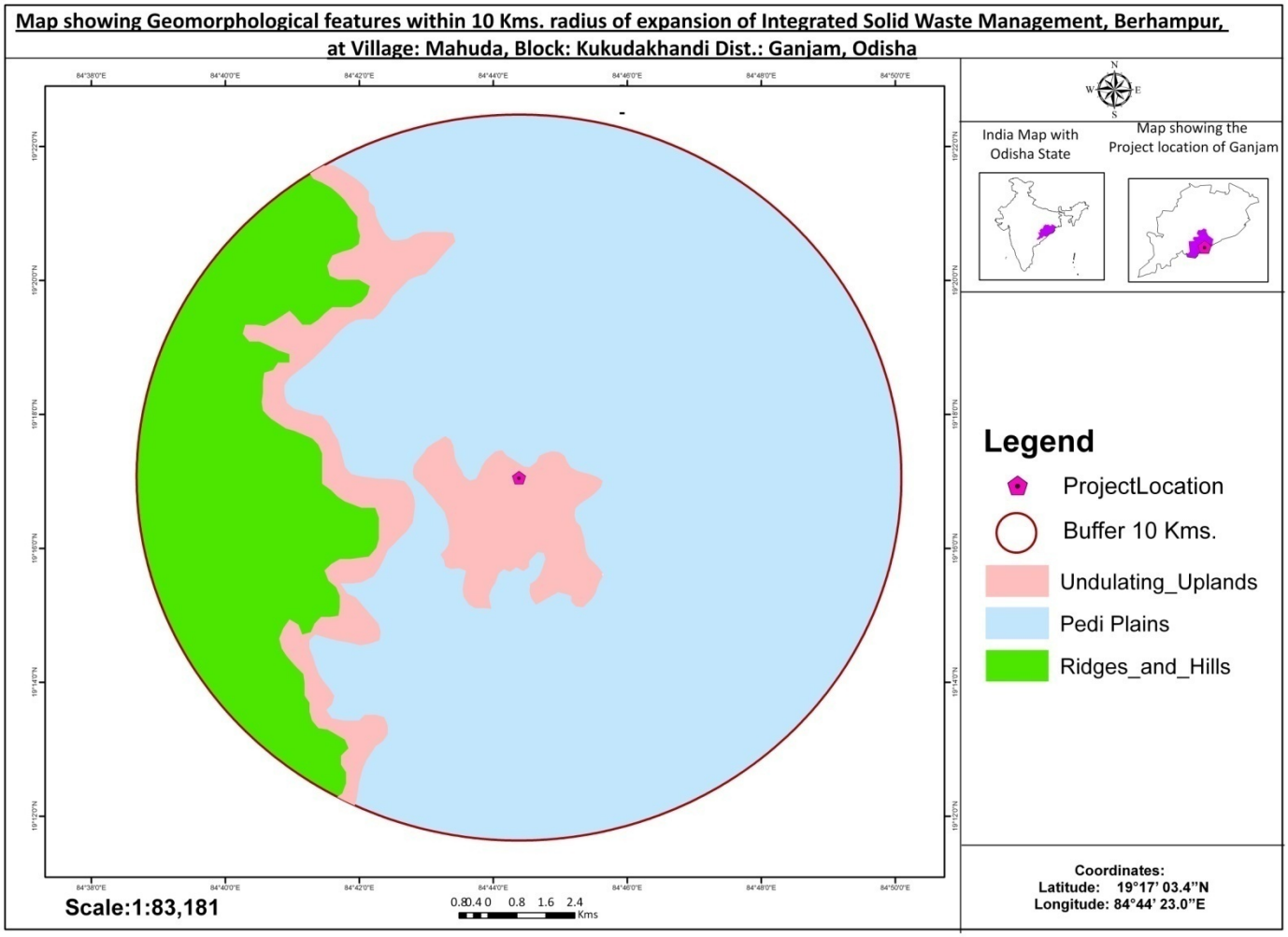
3.7 GEOMORPHOLOGY

A major portion of the geomorphology of the study area was interpreted from processed satellite imagery, published literatures and topographic maps as well as from ground truthing.

The area belongs to the Eastern Ghat hill ranges in the North West and long coastal tract in the south east. A major portion of the study area in the eastern part is covered by the sea (Bay of Bengal). In general the rest of the area presents a highly undulating topography with scattered isolated hillocks and mounds with an average altitude between 40 to 180 m above mean sea level, narrow & shallow intermontane valleys, gently undulating narrow plains covered by Quaternary sediments deposited by tributaries of Rushikulya river. Transported laterites, near the coast, form low uplands. The coastal aeolian dunes occupy considerable area. The major geomorphic feature of the study area are the Buried Pediments, Younger Coastal Alluvium(flood plains), mudflats(not very pronounced) and beach ridge complex, sand dunes, denudational hills & residual valley hills, pediment – inselberg complex(not pronounced), Older alluvium & channel bars(not very pronounced) and water bodies. The core zone represents a flat terrain whereas the buffer zone is undulating. The elevation at the site is approximately 90 metres above mean sea level. The brief descriptions of the various geomorphic units are as below:

- Buried Pediplain
- Residual Hills
- Denudational Hills
- Coastal Plains
- Rivers, Nalahs, Water Bodeis & Canals

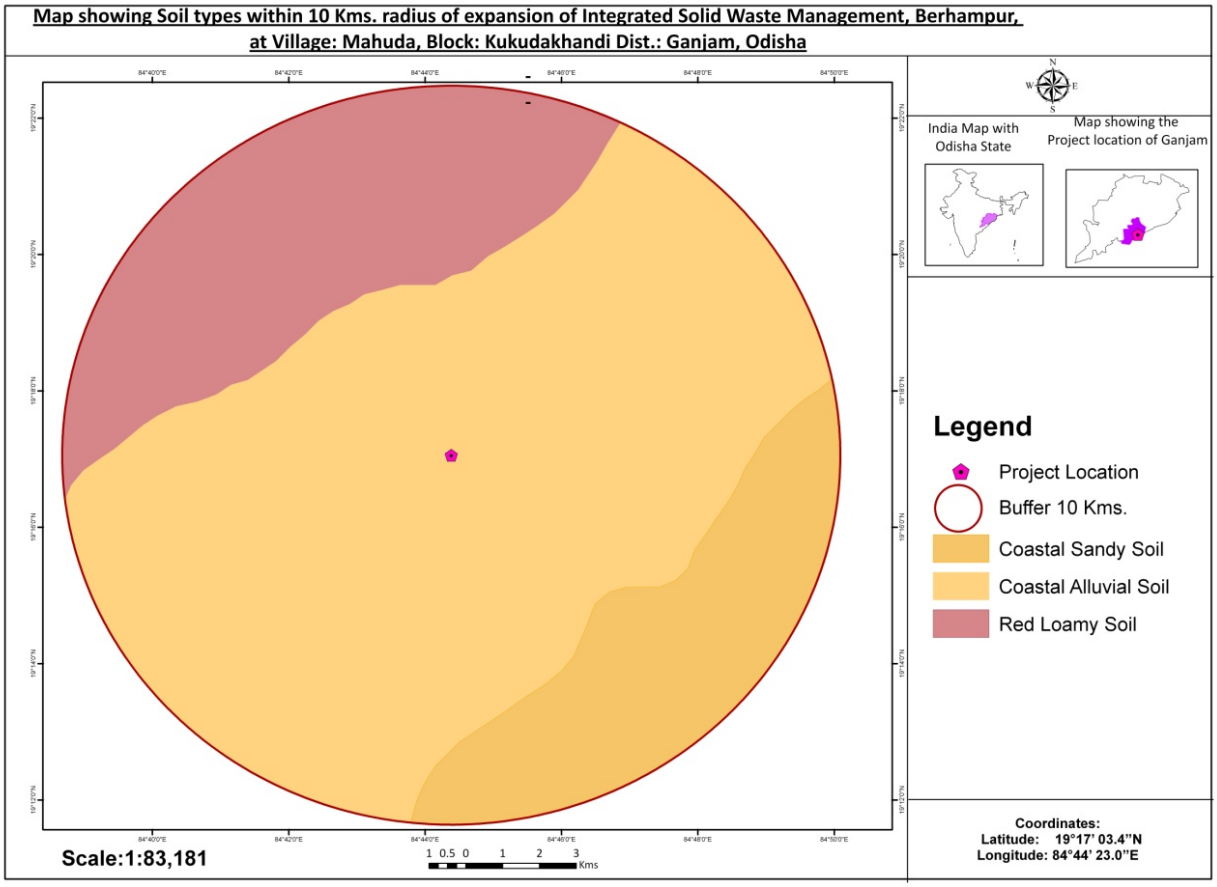
Figure 3.12: Geomorphology Map of Study Area



3.8 SOIL TYPES

The soil type of the Core zone of the study area is Coastal Alluvial soil in nature. They are mostly silty in nature and rests over the older alluviums. It covers more than 70 % of the study area. These types of soils are characterised by dominance of mineral soil materials and absence of distinct pedogenic horizons. The absence of features of any major set of soil forming process is itself an important distinction. There can be no accessory characteristics. Coastal alluvial soil is the soil, in the sense, that they can support plants, in any climatic conditions, under suitable practices for vegetation. The absence of pedogenic horizons may be results of inert parent materials such as quartz sand, insoluble hard carbonate rock, recent ash deposits or even younger alluvium. In the study area these are represented by the coastal alluvial soils and coastal sandy soils. North western part of the study area has red loamy soil and south western part of the study area has coastal sandy soil. The soil map is given in the Fig 3.13.

Figure 3.13: Soil Map of the Study Area



3.8.1 Soil Sampling

Methodology

For studying the soil profile of the region 6 soil sampling points were selected to assess the existing soil conditions in and around the project area (Table-3.5). Soil samples were collected during the winter season which was analyzed for physical and chemical properties. Soil samples were collected at three different strata viz. 30 cm, 60 cm and 90 cm. This will establish the baseline characteristics and will facilitate in the identification of the incremental concentrations from the proposed activities at a larger stage. The baseline characteristics which are analyzed now include the impact on soil in the study area due to the activities of installation of proposed landfill.

Thus the sampling locations are decided based on one or more criteria listed below:

- To determine the existing soil characteristics of the study area
- To determine the impact on soil characteristics due to the activities of the existing industries located in the study area
- To determine the impact on agricultural productivity of soil due to the proposed activity

The Methodology adopted for each parameter is described below

Table 3.3: Analytical Techniques for Soil Analysis

Parameters	Methods
Bulk Density	Sand Replacement, Core Cutter
pH	pH meter
Electrical Conductivity	Conductivity Meter
Nitrogen	Kjeldahl distillation
Phosphorus	Molybdenum blue, Colourimetric
Potassium	Flame Photometer
Chlorides	Argentometric

The details of the soil sampling locations are given in **Table- 3.4 & Fig. 3.14**

3.8.2. The present soil quality of the proposed site

The proposed site is dominated with red loamy & coastal alluvial soil varies with the sample color from red, redish grey to greyish black and characterized by the presence of organic matter and nitrogen. The presence of laterite soil in the proposed site is dominated by brick red colour with pH 7.09 to 8.29. The soil samples taken from six different location in and around the proposed site with a distance of 0 km at propose site to 4.67 km at Goshain Nuagan.

Charaterstics of the soil samples under study taken from different location within a 5 km radius of the proposed landfill site are decribed in table 3.4.

Table- 3.4: Details of Soil Quality Monitoring Locations

Station Code	Location	Distance(Kms) (w.r.t project site)	Direction
S1	Proposed Site	-	-
S2	Sapua canal, Lathi	2.33 km	NE
S3	Mohuda	1.37 km	N
S4	Medinipur	3.84 km	SW
S5	Narasinghapur	1.99 km	NW
S6	Goshain Nuagan	4.67	E

The analytical results of the soil samples collected during the study period are summarized below in **Table 3.5**.

Figure 3.14: Map showing soil sampling locations

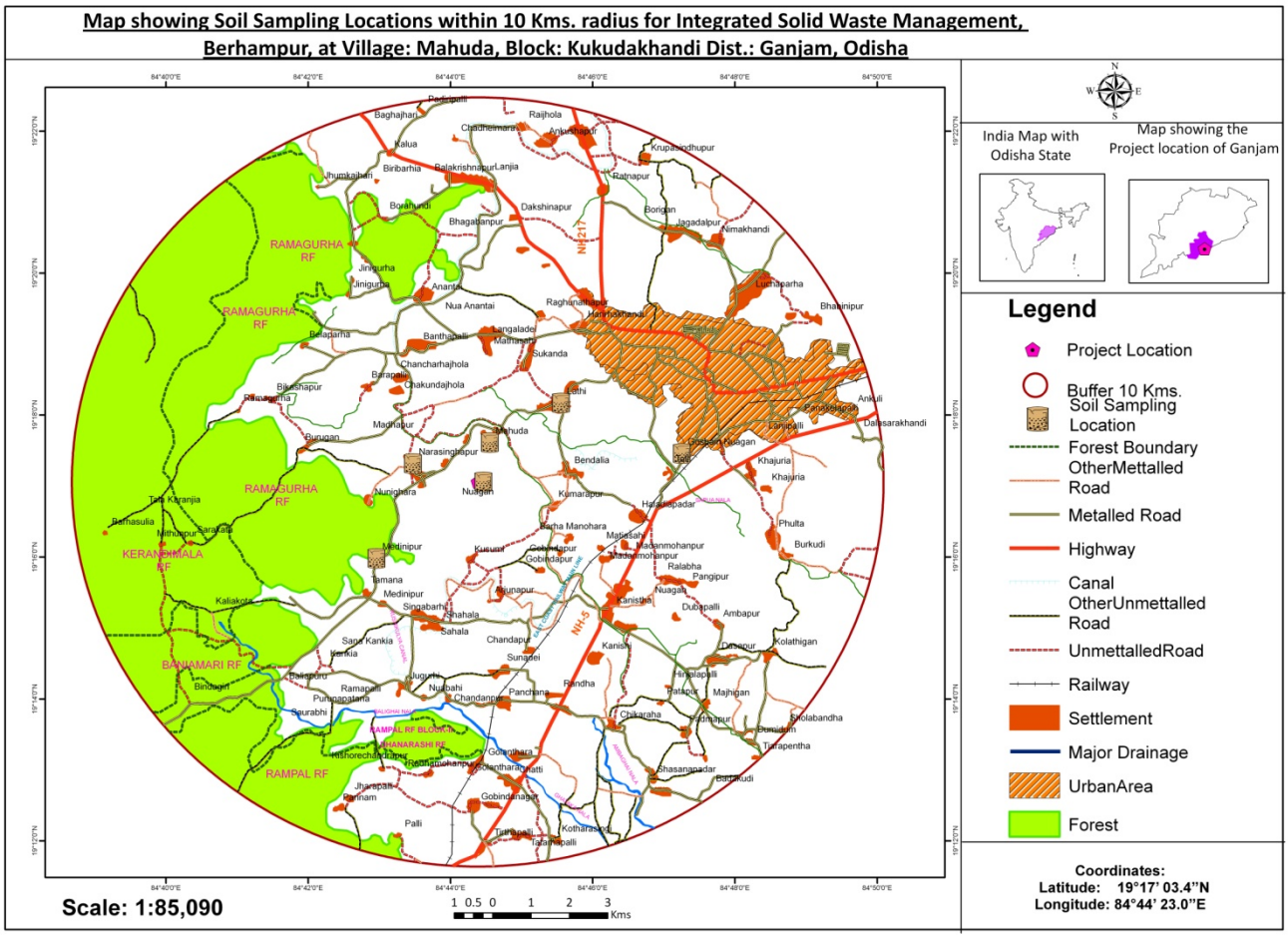


Table 3.5: Soil Sample Analysis

Sl No	Parameter	Sample Location					
		S1 (Proposed Site)	S2 (Sapua canal, Lathi) Distance - 2.33 km NE	S3 (Mohuda) Distance - 1.37 km N	S4 (Medinipur) Distance- 3.84 Km SW	S5 (Narasinghapur) Distance-1.99 Km NW	S6 (Goshain Nuagan) Distance- 4.67 E
1	pH	7.09	8.101	7.52	6.73	8.29	6.35
2	Colour	Brick Red	Blackish grey	Redish Brown	Grey	Greyish Black	Greyish
3	Bulk Density (g/cm^3)	1.17	1.19	1.13	1.36	1.29	1.26
4	EC (milimohs/cm)	0.250	0.190	0.070	0.012	0.143	0.057
5	Nitrogen % w/w	0.14	0.16	0.12	0.10	0.12	0.14
6	Porosity, %	51.27	49.78	53.68	43.98	45.47	50.78
7	Salinity, ppt	1.44	0.53	0.52	0.43	0.49	0.47
8	Water holding capacity	51.0	54.3	52.0	33.0	46.2	41.0
9	Sodium Adsorption Ratio	1.40	1.41	1.27	1.41	1.05	1.86
10	Sodium (as Na,) mg/kg	1183.01	105.62	974.42	983.09	1096.54	962.17

11	Potassium (mg/kg)	867.05	662.47	355.89	514.16	793.45	476.39
12	Magnesium (mg/kg)	1328.74	1191.49	1055.42	954.53	1522.84	581.99
13	Available Phosphorous (mg/kg)	<0.04	58.38	19.12	96.18	<0.04	15.02
14	Cation exchange capacity, meq/100g	34.57	47.41	27.12	23.73	47.34	15.50
15	Zinc (mg/kg)	34.29	16.68	19.63	36.94	32.03	9.38
16	Iron mg/kg	15036.25	10690.11	22841.29	15872.41	10733.82	13418.75
17	Manganese (as Mn), mg/kg	585.38	493.28	915.51	533.20	551.96	605.46
18	Nickel (as Ni)	17.14	11.91	22.09	7.14	7.39	7.04
19	Copper (mg/kg)	24.49	7.14	14.72	11.90	7.39	7.04
20	Texture Sand % w/w	16.56	68.41	54.07	76.32	45.04	46.14
	Silt % w/w	10.25	12.38	8.63	3.86	8.75	23.04
	Clay % w/w	73.18	19.21	37.29	19.82	46.21	30.81

Table showing the Soil bearing capacity

Bore Hole Ref.	Depth in Mtr.	Type of sample	Safe Bearing Capacity (T/m^2)
BH-1	1.50	SPT	10.94
	3.00	SPT	16.48
	4.50	SPT	17.07
BH-2	1.50	SPT	10.76
	3.00	SPT	20.91
	4.50	SPT	19.64
BH-3	1.50	SPT	11.00
	3.00	SPT	16.29
	4.50	SPT	21.29

3.8.3. Interpretation of soil analysis

In general, the healthy soil posses 16 elements which are considered to be suitable for productive purposes. These elements are mainly carbon (C), oxygen (O), hydrogen (H) which is available in air and water. The major nutrient like nitrogen (N), phosphorous (P), potassium (K), are available in soil. These nutrients are term as macro-nutrients (N, P,K, Ca, Mg,S) and the micronutrients which are also available in hydrophonic medium and also in soil are boron (B), chlorine (Cl), copper (Cu), iron (Fe), manganese (Mn), Zinc (Zn), Molybdenum(Mo). Nickel (Ni), Sodium (Na), silicon (Si), cobalt (Co).

Soil pH:

In general the pH of healthy soil varies from 6.5 to 7.0. The soil pH ranging from 5 or <5.0 is considered to be strongly acidic in nature and pH 7.0 or more is considered to be alkaline in nature. The soil sample collected from the proposed site posses pH 7.09 which is slightly alkaline in nature and soil sample collected from Lathi which 2.33 km in north east direction from the proposed site has pH 8.101 and sample taken from Narashinghpur which 1.99 Km towards the north west direction from the site has pH value of 8.29 which are alkaline in nature.

Availability of Nutreints in soil

Nitrogen:

The nitrogen is available in ammonium form (NH_4^+) in neutal soil at pH 7.0. The ammonium in the soil exists in equilibrium with ammonia gas. The nitrogen loss is more in alkaline soil i.e pH >8.0.

Phosphorous:

Phosphorous availability is more in alkaline soil and less available in acidic soil.

Potassium

Potassium availability is less in acidic soil and more in alkaline soil. So the acidic soil needs correction by liming.

Micronutrients:

The availability of the micronutrients like boron (B), chlorine (Cl), copper (Cu), iron (Fe), manganese (Mn), Zinc (Zn), Nickel (Ni), Sodium (Na), silicon (Si), cobalt (Co) etc is less in alkaline soil. However, Molybdenum (Mo) is more available in alkaline soil.

Conclusion:

Hence, the soil the pH does play a major role in nutrient availability. The nutrient management of the soil can be tracked by pH factor. The pH of the soil is declining rapidly in cotiniuos cropped, direct seeded land.

The soli collected from lathi, Mohuda and Narshingpur having pH 8.101, pH 7.52 and pH 8.29 respectivelyare akaline in nature. The availability of nutrients like nitrogen and boron (B), chlorine (Cl), copper (Cu), iron (Fe), manganese (Mn), Zinc (Zn), Nickel (Ni), Sodium (Na), silicon (Si), cobalt (Co) are less. These soil samples requires regular sample test. Cation ion exchange capacity of the above soil samples varies from 27.12 to 47.41 meq/100g which not adequate. These above soils are alkaline in nature, which is termed as sweet soils, usually containing large no. of cations, which remains insoluble in soil. These soils can be rectified by adding ground rock sulphur like organic matters, saw dusts, peat moss, compost, wood cheeps etc. to reduce the P^H.

Landfill disposals sometimes may spread pathogen from biological incidents & contaminate the surrounding land soil, water and air. These can be overruled through constant and continuous environmental monitoring, correction of soil P^H for better health condition of the soil of that locality.

3.9 AIR ENVIRONMENT

3.9.1 Climatic Conditions of the Project Site

The climate in the study region is generally dry and hot and is characterized with seasonal variations of temp., humidity, rainfall etc.

Summer	March to June
Monsoon season	June to September.
Post Monsoon season	October and November
Winter	November to February

The climate setting of the area has been arrived by collecting the existing data from the IMD station at Gopalpur and onsite IMD station at Berhampur near the project site.

3.9.1.1 Temperature

The temperature profile of this region is presented in the Table 3.6

Table 3.6: Temperature Profile of the Study Area

Sl. No.	Description	Minimum Temperature (^{0}C)	Maximum Temperature (^{0}C)
3	Annual total Or Mean	13.2	37.6

(**Source: Climatological Table of Observaties of India (1971-2000))**

3.9.1.2 Humidity

The maximum and minimum humidity values of the region are given in table-3.7.

Table 3.7: Maximum and Minimum Humidity of the Study Area

Maximum. humidity	82%
Minimum humidity	80%

(Source: **Climatological Table of Observaties of India (1971-2000))**

3.9.1.3 Rainfall

The area receives fairly good amount of rainfall from the southwest monsoon during June to September. Light showers of rain occur during the months of October, November and sometimes in December also. The rainfall characteristics of the region are given in the Table-3.8.

Table- 3.8: Rainfall Pattern in the Region

Predominant rainy season (monsoon)	June to September
Average annual rainfall (mm)	1492 mm
Most rainy Month	July, August

***(Source:** Climatological Table of Observaties of India (1971-2000))* **)**

The critical weather elements that influence air pollution are wind speed, wind direction, temperature, which together determines the atmospheric stability. Hence it is an indispensable part of any Air Pollution Studies and required for interpretation of baseline information.

3.9.2 Climatic Condition during Monitoring Period

Meteorological data was collected by the onsite meteorological station at the project site during winter seasons, i.e., November 2013-February 2014.
In order to determine the micrometeorological conditions of the study area a temporary micro-meteorological monitoring observatory was set up near the site. The following parameters were recorded at hourly intervals continually during the study period.

- Wind speed
- Wind direction
- Relative humidity
- Air temperature
- Cloud cover

Wind speed and direction is measured by Anemometer, air temperature by Thermometer, relative humidity is measured by Hygrometer and cloud cover recorded through visual interpretation. At the meteorological station Wind speed & direction, Temperature, Relative humidity and Cloud Cover were recorded at hourly intervals throughout the monitoring period. Total Rainfall for the entire monitoring period was also recorded. The summarized meteorological data is given in **Table-3.6.**

Wind roses on sixteen-sector basis (N, NNE, NE, ENE, E, ESE, SE, SSE, S, SSW, SW, WSW, W, WNW, NW, and NNW) have been drawn for 1-24 hours.

From the analysis of data the overall predominant wind direction has been from North , North East and North West direction during winter season.

The average wind velocity is 0.5-2.1 km/h and the calm period is 3.49 %. Details of the overall wind frequency distribution during the study period at the site are given in **Table-3.9**.

The Wind Rose diagrams for the month of November, December, January during the winter season are given **as Fig-3.15, 3.16, 3.17, 3.18 and 3.19.**

Table-3.9: Summarized Meteorological Data at site

Period	Wind Speed (Km/Hr)		Temperature (°C)		Relative Humidity (%)		Rainfall (mm)		Cloud Cover (Oktas) Mean
	Max	Min	Max	Min	8.30 AM	5.30PM	24 hr Max	Total	
Winter									
November-2013	18.8	0.1	17	29	79	70	Nil	Nil	0
December-2013	16.8	0.5	27	16	78	68	Nil	Nil	0
January-2014	17.2	0.1	27	15	79	73	Nil	Nil	0

Source of information:

- Primary Data – Data from onsite Meteorological station during study period (Nov-2013-Jan-2014)
- Secondary information on meteorological conditions has been collected from the nearest IMD station at Gopalpur and IMD Book (1971-2000).

Table-3.10: Overall Wind Frequency Distribution (November 2013- Jan-2014)

Station ID: 43049 GOPALPUR	Run ID:						
Year: 2013 2014							
Date Range: Jan 1 - Dec 31							
Time Range: 00:00 - 23:00							
Frequency Distribution Speed m/s							
(Normalized)							
Wind Direction	0.5 - 2.1	2.1 - 3.6	3.6 - 5.7	5.7 - 8.8	8.8 - 11.1	>= 11.1	Total
348.75 - 11.25	0.29529	0.131793	0.142663	0	0	0	0.569746
11.25 - 33.75	0	0.000453	0	0	0	0	0.000453
33.75 - 56.25	0.027627	0.007246	0.012681	0	0	0	0.047554
56.25 - 78.75	0	0	0	0	0	0	0
78.75 - 101.25	0.004076	0	0.000906	0	0	0	0.004982
101.25 - 123.75	0	0	0	0	0	0	0
123.75 - 146.25	0	0	0	0	0	0	0
146.25 - 168.75	0	0	0	0	0	0	0
168.75 - 191.25	0.001812	0	0.000453	0	0	0	0.002264
191.25 -	0	0	0	0	0	0	0

	213.75							
	213.75 - 236.25	0.001359	0.000453	0.002264	0	0	0	0.004076
	236.25 - 258.75	0.000453	0	0	0	0	0	0.000453
	258.75 - 281.25	0.002264	0.000453	0.000453	0	0	0	0.00317
	281.25 - 303.75	0.002717	0.001359	0	0	0	0	0.004076
	303.75 - 326.25	0.169837	0.075181	0.083333	0	0	0	0.328351
	326.25 - 348.75	0	0	0	0	0	0	0
Sub-Total: 0.505435 0.216938 0.242754 0.000000 0.000000 0.000000 0.965127								
Calms: 0.034873								
Missing/Incomplete: 0.000000								
Total: 1.000000								
Frequency of Calm Winds: 3.49%								
Average Wind Speed: 2.37 m/s								

Figure 3.15: Overall Wind Rose Diagram (November 2013- Janurary-2014)

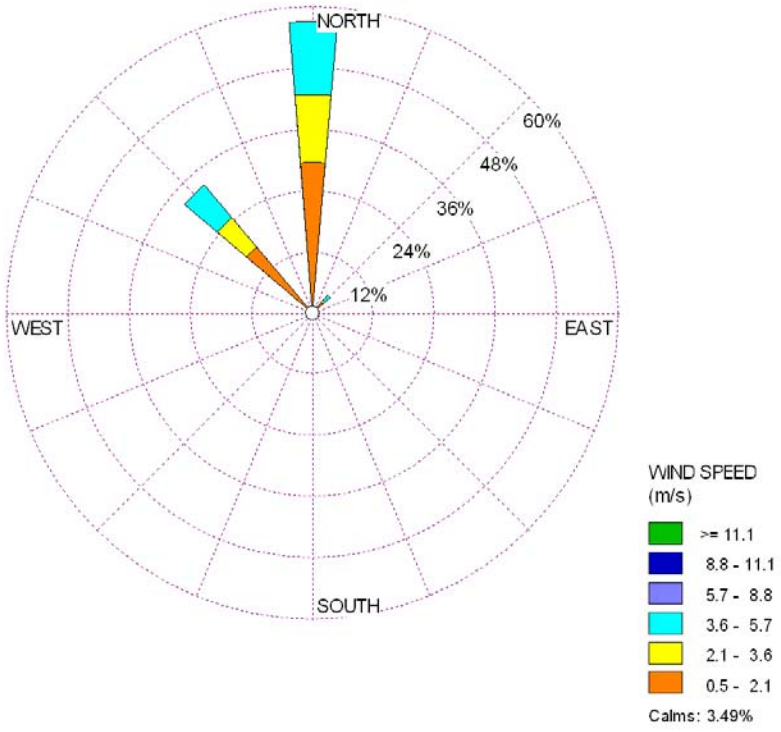


Figure 3.16: Wind Rose Diagram of November-2013

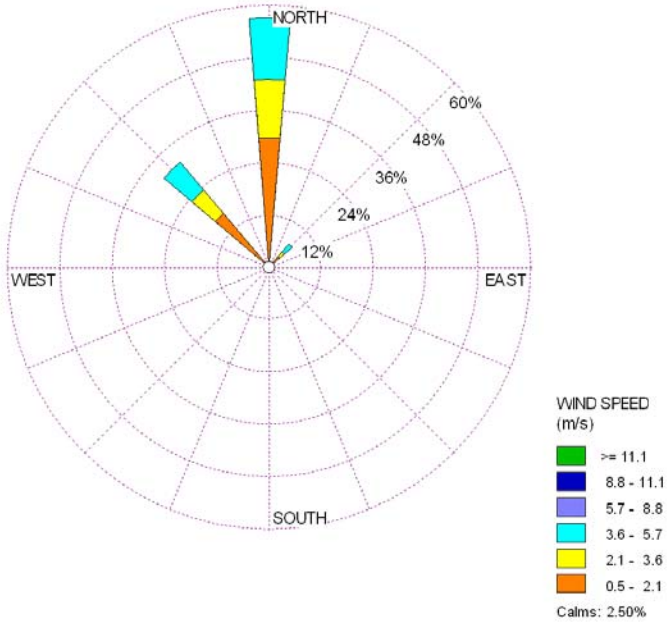


Figure 3.17: Wind Rose Diagram of December 2013

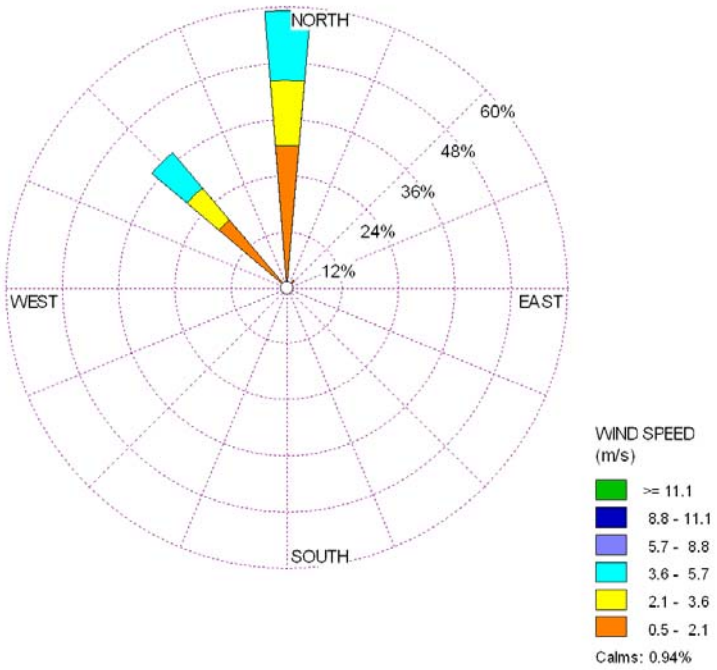
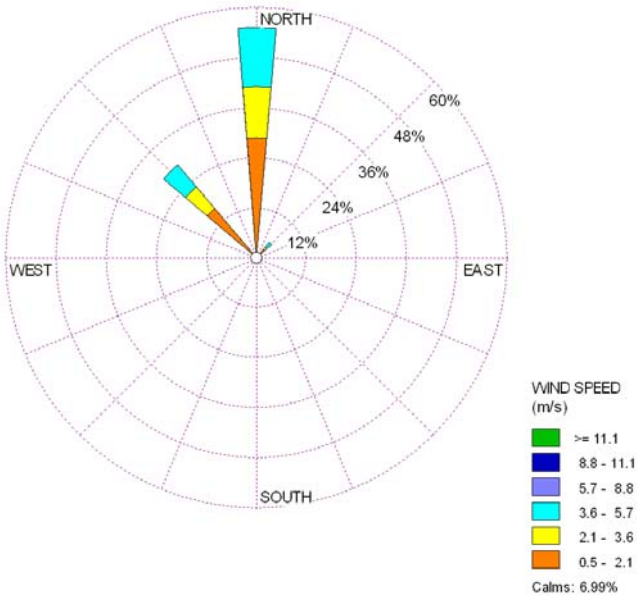


Figure 3.18: Wind Rose Diagram of January-2014



3.10 AMBIENT AIR QUALITY

The ambient air quality in one locations in core zone and six locations in impact (Buffer) zone i.e. 10 Km radius of the study area around the proposed site as the center will form the baseline information over which the predicted impacts can be superimposed to find out the net impacts on the air quality of the surrounding environment of the project area. The design of the network of ambient air quality monitoring stations in the study area was done based on the following criteria.

- Meteorological conditions on a synoptic scale
- Topography of the study area
- Representation of the regional background levels
- Representation of the site
- Influence of the existing sources
- Major human settlements in the study area

The prominent sources of air pollution in the study area are due to emission from industries, vehicular movement and domestic fuel as coal burning in some parts of the study area.

The pollutants of concern area are Particulate Matter (PM_{10} and $PM_{2.5}$), SO_2, NO_X and CO. Ambient air quality monitoring in the study area was carried for the pollutants of concern as per the project requirement. The selected sampling locations for air quality study are shown in **Figure 3.14.** Air quality monitoring stations were selected using simulation models within the study area keeping in view the topographical and the meteorological conditions. All the ambient air quality monitoring stations were installed on flat roof, at least 3 m above the ground level with no obstructions and ensuring free flow of the wind.

3.10.1 Duration of sampling

Sl. No.	Instrument Name	Make	Model	Parameters	Minimum Detection Limit
1	Spectrophotometer	Systronics	DR2000;Sl No.911016344	SO_2, NO_X	2.0 **µg**
2	Electronic balance	Denver	APX 200	$PM_{10,}$ $PM_{2.5}$	0.1 **µg**
3	Gas Chromatograph with NDIR	GC-3, VARIAN	CP- 3800-44; Sl No.8094	CO	0.01 (ppm)

The Duration of Sampling of Particulate Matter (PM_{10}), Particulate Matter ($PM_{2.5}$), SO_2, NO_X, was each twenty four hourly continuous sampling per day and CO was sampled for 8 Hours continuous thrice in 24 hour duration monitoring. The Monitoring was conducted for two days in a week for four months. This is to allow a Comparison with the present revised standards mentioned in the latest gazette notification of the Central Pollution Control Board (CPCB - NOV- 18 - 2009).

3.10.2 Sampling Frequency

The Ambient Air Quality Parameters along with their Frequency of Sampling are given below

Parameters	Sampling Frequency
Particulate Matter (PM_{10})	24 Hourly Sampling twice a week for 3 months
Particulate Matter ($PM_{2.5}$)	24 Hourly Sampling twice a week for 3 months

MONITORED PARAMETERS AND FREQUENCY OF SAMPLING

3.10.3 Instrument Used for Sampling

Fine Particulate Sampler SLE- 105 has been used for monitoring Particulate Matter (PM_{10}, $PM_{2.5}$). Gaseous Pollutants like SO_2, NO_X, were collected in the impinger of attachment SLE-133**.**

In General the following points were taken in to consideration during sampling

- Height of the inlet must be 3 – 10 m above the ground level.
- The Sampler must be more than 20 m from trees.
- Distance of the sampler to any air flow obstacle i.e. buildings, must be more than two times the height of the obstacle above the sampler.
- There should be unrestricted air flow in three of four quadrants.

Sulphur Dioxide (SO_2)	24 Hourly Sampling twice a week for 3 months
Oxides of Nitrogen (NO_X)	24 Hourly Sampling twice a week for 3 months
Carbon Monoxide (CO)	8 Hourly Sampling for 24 Hour twice a week for 3 months

TECHNIQUES USED FOR AMBIENT AIR QUALITY ANALYSIS

Sl. No.	Parameter	Technique	Technical Protocol
1	Particulate Matter (PM_{10})	FP Sampler (Gravimetric Method)	IS: 5182 Part IV
2	Particulate Matter ($PM_{2.5}$)	FP Sampler (Gravimetric Method)	IS: 5182 Part IV
3	Sulphur Dioxide	Modified West and Gaeke method	IS: 5182 Part II
4	Oxides of Nitrogen	Jacob & Hochheiser method	IS: 5182 Part VI
5	Carbon Monoxide	Gas Chromatography	IS: 5182 Part X

3.10.4 Instrument Used for Analysis

The make & model of the instruments used for analysis of the samples collected during the field monitoring are given below.

Table 3.11: National Ambient Air Quality Standards as per MoEF Notification under Schedule-VII, Rule- 3(3B). dt 18.11.09

Sl. No.	Pollutant (in µg/m^3)	Time Weighted Average	Concentration in Ambient Air		
			Industrial, residential, Rural and Other Area	Ecologically Sensitive Area (Notified by Central Govt.)	Methods of Measurement
1	Sulphur Dioxide (SO_2) (µg/m^3)	Annual * 24 hours **	50 80	20 80	- Improved West and Gaeke - Ultraviolet fluorescence
2	Nitrogen Dioxide (NO_2) (µg/m^3)	Annual * 24 hours **	40 80	30 80	- Modified Jacob & Hochheiser (Na-Arsenite)
3	Particulate Matter (size less than 10µm) or PM_{10} (µg/m^3)	Annual * 24 hours **	60 100	60 100	- Gravimetric -TOEM - Beta attenuation
4	Particulate Matter (size less than 2.5µm or $PM_{2.5}$) (µg/m^3)	Annual * 24 hours **	40 60	40 60	- Gravimetric - TOEM - Beta attenuation
5	Ozone (O_3) (µg/m^3)	8 hours ** 1 hour **	100 180	100 180	- UV photometric - Chemilminescence -Chemical Method
6	Lead (Pb) (µg/m^3)	Annual *	0.50	0.50	- AAS/ICP method after

		24 hours **	1.0	1.0	sampling on EPM 2000 or equivalent filter paper - ED-XRF using Teflon filter
7	Carbon Monoxide (CO) (mg/m^3)	8 hours ** 1 hour **	02 04	02 04	- Non dispersive Infra Red (NDIR) spectroscopy
8	Ammonia (NH_3) ($\mu g/m^3$)	Annual * 24 hours **	100 400	100 400	- Chemiluminescence - Indophenol blue Method
9	Benzene (C_6H_6) ($\mu g/m^3$)	Annual *	05	05	- Gas chromatography based continuous analyzer - Adsorption followed by GC analysis
10	Benzo(a)Pyrene (BaP) – particulate phase only(ng/m^3)	Annual *	01	01	- Solvent extraction followed by HPLC/GC analysis
11	Arsenic (As) (ng/m^3)	Annual *	06	06	- AAS/ICP method after sampling on EMP 2000 or equivalent filter paper
12	Nickel (Ni) (ng/m^3)	Annual *	20	20	- AAS/ICP method after sampling on EMP 2000 or equivalent filter paper

* Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

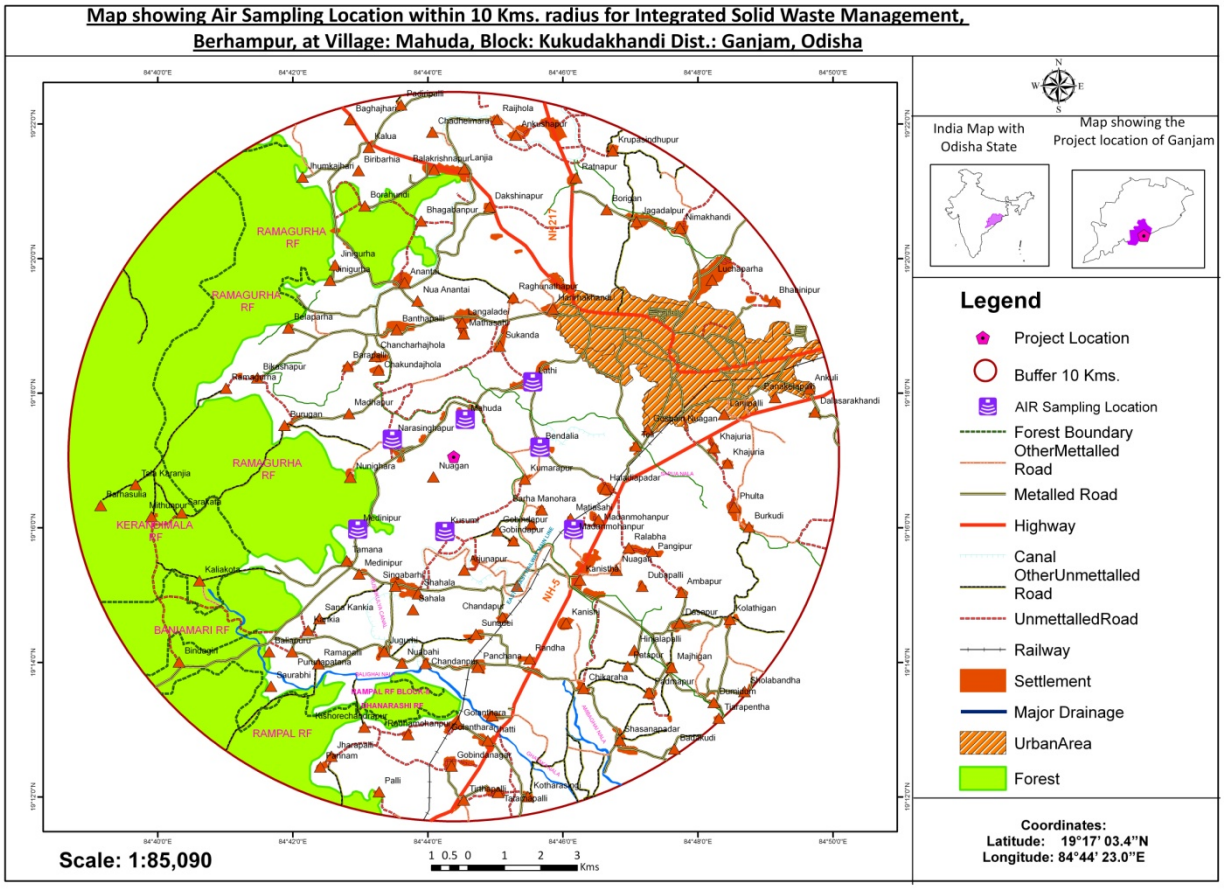
** 24 hourly or 08 hourly or 01 hourly mentioned values, as applicable, shall be complied with 98 % of the time in a year, 2 % of the time; they may exceed the limits but not on two consecutive days of monitoring.

Table 3.12: Details of Ambient Air Quality Monitoring Locations

Sl. No.	Station Code	Sampling Locations	Coordinate	Distance (Km)	Direction	Type of area
				w.r.t. Project Site		
1	CA1	Mohuda	19°17'58.62" N 84°44'22.41" E	-	-	Core zone
2	BA1	Narashinghapur	19°17'36.20" N 84°44'30.36" E	1.99	NW	Rural & residential
3	BA2	Lathi	19°18'46.95" N 84°46'04.75" E	2.33	NE	Rural & residential
4	BA3	Medinipur	19°16'33.12" N 84°43'44.15" E	3.84	SW	Rural & residential
5	BA4	Kusumi	19°16'52.60" N 84°45'01.79" E	0.5	S	Rural & residential
6	BA5	Madanmohanpur	19°16'23.94" N 84°46'45.22" E	3.9	SE	Rural & residential
7	BA6	Bendalia	19°17'46.20" N 84°46'36.73" E	3.47	NE	Rural & residential

CA : Core zone BA : Buffer zone

Figure 3.19: Map showing AAQ Sampling Locations.



The values of air quality pollutants of concern as mentioned above are presented in the following Table 3.10. The range of maximum concentrations reflects that the pollution level is low in most of the places as it is a rural area and surrounded mostly by villages. The value is higher in only that site and at places which are nearer to Highways. An analysis of the data of the site with respect to downward side in particular and other monitoring sites in general represent the background levels.

Spatial and temporal variations in the air quality occur as a result of the air basin and the prevailing meteorological conditions of the study area. To assess the existing sub regional air status during the winter, the above factors govern the status at all the AAQ sampling stations. Various statistical parameters like maximum; minimum and different percentile have been computed from the observed raw data for all sampling stations.

3.10.5 Data Analysis of AAQ Levels

The existing concentrations of the critical pollutants in the study area are represented in the Table-3.13 The range of maximum and minimum concentrations reflect that the pollution levels are varying depending on the prevailing activity i.e. either industrial, or domestic fuel burning or vehicular traffic etc. Background concentrations of the critical pollutants are established by comparing the concentrations at the site and that of the downwind locations with the pollutant concentrations at other locations.

Table-3.13: Summarized ambient air quality data for PM_{10}, $PM_{2.5}$, SO_2, NO_x and CO.

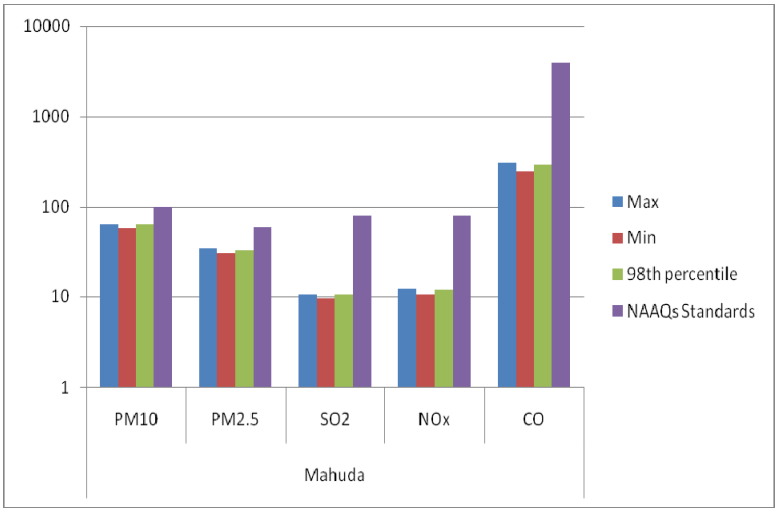
Location Code	Location Name	PM_{10} (µg/m³)			$PM_{2.5}$(µg/m³)			SO_2 (µg/m³)			NO_X (µg/m³)			CO (µg/m³)		
		Max	Min	98th perc	Max	Min	98th perc	Max	Min	98th perc	Max	Min	98th perc	Max	Min	98th perc
CA1	Mohuda	64.3	57.8	63.8	34.8	30.2	32.7	10.6	9.4	10.5	12.1	10.5	11.8	307	243	291
BA1	Narashinghapur	59.2	53.5	58.9	30.6	28.3	29.7	10.2	9.1	9.6	10.8	9.4	10.3	298	251	288
BA2	Lathi	60.4	54.6	59.7	33.1	28.5	32.6	10.4	9.6	10.1	13.1	9.6	12.7	336	283	316
BA3	Medinipur	54.3	49.3	53.9	28.3	25.6	27.5	11.2	10.3	10.9	11.5	9.4	11.2	302	271	297
BA4	Kusumi	53.8	47.7	52.7	26.9	23.8	26.2	10.8	9.2	10.3	10.4	9.4	10.1	293	265	281
BA5	Madanmohanpur	62.4	56.8	61.5	32.7	29.1	31.8	11.8	10.7	11.2	13.9	10.4	13.1	351	289	323
BA6	Bendalia	57.6	51.2	56.9	29.7	26.8	28.6	10.5	9.8	10.2	11.9	9.8	11.3	284	269	278
	Range Value	**64.3-47.7**			**34.7-23.8**			**11.8-9.1**			**13.9-9.4**			**359-243**		
NAAQS STANDARD (Nov 2009)		**100**			**60**			**80**			**80**			**4000**		
INSTRUMENT USED AND METHODS OF MEASUREMENT		**Fine Particulate Sampler SLE- 105 and Gravimetric**			**Fine Particulate Sampler SLE- 105 and Gravimetric**			**Attachment SLE-133 Spectrophotometric analysis (West-Gaeke method)**			**Attachment SLE-133 ,Modified Jacob & Hochhelser (Na-Arsenite)**			**NDIR**		

Analysis of the air quality is done six different location which include Mohuda, Narashinghapur, Lathi, Medinipur, Kusumi, Madanmohanpur and Bendalia for different parameters like **PM_{10}, $PM_{2.5}$, SO_2, NO_X, CO. Figure 3.20, 3.21, 3.22, 3.23, 3.24 graphically represents air quality for the parameters like PM_{10}, $PM_{2.5}$, SO_2, NO_X.**

a) Mohuda

The monitor was placed at **project site**. All the monitored parameter like PM_{10}, $PM_{2.5}$, SO_2, NO_X, CO were within the prescribed limits. Concentration of PM_{10}, $PM_{2.5}$, is slightly high. High concentration of PM_{10} and $PM_{2.5}$ is attributed to wind blown dust from unpaved roads and stone chrusher**.**

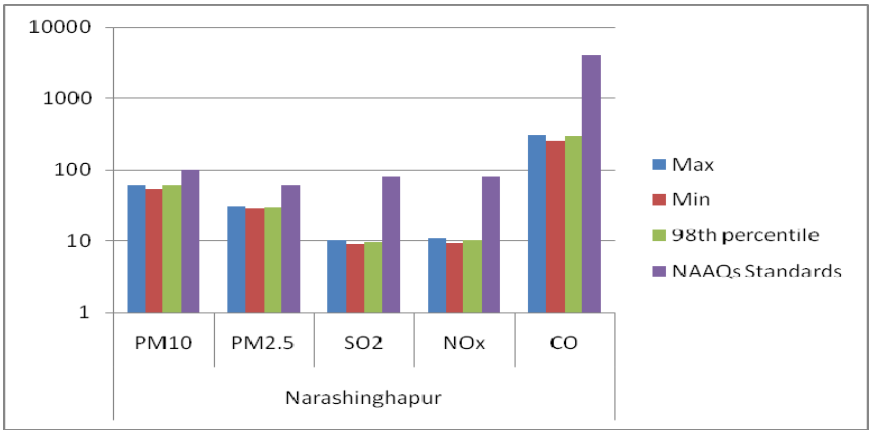
Figure 3.20: Baseline Air Quality at Station Mohuda



b) Narashinghapur

The monitor was placed at **Narashinghapur**. All the monitored parameter like PM_{10}, $PM_{2.5}$, SO_2, NO_X, CO was within the prescribed limits. Concentration of PM_{10}, $PM_{2.5}$, is slightly high. High concentration of PM_{10} and $PM_{2.5}$ is attributed to wind blown dust from unpaved roads

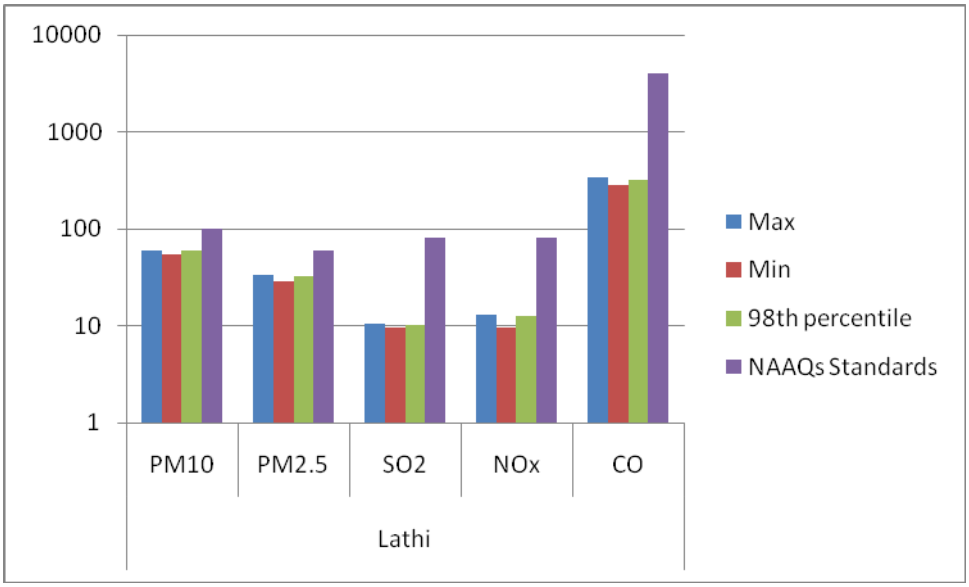
Figure 3.21 : Baseline Air Quality at Station Narashinghapur



c) Lathi

The monitor was placed at **Lathi**. All the monitored parameter like PM_{10}, $PM_{2.5}$, SO_2, NO_X, CO was within the prescribed limits. Concentration of PM_{10}, $PM_{2.5}$, is slightly high. High concentration of PM_{10} and $PM_{2.5}$ is attributed to wind blown dust from unpaved roads.

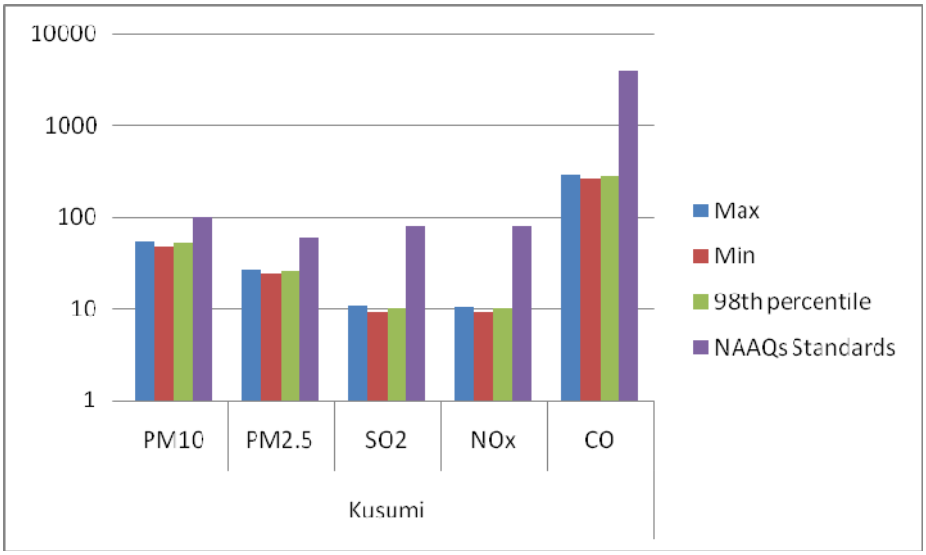
Figure 3.22: Baseline Air Quality at Station Lathi



d) Kusumi

The monitor was placed at **Kusumi**. All the monitored parameter like PM_{10}, $PM_{2.5}$, SO_2, NO_X, CO was within the prescribed limits. Concentration of PM_{10}, $PM_{2.5}$, is slightly high. High concentration of PM_{10} and $PM_{2.5}$ is attributed to wind blown dust from unpaved roads.

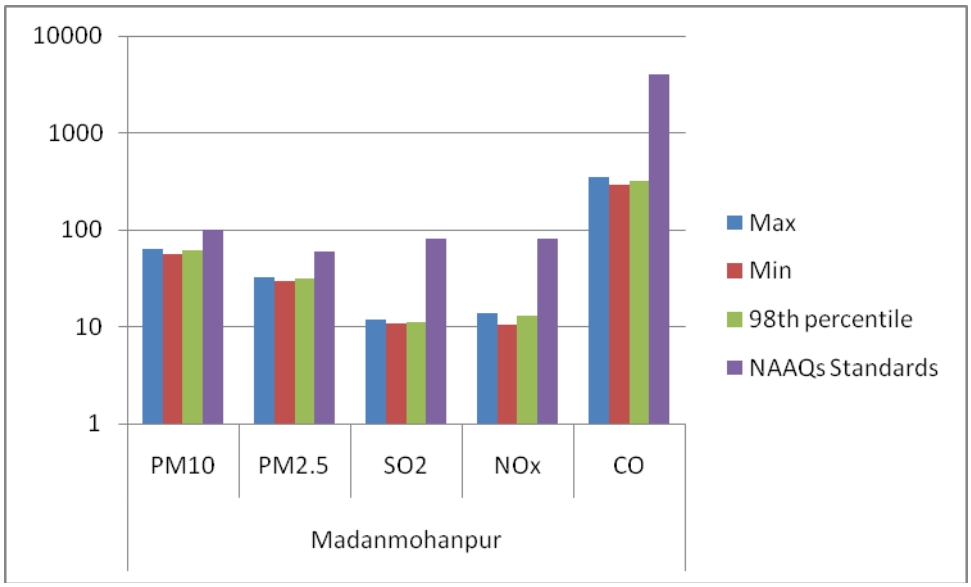
Figure 3.23: Baseline Air Quality at Station Kusumi



Madanmohanpur

The monitor was placed at Madanmohanpur. All the monitored parameter like PM_{10}, $PM_{2.5}$, SO_2, NO_X, CO was within the prescribed limits. Concentration of PM_{10}, $PM_{2.5}$, is slightly high**.** High concentration of **PM_{10} and $PM_{2.5}$** is attributed to wind blown dust from unpaved roads and due to more number of vehicular movement concentration of NO_X is slightly high in comparision to other sampling location.

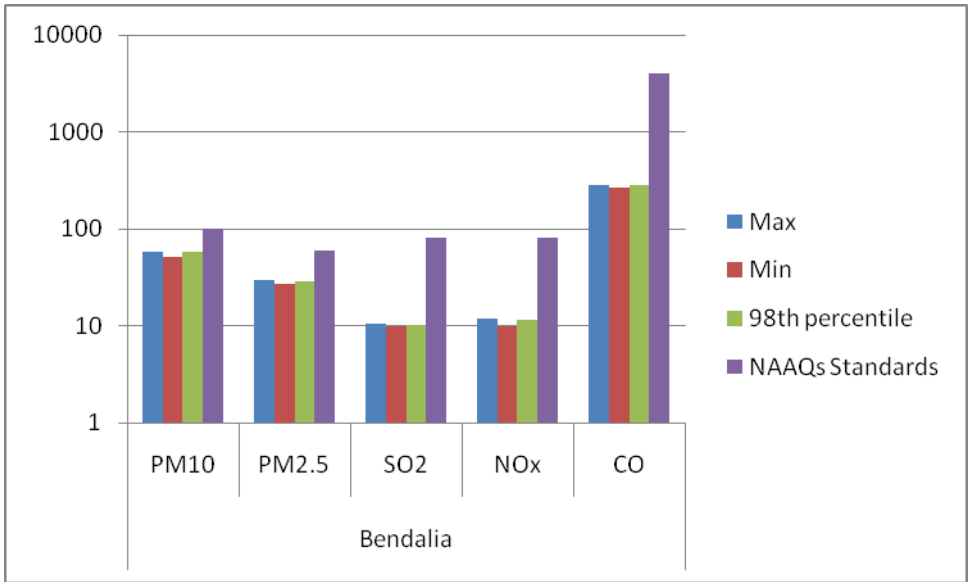
Figure 3.24: Baseline Air Quality at Station Madanmohanpur



Bendalia

The monitor was placed at **Bendalia**. All the monitored parameter like PM_{10}, $PM_{2.5}$, SO_2, NO_X, CO was within the prescribed limits. Concentration of PM_{10}, $PM_{2.5}$, is slightly high. High concentration of PM_{10} and $PM_{2.5}$ is attributed to wind blown dust from unpaved roads.

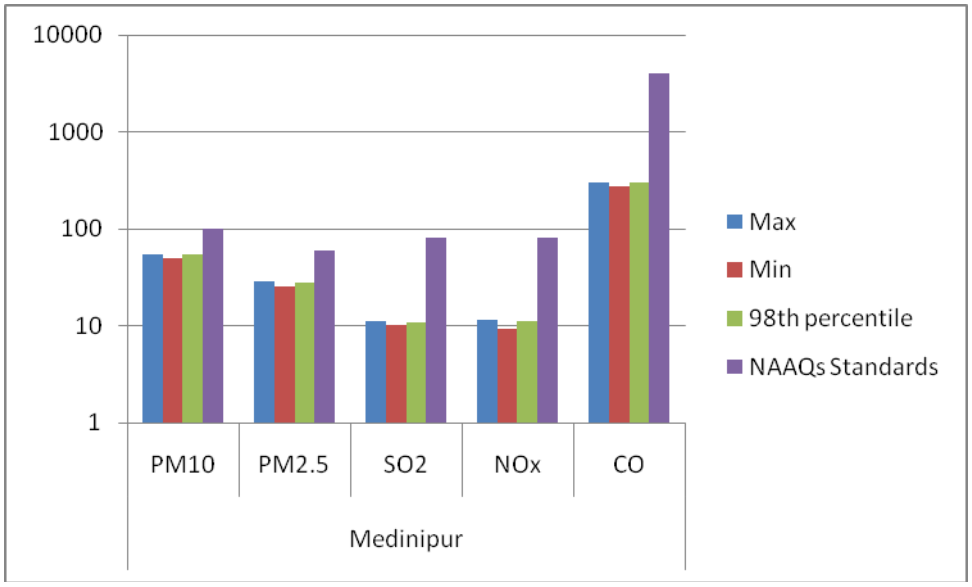
Figure 3.25: Baseline Air Quality at Station Bendalia



Medinipur

The monitor was placed at **Medinipur**. All the monitored parameter like PM_{10}, $PM_{2.5}$, SO_2, NO_X, CO was within the prescribed limits. Concentration of PM_{10}, $PM_{2.5}$, is slightly high. High concentration of PM_{10} and $PM_{2.5}$ is attributed to wind blown dust from unpaved roads.

Figure 3.26: Baseline Air Quality at Station Medinipur



Discussions

During the study period, the concentrations of PM_{10} varied between 64.3-47.7μg/m^3 at different locations of the study area (Table-3.13). The highest value was found to be 64.3 μg/m^3 at the Mohuda village. PM_{10} value was observed to be highest at the core zone meant for different activities like vehicular movement the mining activies in the quarries near by and other activities. The slight increase of PM_{10} values were observed in other location of the study area due to local phenomena viz. unpaved roads, heavy vehicular traffic & agricultural activities leading to generation of dust. Though the PM_{10} value was little high in Mohuda village (Core Zone) but it was within the permissible limit of NAAQS.

The concentrations of $PM_{2.5}$ varied between 34.7-23.8 μg/m^3 at different locations of the study area. The core zone is having the maximum value due to vehicular movement, mining activies in the quarries near by and other activity but all the values are within the limit.The concentrations of NO_X values varied between 13.9-9.4 μg/m^3 at different locations.
The concentration of CO value ranged between 359-243 μg/m^3 which was within the permissible limit of NAAQS.

Particulate Matter

Sources

In general some of the important sources of particulate matter in the study area are due to construction activities, domestic fuel burning, brick manufacturing and fugitive emissions from the traffic during construction of the site and heavy vehicular traffic. The following sources of suspended particulate matter in the study area are identified:

- Fugitive emissions from handling of material during construction
- Fugitive emissions due to vehicular movement.
- Domestic fuel burning

Effects

Excessive exposure to dust causes breathing related diseases as it effects the lungs. Excessive concentration of smoke and dust also reduces the visibility. Particulate matter affects the plants by settling on the leaves and preventing natural growth. The chemical matter in the dust will affect the structures due to slow reaction over a period of time.

SULFUR DIOXIDE (SO_2)

Sulphur dioxide gas is an inorganic gaseous pollutant. Sulphur dioxide emissions are expected to be emitted wherever combustion of any fuel containing elemental Sulphur takes place. The Sulphur in the fuel will combine with oxygen to form Sulphur dioxide. Sulphur trioxide and sulphuric acid mist are the other important pollutants in the Sulphur group.

Sources

In general some of the important sources of Sulphur dioxide are Power stations, Sulphuric acid plants, oil refining, Boilers in utilities in any industry and domestic use of coal. The major source of SO_2 in the study area is the domestic fuel burning and industrial activities.

Effects

The presence of sulfur dioxide in the photochemical smog reaction enhances the formation of visibility enhancing aerosols. Sulphur dioxide in atmosphere is significant because of its toxicity. Sulfur dioxide is capable of producing illness and lungs injury. Further it can combine with water in the air to form toxic acid aerosols that can corrode metal surfaces, fabrics and the leaves of plants. Sulphur dioxide is irritating to the eyes and respiratory system. Excessive exposure to Sulphur dioxide causes bronchial asthma and other breathing related diseases as it affects the lungs.

OXIDES OF NITROGEN (NO_X)

Oxides of nitrogen are also an inorganic gaseous pollutant. Oxides of nitrogen are expected to be emitted at high temperature. Nitrous oxide and nitric acid mist are the other important pollutants in the inorganic nitrogen group.

Sources

In general some of the important sources of oxides of nitrogen are acid manufacture, Boilers in utilities in any industry and Auto exhaust. In a metropolitan town NO_x levels are predominantly due to automobile emissions. The following sources of oxides of nitrogen in the study area are identified:

- Emissions from the coal firing
- Emissions from automobiles.

Effects

Oxides of nitrogen have far greater significance in photochemical smog reaction than any of the other inorganic gaseous contaminants**.** NO_x in the presence of sunlight will undergo reactions with a number of organic compounds to produce all the effects associated with photochemical smog. NO_x has inherent ability to produce deleterious effects by themselves like toxicity. It acts as an asphyxiate when in concentrations great enough to reduce the normal oxygen supply from the air.

Conclusions

From the ambient air quality monitoring carried out for three months (Nov. 2013 & Jan. 2014) during the study period shows that the critical pollutants like PM_{10}, $PM_{2.5}$, SO_2, NO_X and CO are well within the permissible limits. Any slight increase in the pollutant concentrations in the study area may be attributed to vehicular traffic, unchecked domestic fuel burnings and other industrial activity around the study area.

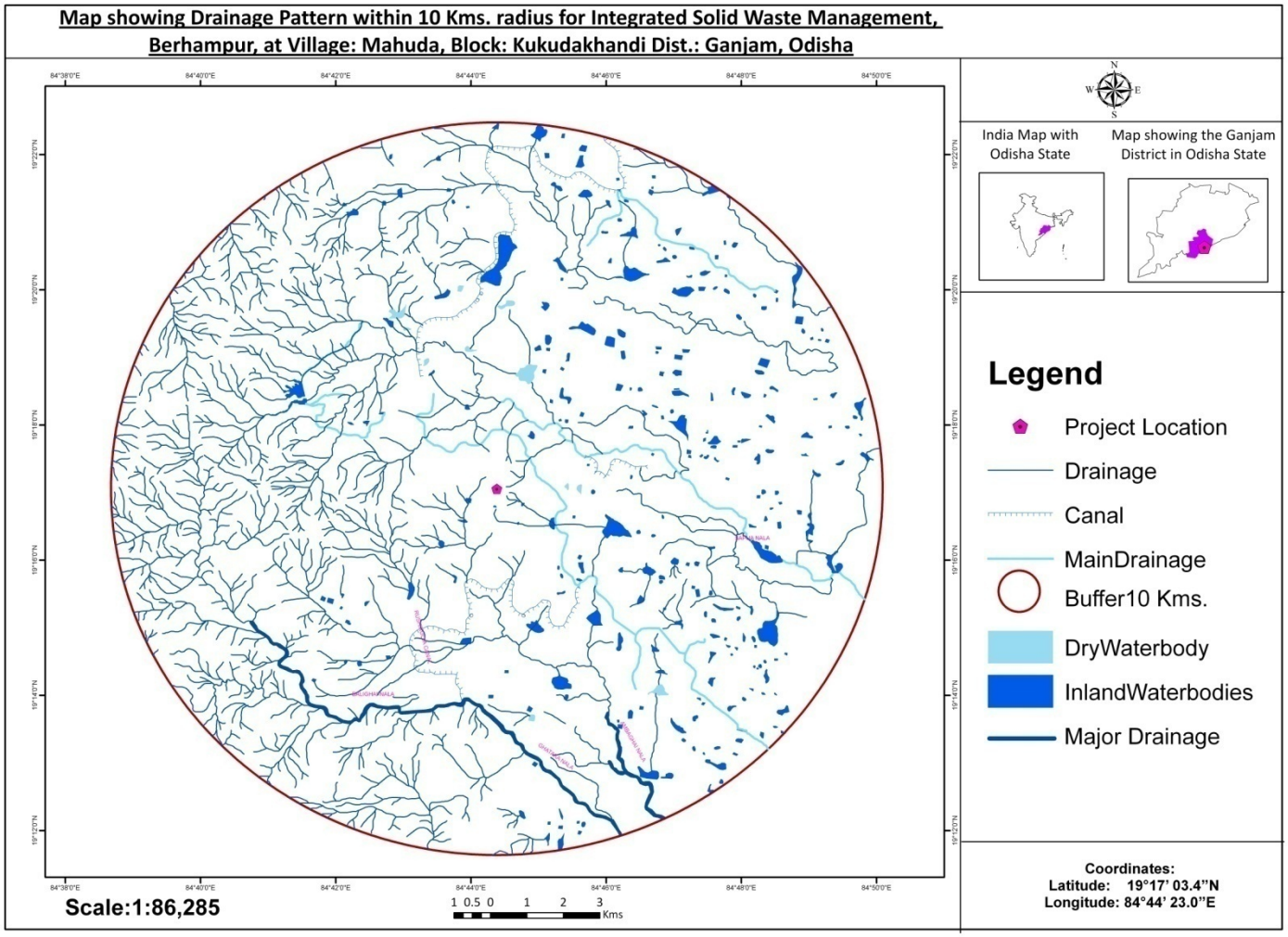
3.11 WATER ENVIRONMENT

Water is a universal solvent and one of the fundamental resources, most commonly available compound. Although its chemical formula is deceptively simple, the effect of water on almost everything including the plant and the animal kingdom is far more consequential than might be imagined. It occurs in all spheres of environment such as in oceans, on land surface, in lakes, in rivers, as groundwater, water vapour and polar ice caps. It occurs in hard materials like ores and minerals too.

3.11.1 Surface Water and Drainage System

The Rushikulya River, flowing from North West to south east traverses about 15 kms north of the study area with its numerous tributaries, Sapua Nala & Surya Nadi and few distributaries before it falls into the Bay of Bengal. The main drainage network of the study area includes Balighai Nala, Aamghai Nala, Rushikulya canal, Ghatana Nala, Ichhapurum canal and many other canals (Fig 3.27). Except for Rushikulya, most rivers are ephemeral in nature with a sub parallel to sub rectangular drainage pattern, largely controlled by structural attributes like fractures and joints. However a few tributaries displays a dendritic pattern and are more or less topography controlled. Overall the drainage pattern is often anastomosing. Canal network of the Rushikulya main canal also traverses the study area. Besides this, a number of water bodies are found to occur in the study area. Ichhapurum canal is main drainage network near the project site which is 1.2 km away from the site. As there is no major river within the study area most of the villages are dependant on the major canals and ground water to cater their daily water requirements.

Figure 3.27: Map showing Drainage Pattern of the Study Area



3.11.2 Surface- Water Bodies

Surface- Water Quality Monitoring

The quality of surface water was assessed by taking samples from different locations based on the following objectives:

- For rational planning of pollution control strategies and their prioritization
- To assess the nature and extent of pollution control needed in different water bodies or their part
- To evaluate the effectiveness of pollution control measures already in existence
- To assess the assimilative capacity of a water body thereby reducing costs on pollution control
- To understand the environmental fate of different pollutants
- To assess the fitness of water for different uses

Methodology

Reconnaissance survey was undertaken and monitoring locations were selected based on:

- Location of the major water bodies
- Location of industries, their water intake and effluent disposal locations
- Critical pockets of pollution occurrence
- Likely areas that can represent baseline conditions

The water samples were collected as grab samplers and were analyzed for physical, chemical and biological characteristics as per CPCB guidelines.

The purpose of the study is to:

- Assess the Water Quality characteristic for critical parameters.
- Evaluate the impacts on agricultural productivity, habitat conditions, recreational resources and aesthetics in the vicinity ; and
- Predict impact on water quality by this project and related activities.

The information required has been collected through primary surveys and secondary sources.

Sampling Methodology

Reconnaissance survey was undertaken and monitoring locations were finalized based on;

- Drainage Pattern
- Location of Residential areas representing different activities / likely impact areas;
- Likely areas, which can represent baseline conditions.

Five Groundwater and five Surface water sources covering 10 km radial distance were examined for physic – chemical, heavy metals and bacteriological parameters in order to assess the effect of industrial and other activities on surface and ground water.

Samples for Chemical analysis were collected in Polyethylene carboys. Samples collected for metal content were acidified with 1 ml HNO_3. Samples for bacteriological analysis were collected in sterilized glass bottles. Selected Physico-chemical and Bacteriological parameters have been analyzed for projecting the existing water quality status in the study area.

Parameters like Temperature, Dissolved Oxygen (DO) and pH were analyzed at the time of sample collection.

The methodology for sample collection and Preservation techniques was followed as per the standard operating procedures (SOP) mentioned below.

Table 3.14: Standard Operating Procedure (SOP) for Water & Wastewater Sampling & Analysis

Sl. No.	Parameter	Type & Container for Sample Collection	Sample Quantity in ml	Storage/ Preservation
1	pH	Grab Sampling Plastic / glass	50	On site analysis
2	Electrical Conductivity	Grab Sampling Plastic / glass	50	On site analysis
3	Total Suspended Solids	Grab Sampling Plastic / glass	100	Refrigeration, can be stored for 7 days
4	Total Dissolved Solids	Grab Sampling Plastic / glass	100	Refrigeration, can be stored for 7 days
5	BOD	Grab Sampling Plastic / glass	500	Refrigeration, 48 Hours
6	COD	Grab Sampling Plastic / glass	100	Add H_2SO_4 to pH>2, Refrigeration , 28 days
7	Residual Chlorine	Grab Sampling Plastic / glass	50	On site analysis
8	Hardness	Grab Sampling Plastic / glass	100	Add HNO_3 to pH<2, Refrigeration, 6 Months
9	Chlorides	Grab Sampling Plastic / glass	50	Not required, 28 days
10	Sulphates	Grab Sampling Plastic / glass	100	Refrigeration, 28 days
11	Sodium, Potassium	Plastic	100	Not required, 28 days
12	Nitrates	Plastic	100	Refrigeration, 48 Hours
13	Fluorides	Plastic	100	Not required, 28 days
14	Alkalinity	Plastic / glass	100	Refrigeration, 14 days
15	Ammonia	Plastic / glass	100	Add H_2SO_4 to pH>2, Refrigeration , 28 days
16	Hexavalent Chromium (Cr^{+6})	Plastic / glass rinse with 1 + 1 HNO_3	100	Refrigeration, 24 Hours

17	Heavy Metals (Hg, Cd, Cr, Cu, Fe, Zn, Pb etc.)	Plastic / glass rinse with 1 + 1 HNO_3	500	Filter, add HNO_3 to pH>2, 6 months

Source: Standard methods for the examination of Water & Wastewater, published by APHA, AWWA, WEF 21st edition 2005.

Analytical Techniques

The Analytical techniques are given below.

Table 3.15: Analytical Techniques for Water Analysis

Parameter	Method (IS Standards)
pH	IS 3025:PART11:1983 (Reaff 2002)
Colour	IS 3025:PART4:1983
Odour	IS 3025:PART5:1983
Temperature	IS 3025:PART09:1984
BOD	IS 3025:PART44:1993
COD	IS 3025:PART58:2006
Electrical Conductivity	IS 3025:PART14:1984
Turbidity	IS 3025:PART10:1984
Chlorides	Clause 2 of IS 3025:PART32:1988 (Reaff 1999
Fluorides	IS 3025:PART23:1964
Phosphates	IS 3025:PART31:1988
Total Hardness	IS 3025:PART21:1983 (Reaff 2002)
Alkalinity	IS 3025:PART23:1986
Sulphates	Clause 4 of IS 3025:PART24:1986
calcium	IS 3025:PART40:1991
Magnesium	IS 3025:PART46:1994 (Reaff 1999)
Sodium	IS 3025:PART45:1993
Potassium	IS 3025:PART45:1993
Manganese	IS 3025:PART59:2006
Mercury	IS 3025:PART48:1994
Selenium	IS 3025:PART56:2003
Lead	IS 3025:PART47:1994
Copper	IS 3025:PART42:1992
Iron	IS 3025:PART53:2003
Zinc	IS 3025:PART49:1991
Boron	IS 3025:PART57:2005
Coliform Organisms	IS 1622:1981(Reaff 2009)

Protocols and Standards followed

Water Samples were collected from ten locations (5 surface water & 5 ground water). These samples were taken as grab samples and were analyzed for various parameters to compare with the standards for drinking water as per IS: 10500 for ground water sources and IS: 2296 for Surface water sources. The water Sampling Locations are identified as per drainage pattern.

Ten number of water samples from river, pond, dug well & bore well were collected from different locations within study area as describe in Table 3.16 and 3.18 & shown in **Fig -3.27 & 3.29.** The analysis results of surface and groundwater are given in the **Table -3.17 & 3.19** respectively.

Surface Water:

Primary monitoring of surface water quality was given importance in EIA study as the treated leachate and runoff generated during the operational phase of the landfill may be likely discharged to nearby surface seasonal channels after ensuring that it meets prescribed norms of CPCB. Primary monitoring of surface water quality was therefore considered important in order to understand the probable impacts of the proposed project activities on the drainage channels of the area. The locations of water quality monitoring are shown in **Figure 3.28**. Surface Water Quality Monitoring Result Surface water characteristics were assessed against water quality criteria as per CPCB guidelines for water resources. Surface water samples were collected from 5 different locations in the buffer zone.

Table 3.16: Surface water Sampling Locations

Sl. No	Code	Location	Co-ordinates	Distance (KM)	Direction
				W r t proposed plant site	
1	SW1	Sapua Canal,Lathi village	19°18'06.00" N 84°45'00.3" E	2.33 km	NE
2	SW2	Pond water, Medinipur	19°15'25.1" N 84°43'00.2"E	3.84	SW
3	SW3	Pond water, Narshingpur	19°15'25.1"N 84°43'00.2"E	1.99	NW
4	SW4	Pond water, Mohuda (Proposed Site)	19°17'01.3"N 84°44'26.8"E	-	-
5	SW5	Pond water, Lathi	19°18'13.1"N 84°35'35.8"E	3.9	NE

Figure 3.28: Map showing Surface water sampling locations

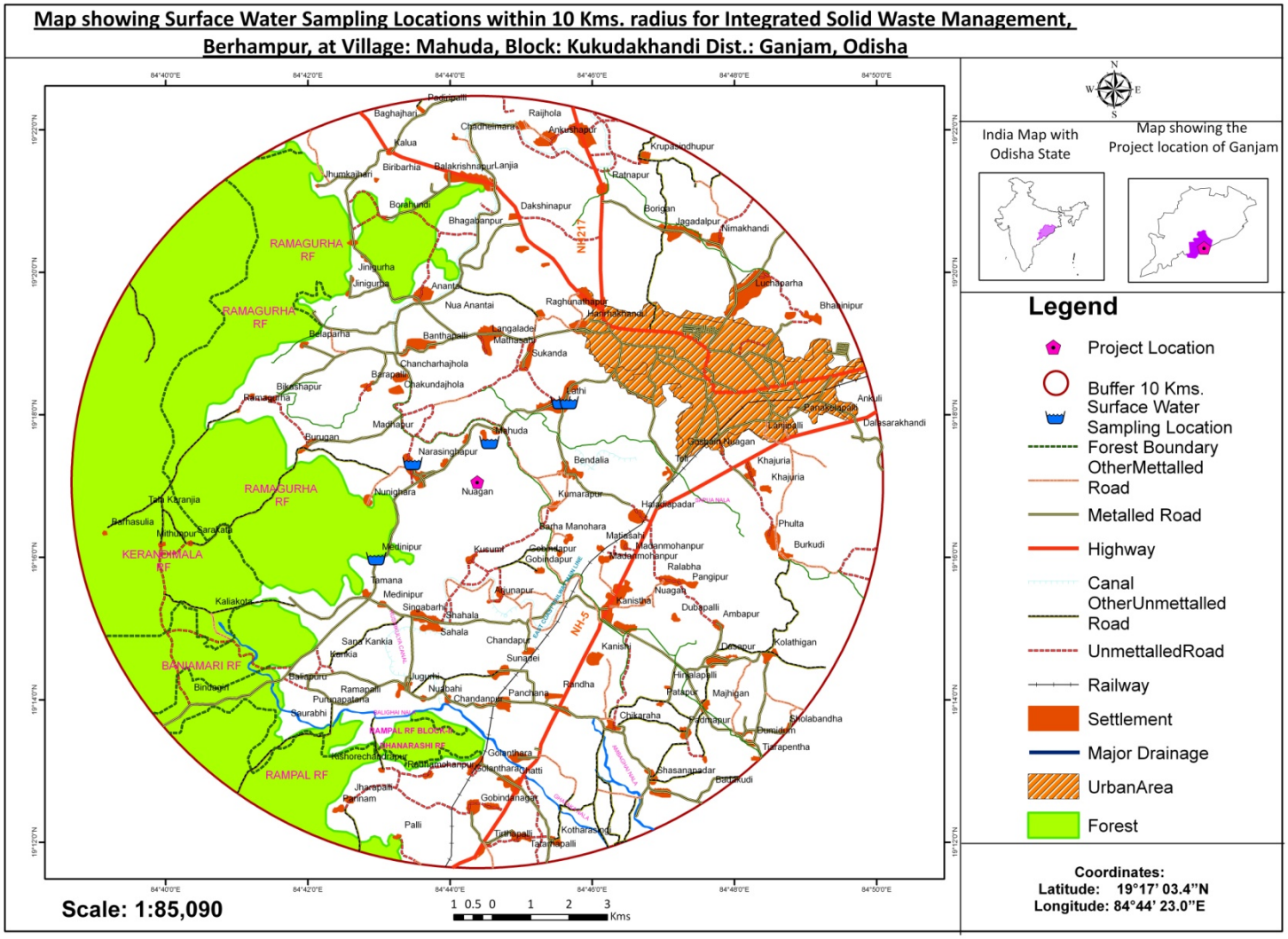


Table 3.17: Surface Water Quality in Study Area

Sl.No.	Characteristics	Unit	IS:2296 Class 'C' Limits	SW 1	SW 2	SW 3	SW 4	SW 5
1.	pH	-	6.5-8.5	8.08	8.06	8.15	7.16	7.85
2.	DO	mg/l	4	4.4	3.2	2.8	4.0	3.2
3.	BOD	mg/l	3	5.2	9.6	10.8	6.4	12.0
4.	Total Coliform	MPN/100 ml	5000	140	110	136	120	146
5.	Colour	Hazen	300	0.8	1.0	1.5	1.5	2.5
6.	Fluoride as F	mg/l	1.5	1.0	0.8	1.4	1.2	0.6
7.	Cadmium	mg/l	0.01	ND	ND	ND	ND	ND
8.	Chloride as Cl	mg/l	600	46.99	29.99	32.0	18.0	45.0
9.	Chromium (as Cr^{+6})	mg/l	0.05	ND	ND	ND	ND	ND
10.	Cyanide as CN	mg/l	0.05	ND	ND	ND	ND	ND
11.	Total Dissolved Solid	mg/l	1500	290	210	192	184	244
12.	Selenium	mg/l	0.05	ND	ND	ND	ND	ND
13.	Sulphate as SO_4	mg/l	400	1.0	2.7	8	10.5	26.0
14.	Lead	mg/l	0.1	0.008	0.003	0.005	0.002	0.003
15.	Copper	mg/l	1.5	ND	ND	ND	ND	ND
16.	Arsenic	mg/l	0.2	ND	ND	ND	ND	ND
17.	Iron	mg/l	50	0.09	0.47	0.7	0.05	0.16
18.	Phenolics compounds (as C_6H_5OH)	mg/l	0.005	ND	ND	ND	ND	ND
19.	Zinc	mg/l	15	ND	0.02	0.03	ND	ND
20.	Insecticides	mg/l	Absent	Absent	Absent	Absent	Absent	Absent
21.	Anionic detergents (as MBAS)	mg/l	1.0	ND	ND	ND	ND	ND
22.	Oil & grease	mg/l	0.1	0.05	ND	0.03	0.04	0.03
23.	Nitrate as NO_3	mg/l	50	5	1	7	8	1.5

ND: Not Detected

Interpretation of Surface Water Quality Results

The DO levels at the surface water locations exhibited values 2.8-4.4 mg/l indicating favorable conditions for the growth and reproduction of normal population of fish and other aquatic organisms in the water bodies. BOD values of all the samples were found to >3 mg/l. This confirms the presence very low biologically oxidizable organic matter in the receiving water bodies. The pH of the surface water samples varied from 7.16-8.15 indicating the slightly saline nature of water. The oil and grease content of the collected water samples were found to be within the permissible limit. The presence of contaminants in the form of heavy metals viz. lead , cadmium , chromium in the surface waters of all sources were not detected. The total coliform content in all the water samples was found to be 110-146 nos. /100 ml. Interpretation of Water Quality Results The samples were analyzed for physicochemical parameters and results compared with IS: 2296 class C surface water standards to identify and interpret any deviation in the statutory limits set for parameters in the standard. The results for relevant dwater quality parameters have been discussed below.

Colour and odour*:* The colour of the potable water sample collected from different villages in the buffer zone were found to be in the range of 0.8 -2.5 Hazen which conforms with the IS: 2296 class C standards. The tastes of all the samples are "agreeable". All the collected samples were also "odourless".

pH and turbidity*:* The pH value for the sample taken from the proposed site and Lathi was found to be within the range and it conforms with standard. And samples collected from sapua canal, Medinipur and Narashinghapur were found alkaline in nature and not conforms with the standard requirement of IS:2296. This water is not fit for drinking purposes. The turbidity values for all the water samples were found to be within range of 1.2 and 50 NTU and in conformance to the IS 2296 standard.

Chlorides and Total Dissolved Solids*:* The chloride concentration of the water samples collected from different locations in the buffer zone were found in the range of 18- 46.99 mg/l and therefore it is well within the stipulated permissible limit of 600 mg/l. The concentration of total dissolved solids for the water samples are within the standard requirement of IS: 2296 and was found to be in the range of 184-290mg/l.

Iron and Fluoride*:* Iron is considered to be an important parameter since at higher concentration it interferes with laundering operations and imparts objectionable stains. Concentration of iron for all the samples were found to be well within the specified desirable limit of 50 mg/l. Fluoride content in the water samples was found to be in the range of 0.6-1.4which indicate the sample are within the desirable limit of the water standard of 1.5 mg/l.

Nitrate: Nitrate contents of the samples taken at Mohuda village was found to be <8 mg/lit and were in conformance to the IS:2296 standards.

Heavy Metals*:* The concentration of heavy metals like cadmium, arsenic and lead in the ground water samples of the different sources were in not detectable range.

3.11.3 Hydro-Geology and Groundwater Resources

Groundwater potential has been assessed as per the data collected from the State Groundwater Department, Irrigation Department and the Central Groundwater Board.

In the ganjam district the alluvial patches along the Rushikulya as well as the coastal alluvial strip form the most potential aquifers. Groundwater occurs under unconfined to semi-confined conditions and can be developed through shallow tubewells and open walls. The thickness of the flood plain deposits varies from 10 to 42 m in the Rushikulya basin. The depth to water level around the proposed project site it is in the range of 5 – 6 metres.

In the study area ground water potential varies from poor to good reverse of ground water. The project site has good ground water reserve. The ground water reseve is very low in the western pattern of study area.

Figure 3.29: Ground water potential map of the study area

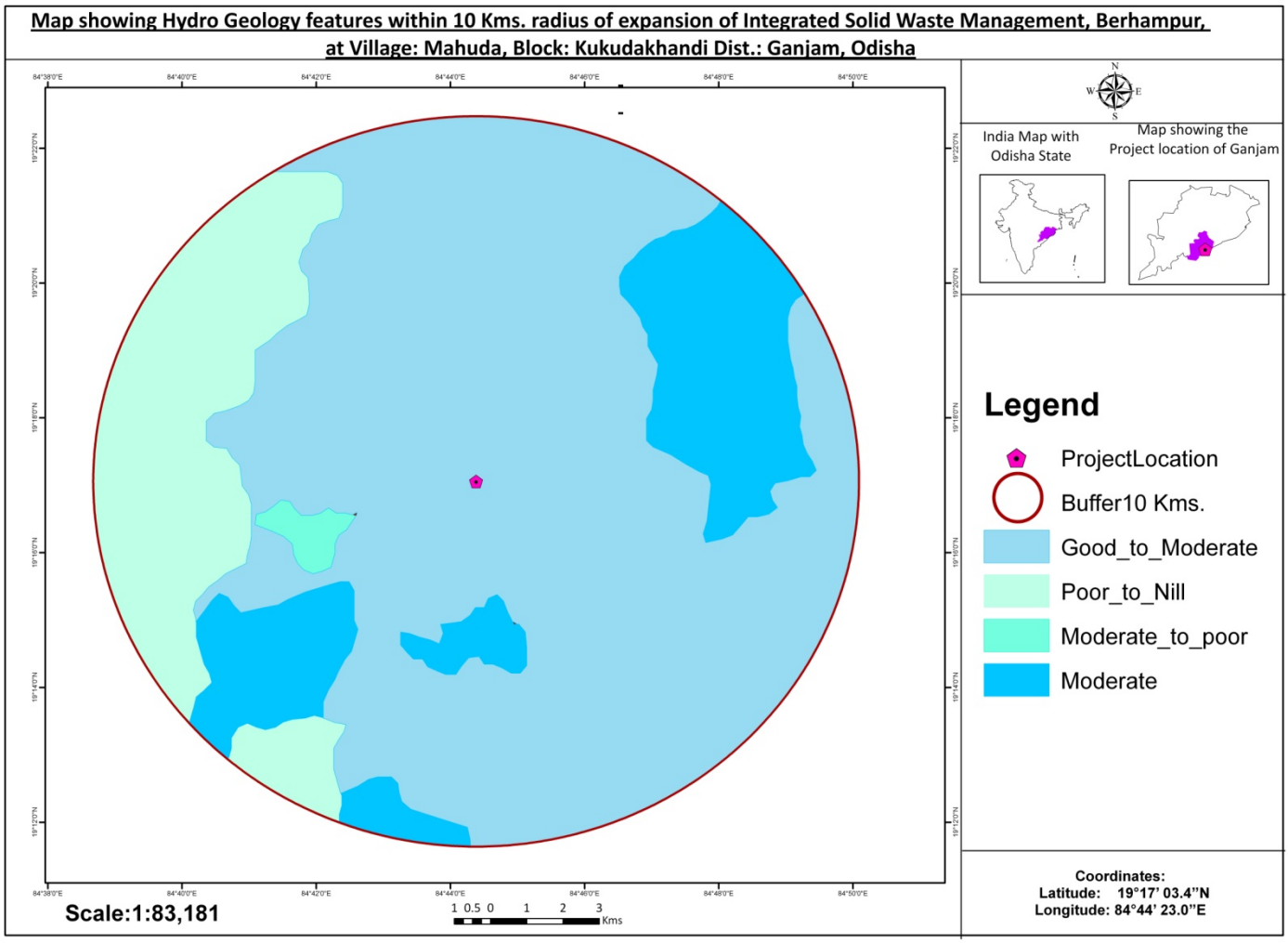


Figure 3.30: Map showing Ground water sampling locations

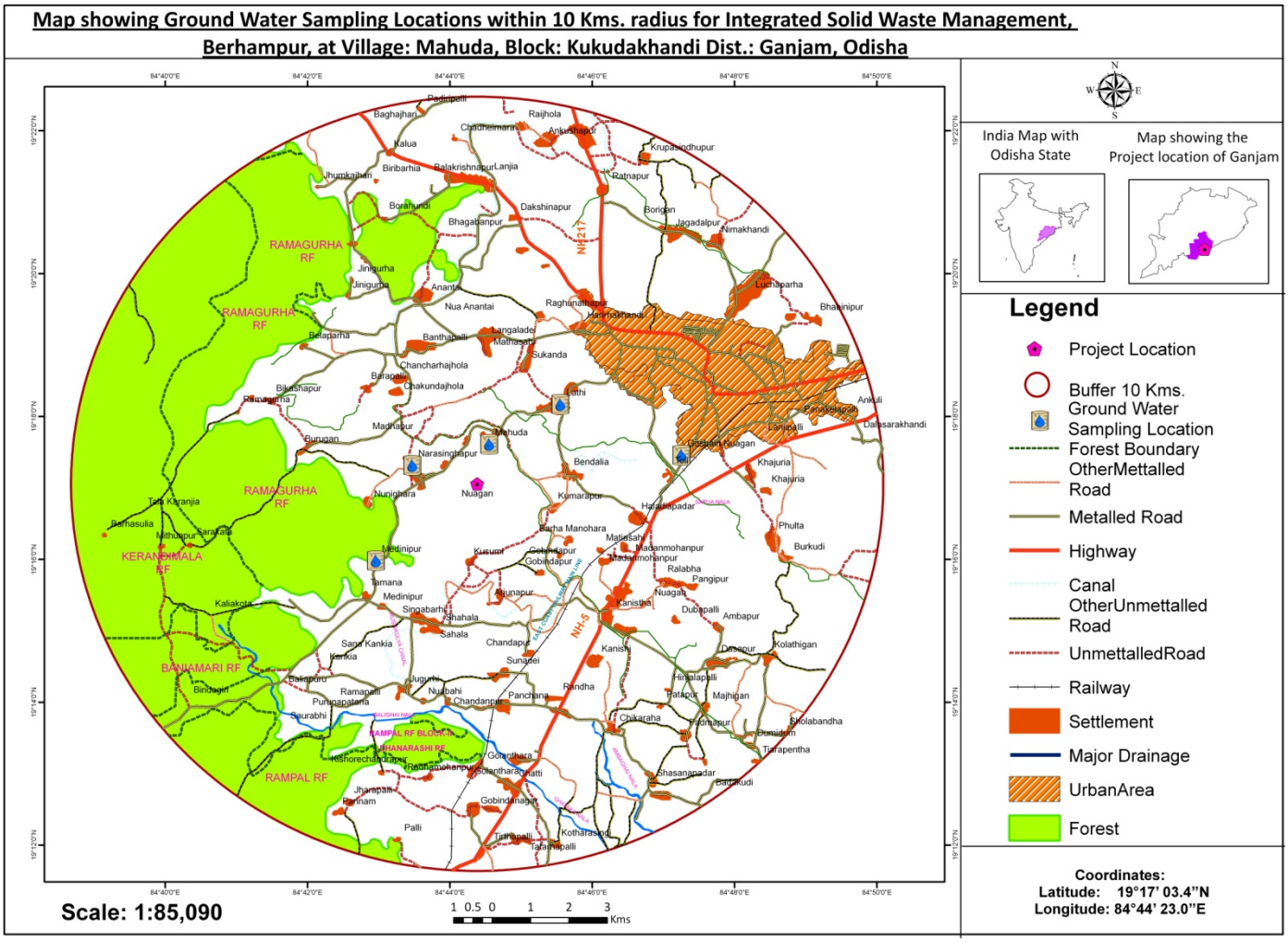


Table 3.18: Location of the Ground water sample collected

Sl. No.	Code	Location	Coordinate	Distance (KM)	Direction
				W r t proposed plant site	
1	GW1	Tube well of Goshain Nuagan	19°17'48.7" N 84°46'55.3" E	4.67 km	E
2	GW2	Tube well of Lathi	19°18'13.1"N 84°35'35.8"E	3.9	NE
3	GW3	Tube well of Mohuda village	19°17'43.1"N 84°44'38.5"E	1.37	N
4	GW4	Tube well of Medinipur	19°15'26.1" N 84°43'04.2"E	3.84	SW
5	GW5	Dugwell of Narashingpur	19°17'44.3" N 84°43'32.7"E	1.99	NW

Table 3.19: Groundwater Quality in Study Area

Sl. No.	Characteristics	Unit	IS : 10500 Limits+	GW 1	GW 2	GW 3	GW 4	GW 5
1.	Colour	-	5	4.5	0.6	1.0	1.5	1.0
2.	Odour	-	UO	UO	UO	UO	UO	UO
3.	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4.	Turbidity	NTU	5	1.8	1.0	4.0	8.0	1.2
5.	pH	-	6.5-8.5	6.96	6.88	6.41	6.55	7.02
6.	Total Hardness (as $CaCO_3$)	mg/l	300	332	1060	280	552	152
7.	Iron (as Fe)	mg/l	0.3	2.12	0.01	0.35	0.03	0.16
8.	Chloride (as Cl)	mg/l	250	94.9	246.0	73.0	137.0	55.0
9.	Residual Free Chlorine	ppm	0.2	ND	ND	ND	ND	ND
10.	Total Dissolved Solids	mg/l	500	536	1165	370	542	290
11.	Calcium (as Ca)	mg/l	75	120.24	360.72	88.17	136.27	44.88
12.	Magnesium (as Mg)	mg/l	30	7.77	38.88	14.58	51.51	9.72
13.	Copper (as Cu)	mg/l	0.05	ND	ND	ND	ND	ND
14.	Manganese (as Mn)	mg/l	0.1	ND	ND	ND	ND	ND
15.	Sulphate (as SO_4)	mg/l	200	12	44	16	16	10
16.	Nitrate (as NO_3)	mg/l	45	1.5	16	20	12	10
17.	Fluoride (as F)	mg/l	1	0.08	0.14	0.06	0.08	0.05
18.	Phenolic Compounds (as C_6H_5OH)	mg/l	0.001	ND	ND	ND	ND	ND
19.	Mercury (as Hg)	mg/l	0.001	ND	ND	ND	ND	ND
20.	Cadmium (as Cd)	mg/l	0.01	0.002	0.001	0.002	0.001	0.002

21.	Selenium (as Se)	mg/l	0.01	0.002	0.001	0.002	0.002	0.001
22.	Arsenic (as As)	mg/l	0.02	ND	ND	ND	ND	ND
23.	Cyanide (as CN)	mg/l	0.05	ND	ND	ND	ND	ND
24.	Lead (as Pb)	mg/l	0.1	0.006	0.004	0.003	0.005	0.003
25.	Zinc (as Zn)	mg/l	5	0.04	0.04	0.02	0.04	0.03
26.	Anionic Detergent (as MBAS)	mg/l	0.2	ND	ND	ND	ND	ND
27.	Chromium (Cr^{6+})	mg/l	0.05	ND	ND	ND	ND	ND
28.	Mineral Oil	mg/l	0.01	ND	ND	ND	ND	ND
29.	Pesticide	mg/l	Absent	Absent	Absent	Absent	Absent	Absent
30.	DO	mg/l	-	3.2	1.6	2.4	1.6	4.4
31.	BOD	mg/l	-	Nil	Nil	Nil	0.2	0.4
32.	COD	mg/l	-	0.4	0.2	0.2	0.4	0.8

***DO, BOD and COD parameter are not mentioned under IS 10500 but here these parameter are added as they are important in lechate study.**

Interpretation of Ground Water Quality

Interpretation of Water Quality Results The samples were analyzed for physicochemical parameters and results compared with IS:10500 drinking water standards to identify and interpret any deviation in the statutory limits set for parameters in the standard. The results for relevant drinking water quality parameters have been discussed below.

Colour, odour and taste*:* The colour of the potable water sample collected from different villages in the buffer were found to be <5 Hazen which conforms with the IS: 10500 standards. The tastes of all the samples are "agreeable". All the collected samples were also "odourless".

pH and turbidity*:* The pH value for the samples collected from different location of the study area is range of 6.5-8.5 stating the neutral nature of water and in conformance with the IS standard . The turbidity values for all the water samples were found to be negligible i.e. 0.8 and 0.6 NTU and in conformance to the IS standard. Except the water sample collected from Medinipur (8 NTU).

Chlorides and Total Dissolved Solids*:* The chloride concentration of the water sample taken at Medinipur was found to be 246 mg/l which slightly high and but it is within the stipulated permissible limit of 250 mg/l. The concentration of total dissolved solids for the samples collected from Goshain Nuagan (536 mg/l) , Lathi (1165 mg/l), Medinipur (546 mg/l) were higher than the standard requirement of IS: 10500.

Total Hardness*:* Hardness of water is considered to be an important parameter in determining the suitability of water for domestic uses particularly washing. Total hardness values for the water samples collected from the Goshain Nuagan (332 mg/l), Lathi (1060 mg/l), Medinipur (552 mg/l) village were higher than the stipulated standard of 300 mg/l specified under IS: 10500.

Iron and Fluoride*:* Iron is considered to be an important parameter since at higher concentration it interferes with laundering operations and imparts objectionable stains. Concentration of iron in the water samples collected from Mohuda village (0.35 mg/l) was found to be slightly specified desirable limit of 0.3 mg/l. Fluoride content in the potable water samples (<0.1mg/l) was found to be within the desirable limit of the potable drinking water standard of 1.0 mg/l.

Nitrate: Nitrate contents of the samples taken from different villages in the study area were found to be <45 mg/lit and were in conformance with the IS standards.

Heavy Metals*:* The concentration of heavy metals like cadmium (< 0.01 mg/l), arsenic (Not Detectable) and lead (< 0.1 mg/l) in the ground water samples collected from different sources in the study area were found to be in compliance with the IS standards.

Discussions

The analytical results of surface water samples at different location for various parameters reveal that all the parameters comply with IS: 2296 (Class 'C') standards indicating their suitability for drinking and other purposes after conventional treatment followed by disinfection.

The analysis results of groundwater samples showed that all the parameters are within the prescribed limits as per IS: 10500 standards for drinking water.

3.12 NOISE ENVIRONMENT

General

The physical description of sound concerns its loudness as a function of frequency. Noise in general is an unwanted sound, which is composed of many frequency components of various types of loudness level distributed over the audible frequency range. Sound Pressure Levels (SPL's) are measured in decibels on the A-weighted scale, dB (A), where the A-weighting scheme accounts for the sensitivities of the human ear over the audio spectrum.

Reconnaissance Survey and Identification of Sampling Locations

A preliminary reconnaissance survey was undertaken to identify the major noise generating sources in the area. The noise at different noise generating sources based on the industrial activities, commercial activities, traffic, noise at sensitive areas like hospitals and schools have been identified. The noise monitoring has been conducted at all the identified location in the study area once in every season during the study period and the different sampling locations are shown in **Fig-3.30**.

Measured noise levels, displayed as a function of time, is useful for describing the acoustical climate of the community. Noise levels recorded at each station with a time interval of about 60 minutes are computed for equivalent noise levels. Equivalent noise level is a single number descriptor for describing time varying noise levels. The equivalent noise level is defined mathematically as

$$L_{eq} = 10 \text{ Log } L / T\Sigma (10^{Ln/10})$$

Where, L = Sound pressure level at function of time dB (A)

T = Time interval of observation

Noise levels during the night time generally drop, therefore to compute Equivalent noise levels for the night time, noise levels are increased by 10 dB (A) as the night time high noise levels are judged more annoying compared to the day time. Noise levels at a particular station are represented as Day Night equivalents (Ldn). Day Night equivalent is the single number index designed to rate environmental noise on daily / 24 hourly basis.

Mathematically Ldn is given by

$$Ldn = 10 \text{ Log } \{1/24 (16 \times 10^{(Ld/10)} + 8 \times 10^{(Ln/10)})\}$$

Where Ld = A weighed equivalent for day time period (6am-10 pm)

Ln = A weighed equivalent for night time period (10 pm to 6 am)

Assessment of Noise Levels

The main objective of noise level assessment is to identify all the sources acceptable and unacceptable to the study region. The acoustical environment varies dynamically in magnitude and character throughout most communities. The noise level variation can be temporal, spectral and spatial. The maximum impact of noise is felt on urban areas, which is mostly due to the commercial / industrial activities and vehicular movement during peak hours of the day.

The assessment of noise pollution in the study area has been carried out keeping the above said considerations. The existing status of noise levels within the study zone has been undertaken through reconnaissance, identification of existing noise sources, land use pattern for monitoring of baseline noise levels.

Sources of Noise

An inventory was conducted for evaluating the sources of noise generation in the study area. It was observed that the major sources of noise generation in the study area were from the Industries, Commercial activities and vehicular movements etc.

Typical considerations in environmental noise assessment can be divided into two separate categories, one related to noise sources and other related to potential receivers. Two quantities are needed to describe completely the strength of the source i.e.

- Sound Power Levels
- Directivity

Sound Power levels measure the total sound power radiated by the source in all directions and directivity is a measure of the difference in radiation with direction. The concept of sound power level and directivity index makes it possible to calculate the sound pressure level (SPL) created by source. The impact of noise sources on surrounding community depends on:

- Characteristics of noise sources (instantaneous, intermittent or continuous in nature). It is well known that a steady noise is not as annoying as one that is continuously varying in loudness.
- The time of the day at which noise occurs, for example, loud noise levels at night in residential areas are not acceptable because of sleep disturbance.
- The location of the noise source, with respect to noise sensitive land use, that determines the loudness and period of noise exposure.

The environmental impact of noise can have several effects varying from Noise Induced Hearing Loss (NIHL) to annoyance depending on loudness of noise levels. The Environmental Impacts of noise from the plant activities is carried out by taking into consideration the various factors:

- Potential damage to hearing
- Potential physiological responses
- Annoyance
- General community responses

Noise Levels in the Study Area

Six noise monitoring stations were identified for the assessment of the existing noise levels keeping in view the nature of the monitoring location i.e. residential areas in villages, schools, bus stations etc. The noise monitoring stations are shown in the Fig 3.31 and the distance and the direction of the noise monitoring locations with reference to the Project site is given in the table. -3.20.

Table- 3.20: Details of Noise Level Monitoring Locations

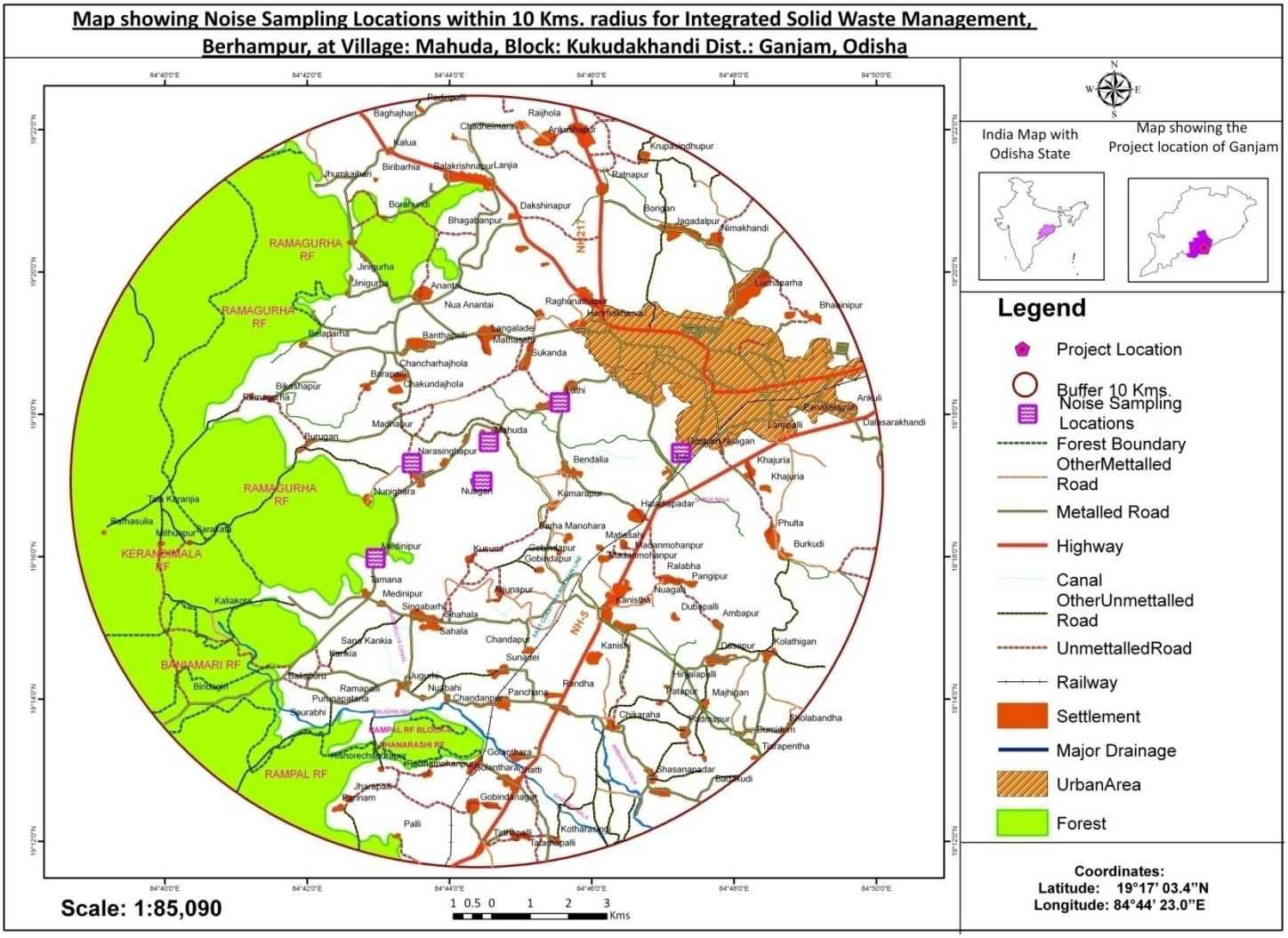
Station Code	Location		Distance(Km) (w.r.t project site)	Direction	Noise (in dB(A))
N1	Goshain Nuagan	19°17'48.7" N 84°46'55.3" E	4.67 KM	NW	**52.3**
N2	Mohuda	19°17'43.1"N 84°44'38.5"E	1.37 km	N	52.4
N3	Medinpur	19°15'25.1" N 84°43'00.2"E	3.84 km	SW	53.9
N4	Narashingpur	19°17'44.30" N 84°43'32.7" E	1.99 km	NW	49.4
N5	Sapua canal in lathi village	19°18'06.00" N 84°45'00.3" E	2.33 km	N	51.7
N6	Proposed site	19°17'01.3"N 84°44'26.8"E	-	-	49.2

Baseline monitoring was carried out to measure the sound pressure level in all the surrounding villages of the study area for every hour for 24 hours to study the impact of the noise on the local environment**.**

The notations for statistical quantities of noise levels are described below;

- Hourly L_{eq} values have been computed by integrated sound level meter (SLM 100 Envirotech)
- L_{day} : As per the CPCB Guidelines, The day time limit is between 06:00 AM to 10:00 PM (MOEF Notification number S.O 50 (E) dated 11/01/2010)
- L_{night} : As per the CPCB Guidelines, The day time limit is between 10:00 PM to 06:00 AM (MOEF Notification number S.O 50 (E) dated 11/01/2010)
  A rating developed by Environment Protection Agency (US - EPA) for specification of community noise from all the sources is the Day – Night sound level (L_{dn}).
- L_{dn}: It is similar to a 24 Hour equivalent sound level except that during night time period (10:00 PM to 06:00 AM) a 10 dB(A) weighting penalty is added to the instantaneous sound level before computing the 24 Hour average. This night time penalty is added to account for the fact that noise during night when people usually sleep is judged as more annoying than the same noise during the day time.

Figure 3.31: Map showing Noise Monitoring Location



The parameters are analyzed for L_{day}, L_{night} & $L_{daynight}$ and the results are presented below in **Table-3.21**

Table 3.21 Noise Level in the Study Area

Station code	Location village	$L_{day(dB)}$	$L_{night(dB)}$	$L_{daynight(dB)}$
N1	Proposed site	49.2	41.3	47.8
N2	Mohuda	52.4	41.6	50.8
N3	Narashingpur	49.4	42.4	48.1
N4	Sapua canal in lathi village	51.7	41.9	50.2
N5	Medinipur	53.9	45.2	52.4
N6	Kusumi	50.3	42.7	48.9
N7	Madanmohanpur	54.1	44.1	52.6
N8	Bendalia	51.8	42.6	50.3

Observations

The high values of noise level were observed in Madanmohanpur Viilage i.e. 52.6 dB and this is because of different human activities and vehicular movement but it is within the noise standard level. All other location the noise level was found to be well within the prescribed noise standard of SPCB.

3.13 TRANSPORTATION & TRAFFIC

Traffic survey was conducted at one location i.e. starting point of the approach road towards the proposed landfill site to have a better understanding of traffic density pattern of the area and to assist the proponent in planning vehicular movement during various phases of the project. The traffic count was monitored continuously for 8 hours, once in the entire study period. The traffic survey was done for both way movement of vehicles categorized into heavy vehicles (truck, bus, trailer, lorries etc.) four wheelers (car, matador, jeep etc.), three wheelers (auto, tempo etc.) and two wheelers (motorcycle etc.). The co-ordinate of the point from where traffic monitoring was carried out is 19°18’3.75” N 84°45’18.18 E. The results of traffic monitoring are given in the **Table 3.22** below.

Table 3.22: Traffic Survey Data

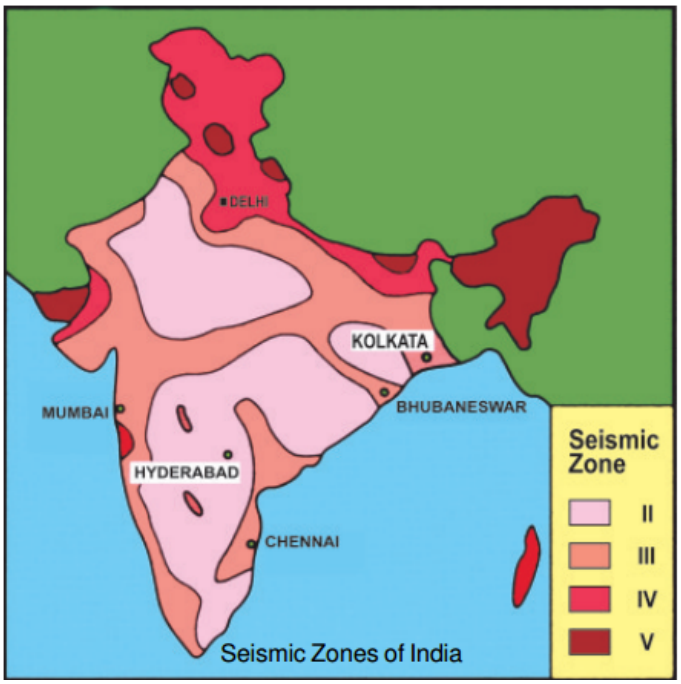
Time	No. of Vehicles				
	Heavy Motor Vehicles	Light Motor Vehicles	Two Wheelers	Three Wheelers	Total
08.00-09.00	7	16	45	18	**86**
09.00-10.00	4	25	51	22	**102**
10.00-11.00	6	10	22	15	**53**
12.00-13.00	8	12	12	12	**44**
13.00-14.00	7	9	18	4	**38**
14.00-15.00	4	7	14	4	**29**
15.00-16.00	3	4	12	5	**24**
16.00-17.00	1	8	48	17	**74**
Total	**40**	**91**	**222**	**97**	**450**

Interpretation of Traffic Survey Results

Two wheelers constituted largest traffic volume (222 Nos) followed by three wheeler vehicles (97), light motor vehicles (91 Nos) and heavy motor vehicle(40 Nos) . The peak vehicular traffic (188 Nos) monitored was recorded between 08.00-10.00 hrs, and the hourly peak was noted at 09.00-10.00 hrs (102 Nos). The lowest vehicular traffic load (24 Nos) was recorded between 15.00 to 16.00 hrs.

3.14 NATURAL HAZARD

Figure 3.32: Seismic Zones of India



The varying geology at different locations in the country implies that the likelihood of damaging earthquakes taking place at different locations is different. Thus, a seismic zone map is required so that buildings and other structures located in different regions can be designed to withstand different level of ground shaking. The current zone map divides India into four zones – II, III, IV and V. Project area is located in Zone II of the Bureau of Indian Standards (BIS) 2000, seismic zone map for India (refer Figure 3.31). The maximum magnitude of these earthquakes has been reported around 4.5 to 5.3 in the Richterís scale. Therefore, there are rare chances of collapsing of building and human casualties in these areas.

Flash cyclone and flood

Berhampur has witnessed devastation causing loss of life and properties due to the cyclone and flood in recent past (i.e in the year 1999) and in the present i.e in month of October 2013 (Cyclone name as Phailine). The main reason of the cyclone and flood in the Berhampur area is depression in the Bay of Bengal.

3. 15 BIOLOGICAL ENVIRONMENT

Generally biological communities are good indicators of climatic and adaphic factors. Their natural settings can get disturbed by any externally induced anthropological activities and once these setting is disturbed it sometimes impossible or may take a longer time to come back to the original state. Studies on biological aspects of ecosystems are important in environmental impact assessment for safety of natural flora and fauna.

3.15.1 Methodology adopted for the study

To achieve the above objectives a detailed study of the area was undertaken in 10 km radius area from proposed MSW Dumping site as centre. According to Champion & Seth classification the observed vegetation in the study area is of open scrub types. For this study a team of Global Experts was visited the site for collection of samples and data. The different methods adopted for the study were as follows:-

A. Primary data was generated through:-

1. Preparing a general check list of all plants encountered in the study area and lists all the plants by visual observations.
2. Phytological studies by using list count quadrate method and the quadrate of 100 m^2 size was employed for this study.
3. Bird populations were studied by taking random reading at every location.
4. Observing mammals, amphibians, and reptiles noting their cells, dropping, burrows, pugmarks and other signs.
5. Noting the status and quality of plant growth, and any symptoms like defoliation, deformities, chlorosis, necrosis, warping, reduced vigour and infection by parasites and insects by visual observation.
6. Local inhabitants were interviewed about the plant and animal of the local areas.

B. **Secondary data:** Forest Dept. Berhampur, Botanical Survey of India

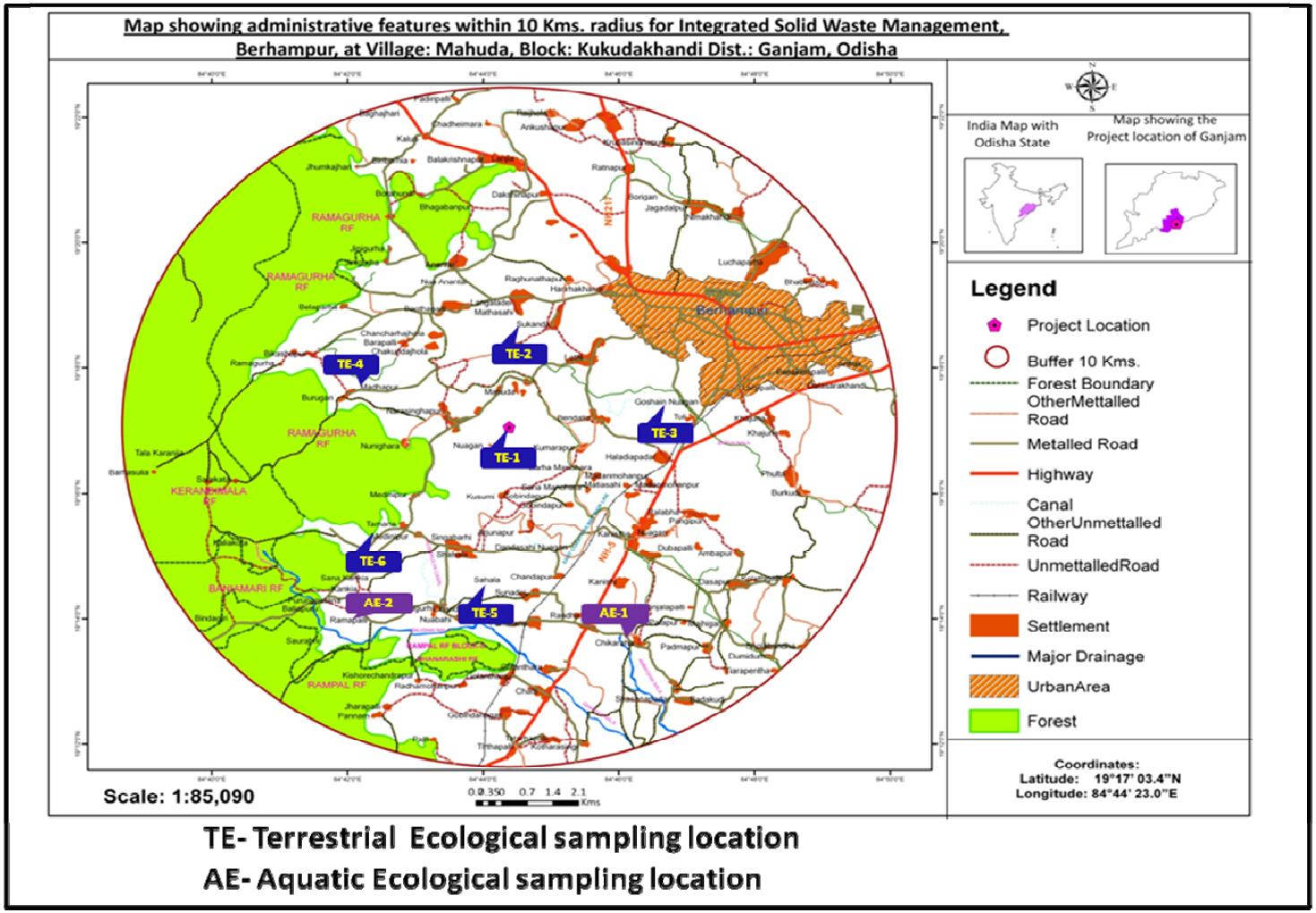
3.15.2 Sampling locations

For ecological study different sampling locations were selected for sample collection and site specific syudy. Sampling locations were selected on the basis of topography, land use, vegetation pattern etc. as per the objectives for environmental impact assessment. All observations were taken in and around the sampling locations for quantitative representation of different species.

TERRESTRIAL AND AQUATIC SAMPLING LOCATIONS

Location code	Sampling locations	Direction w.r.t site in km	Distance w.r.t Project site
TERRESTRIAL SAMPLING LOCATION			
TE-1	Solid Waste Dumping Site	--	--
TE-2	Sukanda	3.5	N
TE-3	Goshain Nuagan	4.0	E
TE-4	Madhapur	5.0	NNW
TE-5	Sahala	6.5	S
TE-6	Medini[Pur	5.5	SW
AQUATIC SAMPLING LOCATION			
AE-1	Chikaraha (Near Ambaghai Nala)	7.0	SE
AE-2	Ramapalli (Near Balighai Nala)	8.0	SW

Fig 3.33 Map showing of Terrestrial and Aquatic Sampling Locations



3.15.3 FloraL Structure and Composition of the Study Area

Vegetation Types

The study area comperis 10 km radius around the solid waste dumping site.The vegetation types of the study area shows in three different strata,i.e Top, Middle And Ground on the basis of their height. The top strata comprises of trees, Middle strata plants includes Shrubs and the ground or herbaceous specie. The vegetation recorded in the Berhampur city and its surrounding areas are classified as open scrub forest, bock plantation (Cashew and Casuarina), fruit orchard, naturally grown Kewda (Pandanus odoratissimus) and riparian forest. The study area mainly comprises of three reserve forest namely Ramgruha R.F, Rampali R.F & Dhanarasahi R.F present in the South- west & North-west side of the study area.

Flora at the Proposed Treatment and Disposal Site at Mahuda Village

The proposed landfill site at Mahuda Village has mostly non-forest Government land with plantation under soil conservation program. The major tree species recorded in the proposed site is given in the below table.

Table-3.23: List of Flora found in the Municipal solid waste Dumping site.

Botanical name	**Local name**
Tree	
Bambusa arundinacea	Baunsa
Cassia siamea L.	Chakunda
Phoenix acaulis Roxb.	Khajur
Haldinia Cordifolia	Halanda
Flacourtia Indica	Garverna
Capparis Spinosa	
Streblus Aspera	Hirtonimranu
SHRUBS	
Calotropis gigantea Ait.	Araka/Ak
Euphorbia nivulia Ham.	Sijhu
HERBS	
Aganosma caryophyllata (Roxb. ex Sims)	Malti
Asparagus racemosus Willd. var.	Satabari/Satmuli
Mimosa pudica L	Lajkuli (Lajwanti)
GRASS	
Cynodon dactylon L. (Pers)	Duba
Imperata cylindrica (L) P.Beauv.	Kharo grass
Bambusa arundinacea Retz. Willd	Kanta bansa

Table-3.24: List of flora recorded in the buffer zone of the study area

Sr. No.	Local Name	Botanical Name	Family	Life forms
A. Tree				
1	Acacia	Acacia auriculoformis	Mimosaceae	Phnerophyte
2	Amba	Mangifera indica	Anacardiaceage	Phnerophyte
3	Anla	Emblica officinalis	Euphorbiaceace	Phanerophyte
4	Arjuna	Terminalia arjuna	Combrataceae	Phanerophyte
5	Aswath (pipal)	Ficus religiosa	Moraceae	Phanerophyte
6	Babool	*Acacia nilotica*	Mimosaceae	Phanerophyte
7	Bara	*Ficus benghalensis*	Moraceae	Phanerophyte
8	Barakuli	*Ziziphus maurutiana*	Rhamnaceae	Phanerophyte
9	Bel	Aegle marmelos	Rutaceae	Phanerophyte
10	Behada	*Tarminalia bellarica*	Combrataceae	Phanerophyte
11	Chakunda	*Cassia slamea*	Caesalpiniaceae	Phanerophyte
12	Champa	*Michelia champaca*	Magnoliaceae	Phanerophyte
13	Chandan	*Santalum album*	Santalaceae	Phanerophyte
14	Dhimiri (tambal)	*Ficus hispida*	Moraceae	Phanerophyte
15	Eucalyptus	*Eucalyptus species*	Myrtaceae	Phanerophyte
16	Gambharia	*Gmelina arborea*	Verbenaceae	Phanerophyte
17	*Ganiari*	*Cochlospermum religiosum*	Cachlospermaceae	Phanerophyte
18	Harida	*Terminalia chebula*	Combretaceae	Phanerophyte
19	Jambu (jamu)	*Syzygium cumini*	Myrtaceae	Phanerophyte
20	Kadamba	Anthocephalus chinensis	Rubiaceae	Phanerophyte
21	Kaitho (benta)	*Llmonea acidissima*	Rutaceae	Phanerophyte
22	Karanj	*Pongamia pinnate*	Fabaceae	Phanerophyte
23	Kusam	*Schelchera oleosa*	Sapindaceae	Phanerophyte
24	Mahalimba(mahaneem)	*Ailanthus exelsa*	Simaroubiaceae	Phanerophyte
25	Mahul	*Madhuca indice*	Sapotaceae	Phanerophyte
26	Neem	*Azadirachta indica*	Meliaceae	Phanerophyte
27	Panasa	*Artocarpus heterophyllus*	Moraceae	Phanerophyte
28	Poijamu (chata jamu)	*Syzygium caryophyllifolium*	Moraceae	Phanerophyte
29	Saguan	*Tectona grandis*	Verbanaceae	Phanerophyte
30	Sahada	*Streblus asper*	Moraceae	Phanerophyte
31	Sajana	*Moringa oleifera_*	Morino aceae	Phanerophyte
32	Sal (saragi)	*Shorea robusta*	Dipterocarpaceae	Phanerophyte
33	Salai	*Boswellia serrata*	Burseraceae	Phanerophyte
34	Siris	*Albizia lebbeck*	Mimosaceae	Phanerophyte
35	Sisso (bali)	*Dalbergia sisoo*	Fabaccae	Phanerophyte
36	Sunari	*Cassia fistula*	Caesalpinaceae	Phanerophyte
37	Tal	*Borassus flaberifer*	Arecaceae	Phanerophyte
38	Tentuli	*Tamarindus indica*	Caesalpiniaceae	Phanerophyte
***B.* Shrubs**				
1	Arakha	*Calatropis gigantea*	Asclepiadaceae	Therophyte
2	Assadhua (nepheda)	*Capparis brevispina*	Capparaceae	Therophyte
3	Assamalata (gandhuri)	*Eupatorium odoratum*	Asteraceae	Therophyte
4	Ata	*Annona squamosa*	Annonaceae	Therophyte
5	Baincha	*Flacourtia jangomos*	Flacourtiaceae	Therophyte
6	Bana tulasi	*Ocimum gratissimum*	*Lamiaceae*	Therophyte
7	Banakhajuri	*Phoenix acaulis*	*Arecaceae*	Therophyte
8	Banamali	*Jasminum arborescens*	Oleaceae	Therophyte
9	Basanga	*Justicea adhatoda*	Acanthaceae	Therophyte
10	Begunia	*Vitex negundo*	Verbanaceae	Therophyte
11	Budhi kasmar	*Premna hamiltonii*	Verbeneceae	Therophyte
12	*Gangai*	*Malastoma malabathricum*	Melastomaceae	Therophyte
13	Gangasiuli (singadahar)	*Nyctanthus arbortristis*	Oleaceae	Therophyte

14	*Guakuli*	*Diospyros ferrea*	Ebenaceae	Therophyte
15	Kamini (ban mallica)	*Murraya paniculata*	Rutaceae	Therophyte
16	Kanteikoli	*Zizhyphus oenoplea*	Rhamnaceae	Therophyte
17	Lajwanti (laljkuta)	*Mimosa podica*	Mimosaceae	Therophyte
18	Madanga (epiphyte)	*Dendrophthoe falcata*	Loranthaceae	Therophyte
19	Panidanturi	Desmodium tringulare	Fa baceae	Therophyte
20	Saru	*Colocasia esculanta*	Arecaceae	Therophyte
21	Siju	*Euthorbia nivulia*	Euehorbiaceae	Therophyte
22	Tulshi	*Ocimum sanctum*	Lamiaceae	Therophyte
23	Ukara	Biepharis *maderaspatensia*	Acanthaceae	Therophyte
		C. **Herbs**		
1	Amarpoi (hemakakri)	*Kalanchoe pinnata*	Crassulaceae	Therophyte
2	Bana ada	*Zinglber purpureum*	Zingiberaceae	Therophyte
3	Bana kadali	*Musa ornata*	Musaceae	Therophyte
4	Bana methi	*Crotolaria epunctata*	Fabaceae	Therophyte
5	Bhuin chakunda	*Cassia obtusifolia*	Caesalpinaceae	Therophyte
6	Bhuin neem	*Andrographis paniculata*	Acanthaceae	Therophyte
7	Bhutamari	*Anisomeles Indica*	Lamiaceae	Therophyte
8	Bisalyakarni	*Tridex procumbens*	Asteraceae	Therophyte
9	Chawaldua	*Glycoswmis pentaphylla*	Rutaceae	Therophyte
10	Pipali (cher pipala)	*Piper longum*	Piperaceae	Therophyte
		D. Bamboo		
1	Daba bans/kanta bans	Bambusa arundinacea	Poaceae	Therophyte
2	Salia/Hill bamboo	Dendrocalamus strictus	Poaceae	Therophyte
		E. Grassess		
1	Chhana	Imperata arundinaceae	Poaceae	Hemicryptophyte
2	Duba	Cynodon dactylon	Poaceae	Hemicryptophyte
3	Guguchia	Chrysopogon gryllus	Poaceae	Hemicryptophyte
4	Kasa tandi	Saccharum spontaneum	Poaceae	Hemicryptophyte
5	bena	Vitiveria zizynoldes	Poaceae	Hemicryptophyte
6	Koji jhipa (kuti)	Eragrostis coaretata	Poaceae	Hemicryptophyte
7	Noto	Phramite karka	Poaceae	Hemicryptophyte
8	phull zadu	Thysanolaena maxima	Poaceae	Hemicryptophyte
9	Rossa grass	Cymbopogon martini	Poaceae	Hemicryptophyte
10	Sabai (panasi)	Eulaliopsis binnata	Poaceae	Hemicryptophyte
11	Tuli	Echaemum rugosum	Poaceae	Hemicryptophyte

There is no endangered threatened, vulnerable and rare species of plant are found in the study area as per BSI publication and RED DATA BOOK.

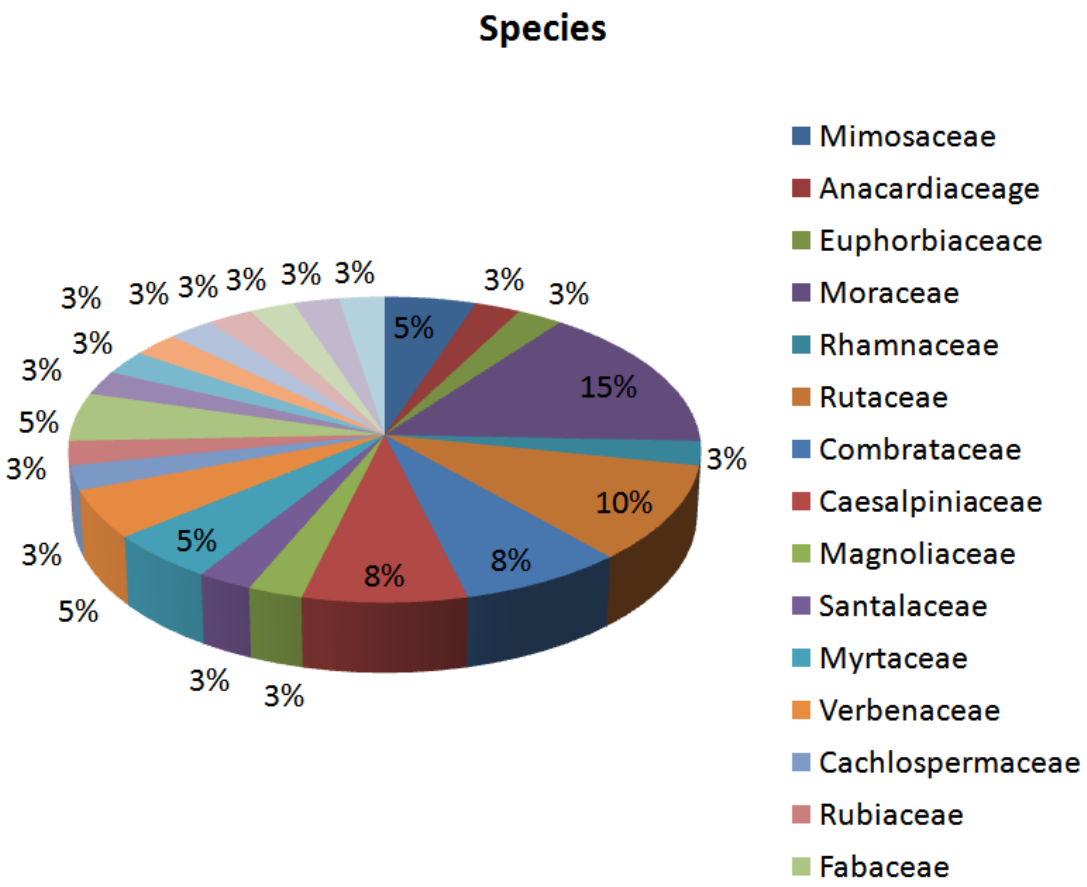

Species
Mimosaceae
Anacardiaceage
Euphorbiaceace
Moraceae
Rhamnaceae
Rutaceae
Combrataceae
Caesalpiniaceae
Magnoliaceae
Santalaceae
Myrtaceae
Verbenaceae
Cachlospermaceae
Rubiaceae
Fabaceae
5%
3%
3%
15%
3%
10%
8%
8%
3%
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Figure-3.34: Photographs showing the some species that are found in the proposed solid waste dumping Site at Mahuda village.

3.15.4 Fauna and Wildlife

There is no sensitive ecological habitat like wildlife sanctuary, National Park, Biosphere Reserve, Ramsar site within the 10 km radius of Berhampur city, and the new site at Mahuda Village. There is no demarcated wildlife habitat in the city. However, plantation area, scrub land and Kewda jungles provides habitat for some common faunal species.

Table-3.25: List of Fauna observed during the site visit in the proposed project area

Sr. No	Scientific Name	Common Name / English name	Wildlife Schedule
BIRDS			
1	*Acridotheres tristis*	Common myna	Schedule IV
2	*Aloedo atthis*	Small Blue Kingfisher	Schedule IV
3	*Corvus splendens*	House Crow	Schedule V
4	*Eudynamys scolopacea*	Koel	Schedule IV
5	*Passer domesticus*	House Sparrow	Schedule IV
6	Ploceus *philippinus*	Baya	Schedule IV
7	Strebopelia *decaocto*	Dove	Schedule IV
8	*Passer domesticus*	*Gharchatia* (house sparrow)	Schedule IV
Mammals			
1.	*Suncus murinus*	Chuchundra / grey musk shrew	Schedule -IV
2.	*Rattus rattus*	Musa / Rat	Schedule -V
3.	*Heypestes edwrdis*	Neola (hatla) / mongoose	Schedule -Il
4.	*Sciuridae*	Nepali musa / squirrel	Schedule -V
Reptiles and Amphibians			
1.	*Calotes versicolor*	Bahurupi kuasap / *garden geeko*	Schedule -IV
2.	chameleon *zey/arlicus*	*Bahurupi* / Indian chameleon	Schedule IV
3.	*HemIdictylus Ieschenau/tia*	Jhitipiti	Schedule –IV
4.	*Eublepharis species*	Endua (rock geko , fattailed geeko)	Schedule -Il
Amphibians			
1	*Rana tigrina*	Frog	Schedule -IV

Observation

The project site is an open scrub land so only small no of common fauna sp. are found during the site visit of the proposed project area. During site visit 8 species of birds,4 species of mammals, 4 species of reptiles and 1 species of amphibians were observed.

List of Fauna recorded in the study area

Sr.No.	Scientific Name	Common Name	Wildlife Schedule
Birds			
1	*Acridotherestristis*	Common myna	Schedule IV
2	*Aloedoatthis*	Small Blue Kingfisher	Schedule IV
3	*Coraciasbenghalensis*	Indian Roller	Schedule IV
4	*Corvussplendens*	House Crow	Schedule V
5	*Eudynamysscolopacea*	Koel	Schedule IV
6	*Gallinulachloropus*	Indian Moorhen	Schedule IV
7	*Haliasturindus*	Brahmipt kite	Schedule IV
8	*Passerdomesticus*	House Sparrow	Schedule IV
9	*Ploceus*philippinus	Baya	Schedule IV
10	*Pycnonotuscafer*	Red Vented Bulbul	Schedule IV
11	*Acrildotherestristis*	Bani / myna India	Schedule IV
12	*Pynonotuscater*	bulbul (bulbul red vented)	Schedule IV
13	*Appusaffinis*	Chatak / house swift	Schedule IV
14	*Milvusmigranus*	Chilla (Indian kite)	Schedule IV
15	*Arnanronisphoinicarvus*	Dheuka / caucal	Schedule IV
16	*Stereptopelia chineni*	*Dove* spotted	Schedule IV
17	*Egrettagarzettagarzetta*	Little egret	Schedule IV
18	*Passerdomesticus*	*Gharchatia* (house sparrow)	Schedule IV
19	*Oriolusxanthornus*	Haladi basanta /oriole black headed	Schedule IV
20	*Dicrususmacrocerus*	Kajalpati (common drongo)	Schedule IV
21	*Picoidesnanaus*	Kathakumpar (woodpeaker pigmy)	*Schedule IV*
22	*Tytoalbastertens*	Owl (Indian barn owl)	*Schedule IV*
Mammals			
1.	*Cynopterussphinx*	Badudi / shortnosed truitbat	Schedule –V
2.	*Canisaurius*	Bilua / jackal	Schedule –III
3.	*Fellsbengalensis*	Cheetah biradi /leopard cat	Schedule -II
4.	*Muntiacusmuntijack*	Kutra / barking deer	Schedule -III
5.	*Rattusrattus*	Musa / Rat	Schedule -V
6.	*Rattusblanfordli*	*Musa* / white tailed wood rat	Schedule -V
7.	*Heypestesedwrdis*	Neola (hatla) / mongoose	Schedule-Il
8.	*Tytraperspicillata*	Odha / smooth Indian otter	Schedule-II
9.	*Canislupus*	Ramsiyali/Wolf	Schedule-II
10.	*Paradoxorushermaphroditus*	Sallyapatani / toddycat	Schedule-Il
11.	*Cervusunicolor*	Samber / samber	Schedule -III
Reptiles and Amphibians			
1.	*Najanaja*	Cobra	*Schedule-II*
2.	*Chamaeleozeylanicus*	*Bahurupi* / Indian chameleon	Schedule IV
3.	*Bangaruscaeruleus*	Chiti (common Indian krait)	Schedule -IV
4.	*Ptyasmucosus*	Dhamana	Schedule-II

5.	*Xenschrophispiscator*	Dhanda	Schedule –Iv
6.	*Hemidictylusflavivirdis*	House lizard	Schedule –II
7.	*Ahetulla species*	*Kandanali* / tree snake	Schedule-II
8.	*Najanajakuothia*	Tampa	Schedule-II
9..	*Ranatigrina*	Frog	
There are no endangered, threatened, vulnerable and rare species of animals found in the Study area as per RED DATA BOOK.			

Primary Source: **-** *observed during primary survey and discussion with villagers*
Secondary Source: - forest working plan Ghumasor south forest division

3.15.5 Aquatic Ecosystem

The aquatic ecosystem at Berhampur city and its surrounding areas constitute numerous seasonal streams and tanks. The biological species found in these aquatic systems includes Phytoplankton & Zooplankton. The plankton samples were collected from the Ambaghai Nala, Balighai Nala, Rushikulya Nala & Ghataka Nala and the ponds and ditches present near the study area

METHODOLOGY

- The plankton samples were collected by using plankton net. The collected samples were preserved with formaldehyde solution at the sampling location for analysis in the laboratory.
- Generating data by actual field sampling during study period.
- Discussion with the local people to get information about the aquatic plants and aquatic animals.

Table-3.26 : List of Phytoplankton Species Identified from Study Area

Family	**Species**	**Family**	**Species**
Bacillariophyceae	Cymbella sp.	**Chlorophyceae**	Ankistrodesmus sp.
	Cyclotella sp.		Chlorococcum sp.
	Diatoma sp.		Chollera sp.
	Navicula sp.		Closterium sp.
	Nitzschia sp.		Eudorina sp.
Cyanophyceae	Anabaena sp.		
	Anacystic sp.		
	Lyngbya sp.		
	Phormidium sp.		

Table-3.27: List of Zooplankton species identified in the study area

Groups	**Species**
Protozoans	
	Tintinnopsis butschlii
	T. cylindrical
	T.beroidea
	Globigerina sp.
Crustaceans	
Copepods	**Cyclops sp.**
	Nauplius larva

	Diaptomus sp.
Cladocera	**Daphnia sp.**
	Ceridodaphnia sp.
	Diaphnosoma sp.
	Bosmina sp.
Rotifer	**Asplanchna sp.**
	Brachionus sp.
	Keratella sp.

Table-3.28: List of Freshwater Fishes Observed in the Study Area

LOCAL NAME	SCIENTIFIC NAME	LOCAL NAME	SCIENTIFIC NAME
Balia	*Wallagoniaattu*	Dandikiri	Esomusdandrica
Baligarada	*Glosogobiusgiuris*	Gadisa	Ophiosephaluspunctatus
Banspati	*Aillacoha*	Illisi	Hilsailisa
Bhakura	*Catlacatla*	Kantia	Myotuscavasius
Chenga	*Ophiocephalusgachua*	Kau	Anabustestidineus
Chitala	*Notopteruschitala*	Magura	Clariusbatracus
Seula	*Ophiocephalusst riatus*	Mirikali	Ciirrhiniamrigala
Todi	*Mastacombelusarmatus*	Rohi	Labiorohita
Singi	*Heterophneustesfossilis*		
Prawn sp.	*Macrobrachium rosenbergii*		
	Macrobrachium carcinus		
	Penaeus monodon		
	Litopenaeus vannamei		
	Haliporoides triarthus		
	Fenneropeneaus indicus		
	Aristaemorpha foliaceae		

LIST OF BUTTRFLIES RECORDED

Sr. No.	Families/ Common Name	Scientific Name	Occurrence
1.	Common birdwing	Atrophaneura varuna	c
2.	Common rose	Paristolochiae	a
3.	Blue peacock	Priceps arcturus	c
4.	Red Helen	p.helenus helenus	c
5	Yellow orange tip	Ixlas pyrene famillíaries	c
6	Grey pansy	Précis atlites	c

Source: observed during field survey
Where a= abundant, c= common,

3.16 SOCIO- ECONOMIC ENVIRONMENT

This section describes the baseline socio economic environment of 10 km radius of proposed solid waste management site the area in general. The result of the analysis will help in predicting the impact of the proposed project on the local people, their physical and psychological health and well being, economic facilities, heritage and culture and their lifestyle in general. The issues under focus are demographic structure, economic activity, education, literacy profile, infrastructure facilities, etc. The assessment and evaluation of potential socio-economic impacts will thereby assist in the formulation of necessary guidelines for impact mitigation and management of human environment. The information provided in the following sections has been primarily derived from secondary sources (Census of India, District Information Centre, District Statistical Handbook, City Development plan etc). Primary information on block socio-economic infrastructure has been gathered through informal discussion with locals. The village-wise secondary data (obtained from Census) has been taken into consideration for analyzing the socio-economic profile in a comparative manner for the exploratory block.

OBJECTIVES OF THE STUDY

The main objectives are as follows:

i) To assess the impact of the project on agricultural situation;
ii) To examine the impact of the project on pattern of demand;
iii) To assess the in impact of the project on consumption pattern;
iv) To examine employment and income effects of the project;
v) To explore the possibility of local industrialization as an offshoot of the project;
vi) To examine the effect of the project on education status of the people in the study area
vii) To judge peoples' perception regarding the project

Methodology

The methodology adopted in the assessment of socio-economic condition is as given below:

- To evaluate the parameters defining the socio-economic conditions of the people.
- To analyse the identified social attributes like population distribution, sex ratio, literacy rate, occupational structure, availability of public utilities etc through literature like the census of India, District Census Statistical Handbooks and from records of National Informatics Centre etc.

DEMOGRAPHY & SOCIOECONOMIC STATUS

Table 3.29: Villages Considered For Socio-Economic Survey

Name of village	Latitude Longitude	Direction from Solid waste Management site	Distance from Solid waste Management site(in Km.)
Lathi	N 19°18'09.10" E 84°45'38.16"	NE	2.33 km
Mohuda	N 19°17'43.1" E 84° 44'38.5"	N	1.37 km
Medinipur	N19°15'22.83" E 84° 43'08.81"	S	3.84 km

Narashinghpur	N 19°17′ 44.3″ E 84° 43′ 32.7″	NW	1.99 km
Bendalia	N 19°17′ 40.63″ E 84° 46′16.22″	NE	3.47 km
Kusumi	N 19°16′ 55.20″ E 84° 44′41.48″	SE	0.5Km
Madanmohanpur	N 19°16′21.35″ E 84° 46′28.98″	SE	3.92 km

Demographic Profile

Ganjam is the 5th biggest district in terms of size and first in terms of population in Odisha. In 2011, Ganjam had population of 3,529,031 out of which male and female were 1,779,218 and 1,749,813 respectively. Out of the total Ganjam population for 2011 census, 21.76 percent lives in urban regions of district. In total 768,001 people lives in urban areas of which males are 395,582 and females are 372,419.

Sex Ratio in urban region of Ganjam district is 941 as per 2011 census data. Similarly child sex ratio in Ganjam district was 913 in 2011 census. Child population (0-6) in urban region was 77,695 of which males and females were 40,609 and 37,086. This child population figure of Ganjam district is 10.27 % of total urban population. Average literacy rate in Ganjam district as per census 2011 is 83.28 % of which males and females are 89.29 % and 76.93 % literates respectively. In actual number 574,900 people are literate in urban region of which males and females are 316,940 and 257,960 respectively.

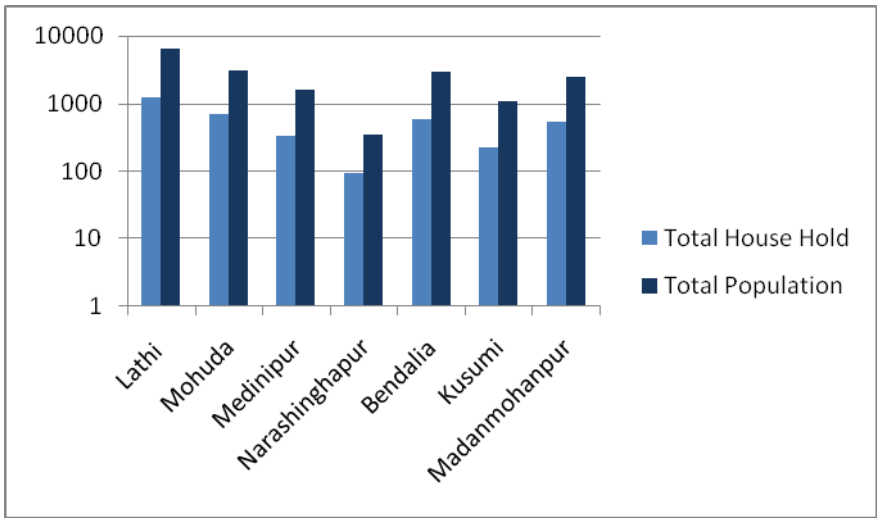
The demographic and socioeconomic profiles are collected from the Primary Census Abstract for the study area of Ganjam district.

Of the study area defined, the baseline study focuses on following villages located in and around the proposed project site. The study area villages comprises of Lathi, Mohuda, Narashingpur, Medinipur, Bendalia, Kusumi, Madanmohanpur

3.16.1 Population and Household Size

Of the study area villages, Lathi has the highest population of 6,481 followed by Mohuda with a population of 3,141 with total household of 1227 and 705 respectively. The lowest population was found in village Narashingpur (i.e 351), with total number of house hold 93. The total population and household distribution of the study area villages have been represented in the **Figure 3-35** below

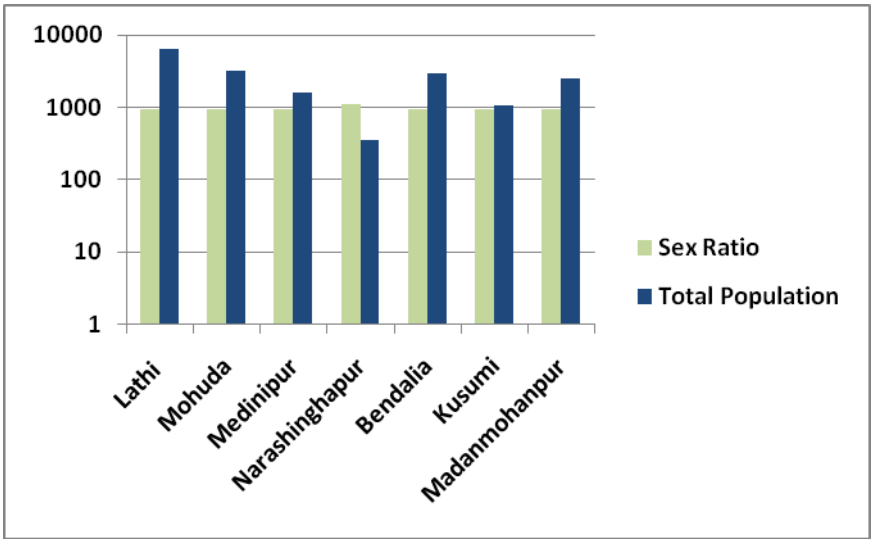
Figure 3.35: Population and Household Distribution of the Study Area



3.16.2 Sex Ratio

Hightest Sex ratio in ganjam was found in Narashinghapur (i.e 1114.46 females per 1000 males as per the 2011 census). The sex ratio as per 2011 census in different study area of Ganjam is as follows: The average sex ratio of 970 was recorded in the study area villages which is slightly less than the state average of 979 females per thousand males. The highest sex ratio within the study area is recorded for Narashinghapur village (i.e 1114.46) followed by Lathi (954.46) and Medinipur (945.41) villages. The lowest sex ratio is particularly observed for the villages of Madanmohanpur (923). The comparision of sex ratio with population of the study area villages have been represented in **figure 3.36**

Figure 3.36: Sex Ratio in the Study Area



3.16.3 Scheduled Caste (SCs) & Scheduled Tribes (STs)

Almost 19 % percent ans 3.3% of the population of the district belongs to SC and ST respectively. Over 26% of the population in the study area villages belongs to scheduled castes and 7 % of the population of study area belongs to scheduled tribes. Among the study area villages, Schedule tribe population was found only in Mohuda, Medinipur and Madanmohanpur villages. The highest population of scheduled tribe was recorded in

Madanmohanpur and highest population of scheduled caste was found in Bendalia Village. Graph showing the comparision of the total population with SC ST population of different study area

Figure 3.37: Comparison of the total population with SC ST population of different study area

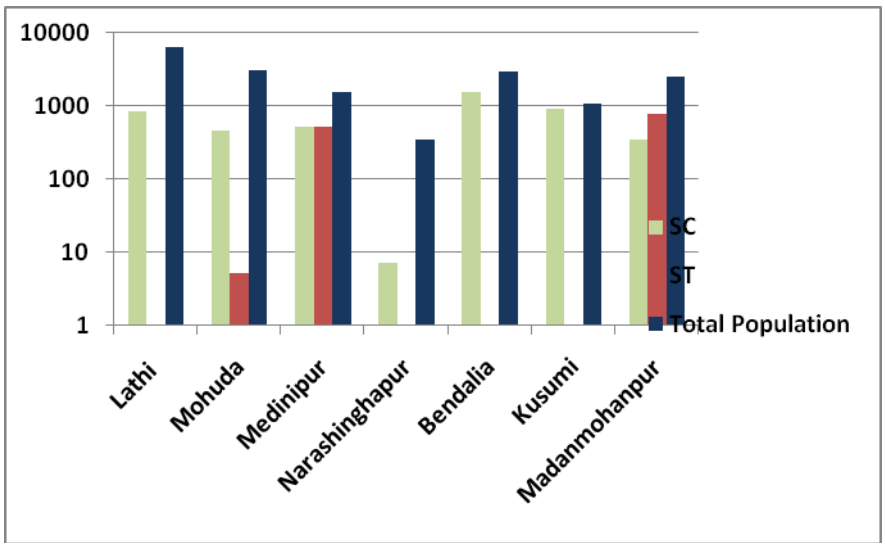


Table 3.30: Demographic pattern of 10 Km radius Buffer Zone

Name	No_HH	TOT_P	TOT_M	TOT_F	Sex ratio	P_06	M_06	F_06	Sex ratio	P_SC	M_SC	F_SC	sex ratio	P_ST	M_ST	F_ST	sex ratio
Chandapur	197	999	497	502	1010.06	131	70	61	871.4286	124	65	59	907.6923	0	0	0	0
Medinipur	326	1568	806	762	945.4094	225	107	118	1102.804	516	279	237	849.4624	516	250	266	1064
Buragam	41	134	67	67	1000	10	5	5	1000	0	0	0	0	119	58	61	1051.72414
Nunighara	25	102	51	51	1000	21	11	10	909.0909	0	0	0	0	97	47	50	1063.82979
Manahara	232	1225	618	607	982.2006	185	93	92	989.2473	453	231	222	961.039	1	1	0	0
Sahala	457	2131	1097	1034	942.5706	226	114	112	982.4561	807	383	424	1107.05	3	2	1	500
Kumarpur	314	1500	708	792	1118.644	190	93	97	1043.011	1250	586	664	1133.106	0	0	0	0
Kusumi	228	1074	553	521	942.1338	155	88	67	761.3636	925	474	451	951.4768	1	1	0	0
Gobindapur	163	763	361	402	1113.573	102	46	56	1217.391	243	104	139	1336.538	23	12	11	916.666667
Lathi	1224	6481	3316	3165	954.4632	741	399	342	857.1429	851	430	421	979.0698	0	0	0	0
Mohada	705	3141	1618	1523	941.2855	329	170	159	935.2941	452	223	229	1026.906	5	4	1	250
Siriapur	21	138	75	63	840	19	6	13	2166.667	19	11	8	727.2727	0	0	0	0
Matiapalli	30	140	62	78	1258.065	9	7	57	8142.857	33	0	0	0	105	47	58	35
Chakundajhola	17	61	31	30	967.7419	9	3	6	2000	61	31	30	967.7419	0	0	0	0
Langaladei	452	2141	1082	1059	978.7431	324	166	158	951.8072	782	377	405	1074.271	180	86	94	1093.02326
Chakundajhola	17	61	31	30	967.7419	9	3	6	2000	61	31	30	967.7419	0	0	0	0
Raghunathapur	658	2905	1436	1469	1022.981	327	174	153	879.3103	544	257	287	1116.732	12	5	7	1400
Narasinghapur	93	351	166	185	1114.458	51	23	28	1217.391	7	3	4	1333.333	0	0	0	0
Ambagada	307	1542	804	738	917.9104	218	130	88	676.9231	321	166	155	933.7349	0	0	0	0
Madhapur	4	7	6	1	166.6667	0	0	0	0	0	0	0	0	0	0	0	0
Singabadi	189	937	492	445	904.4715	123	71	52	732.3944	185	96	89	927.0833	1	0	1	0
Nuagan	146	788	409	379	926.6504	99	49	50	1020.408	42	18	24	1333.333	0	0	0	0
Bendalia	597	2927	1500	1427	951.3333	379	198	181	914.1414	1544	761	783	1028.909	1	1	0	0
Matiapalli	30	140	62	78	1258.065	16	9	7	777.7778	57	24	33	1375	0	0	0	0
Barapalli	238	1197	577	620	1074.523	142	65	77	1184.615	291	140	151	1078.571	0	0	0	0
Haladiapadar	839	3857	1945	1912	983.0334	429	222	207	932.4324	1310	654	656	1003.058	45	22	23	1045.45455
Modanamohanpur	545	2478	1288	1190	923.913	312	170	142	835.2941	340	172	168	976.7442	768	388	380	979.381443
Ralaba	634	3030	1533	1497	976.5166	402	206	196	951.4563	890	429	461	1074.592	94	66	28	424.242424
Jugudi	591	2712	1346	1366	1014.859	387	195	192	984.6154	1781	865	916	1058.96	1	1	0	0
Jagadalpur	1183	6163	3119	3044	975.9538	820	444	376	846.8468	2652	1308	1344	1027.523	238	128	110	859.375
Nimakhandi	572	2864	1504	1360	904.2553	290	162	128	790.1235	309	146	163	1116.438	0	0	0	0
Bhabinipur	122	564	296	268	905.4054	72	38	34	894.7368	58	31	27	870.9677	0	0	0	0
Khaira	234	1037	504	533	1057.54	135	67	68	1014.925	121	49	72	1469.388	0	0	0	0
Khajuria	14	56	25	31	1240	13	9	4	444.4444	25	12	13	1083.333	0	0	0	0
Brahmapalli	21	99	45	54	1200	15	5	10	2000	0	0	0	0	0	0	0	0
Rangipur	274	1484	757	727	960.3699	162	93	69	741.9355	546	278	268	964.0288	0	0	0	0
Ralabha	948	4405	2211	2194	992.3112	542	294	248	843.5374	286	147	139	945.5782	1	0	1	0
Burukudi	256	1158	620	538	867.7419	121	65	56	861.5385	8	5	3	600	0	0	0	0
Ambapua	384	1800	933	867	929.2605	223	114	109	956.1404	120	55	65	1181.818	0	0	0	0
Kolathigam	453	2300	1184	1116	942.5676	254	122	132	1081.967	460	233	227	974.2489	0	0	0	0
Golanthara	1095	5118	2550	2568	1007.059	592	314	278	885.3503	886	437	449	1027.46	87	40	47	1175
Chikarada	651	2987	1445	1542	1067.128	381	201	180	895.5224	541	261	280	1072.797	0	0	0	0
Kaithapalli	47	207	106	101	952.8302	18	8	10	1250	0	0	0	0	0	0	0	0

Dumdumi	176	674	306	368	1202.614	66	35	31	885.7143	19	11	8	727.2727	0	0	0	0
Padmapur	359	1891	964	927	961.6183	264	133	131	984.9624	209	113	96	849.5575	0	0	0	0
Pattapur	113	616	314	302	961.7834	78	46	32	695.6522	183	84	99	1178.571	7	3	4	1333.33333
Hinjalapali	175	821	409	412	1007.335	108	56	52	928.5714	280	144	136	944.4444	0	0	0	0
Majhigam	16	56	27	29	1074.074	8	5	3	600	0	0	0	0	56	27	29	1074.07407
Daspur	588	2548	1207	1341	1111.019	290	148	142	959.4595	196	69	127	1840.58	0	0	0	0
Keluapalli	363	1672	834	838	1004.796	180	82	98	1195.122	39	17	22	1294.118	0	0	0	0
Belakudi	71	317	151	166	1099.338	33	18	15	833.3333	6	3	3	1000	0	0	0	0
Gobindanagar	522	2574	1295	1279	987.6448	347	178	169	949.4382	221	103	118	1145.631	0	0	0	0
Chandapur	184	896	457	439	960.6127	103	48	55	1145.833	348	172	176	1023.256	0	0	0	0
Jharapalli	14	65	27	38	1407.407	10	2	8	4000	0	0	0	0	65	27	38	1407.40741
Chandanpur	289	1488	793	695	876.4187	183	100	83	830	391	214	177	827.1028	6	4	2	500
Jugudi	591	2712	1346	1366	1014.859	387	195	192	984.6154	1781	865	916	1058.96	1	1	0	0
Kankya	217	973	489	484	989.7751	118	60	58	966.6667	310	149	161	1080.537	602	310	292	941.935484
Baliapata	229	1016	512	504	984.375	159	80	79	987.5	598	305	293	960.6557	239	112	127	1133.92857
Betajhari	29	128	66	62	939.3939	16	9	7	777.7778	0	0	0	0	128	66	62	939.393939
Raiguda	38	131	68	63	926.4706	15	6	9	1500	0	0	0	0	94	48	46	958.333333
Barigam	30	116	52	64	1230.769	12	7	5	714.2857	0	0	0	0	114	52	62	1192.30769
Belapanka	75	324	154	170	1103.896	58	27	31	1148.148	5	2	3	1500	150	74	76	1027.02703
Lochapada	104	502	279	223	799.2832	71	42	29	690.4762	162	84	78	928.5714	0	0	0	0
Kanthigada	30	126	56	70	1250	15	5	10	2000	0	0	0	0	125	55	70	1272.72727
Nuapalli	45	143	71	72	1014.085	13	8	5	625	24	11	13	1181.818	111	57	54	947.368421
Arjunapalli	233	1144	581	563	969.0189	157	72	85	1180.556	327	174	153	879.3103	36	18	18	1000
Teliapalli	32	102	46	56	1217.391	3	0	3	0	0	0	0	0	102	46	56	1217.3913
Kumbharajholi	43	146	80	66	825	22	12	10	833.3333	66	36	30	833.3333	0	0	0	0
Bodalundi	32	123	58	65	1120.69	10	5	5	1000	1	1	0	0	109	52	57	1096.15385
Bhagabanpur	332	1461	736	725	985.0543	196	100	96	960	293	149	144	966.443	1	1	0	0
Baiganabadi	330	1593	844	749	887.4408	175	92	83	902.1739	579	303	276	910.8911	0	0	0	0
Biribadia	41	134	60	74	1233.333	18	8	10	1250	0	0	0	0	127	55	72	1309.09091
Dakhinapur	375	1852	968	884	913.2231	187	99	88	888.8889	366	187	179	957.2193	0	0	0	0
Raijhala	311	1385	693	692	998.557	135	77	58	753.2468	133	67	66	985.0746	14	8	6	750
Ankusapur	1030	5348	2893	2455	848.6001	559	300	259	863.3333	875	451	424	940.133	3	3	0	0
Krupasindhupur	43	173	91	82	901.0989	15	8	7	875	48	21	27	1285.714	0	0	0	0
Borigam	444	2024	1011	1013	1001.978	288	149	139	932.8859	492	268	224	835.8209	12	6	6	1000
Brahmapur (M.Corp.)	74720	356598	185754	170844	919.7325	32174	16848	15326	909.6629	35137	17644	17493	991.4418	3070	1661	1409	848.284166

Courtesy: Census report Govt. of India, 2011.

3.16.4 Education & Literacy

The literacy rate in Ganjam is 83.28 % which is more than the national average of 74 % (census 2011). Average literacy rate of the study area is of the study area villages within the block has a total literacy rate above 55%, the highest literacy rate being observed in Mohuda village (62%) and the lowest literacy was found in Medinipur village (42%). Average male and female literacy rate in the study area was recorded at 34 % and 23% respectively. The highest female literacy rate was observed in Narashinghpur (26%) village and the lowest for Medinipur (18%) village. The village-wise male and female literacy status as obtained from Census 2011 is provided

Figure 3.38: Literacy rate of the study area

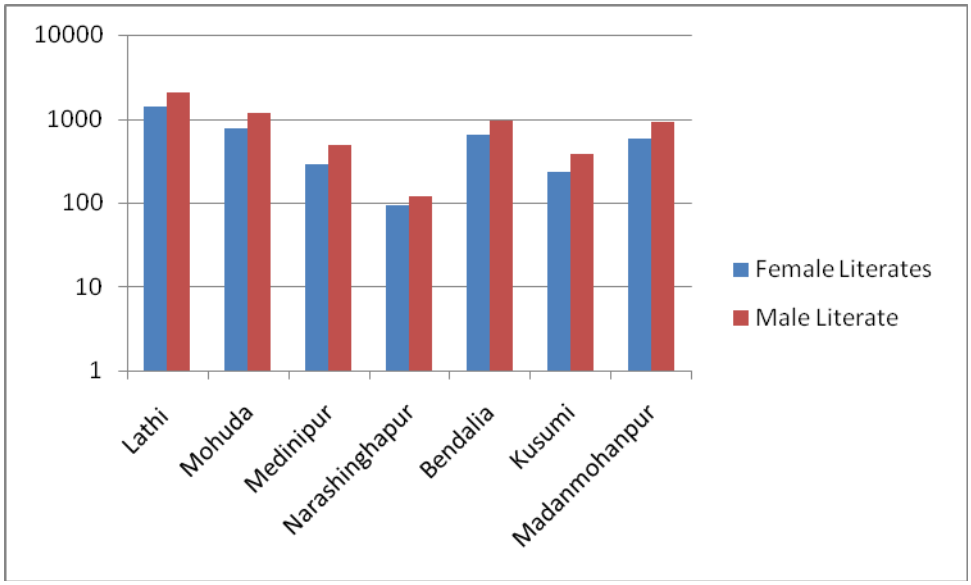


Table3.31: Literacy status of the population residing in the buffer zone of the study area

Name	Total population	Total Literates	Male Literates	Female literates	Literacy Rate
Chandapur	999	671	386	285	67.16
Medinipur	1568	770	480	290	49.1
Buragam	134	84	57	27	62.68
Nunighara	102	41	24	17	40.196
Manahara	1225	371	220	151	30.28
Sahala	2131	772	472	300	36.22
Kumarpur	1500	601	381	220	40.066
Kusumi	1074	609	377	232	56.7
Gobindapur	763	393	237	156	51.5
Lathi	6481	3417	2023	1394	52.72
Mohada	3141	1958	1177	781	62.33
Siriapur	138	101	64	37	73.188
Matiapalli	140	15	20	34	10.71
Chakundajhola	61	29	24	5	47.54
Langaladei	2141	1077	622	455	50.3
Chakundajhola	61	29	24	5	47.54
Raghunathapur	2905	1921	1092	829	66.12
Narasinghapur	351	211	118	93	60.11
Ambagada	1542	785	462	323	50.9
Madhapur	7	5	5	0	71.42
Singabadi	937	428	250	178	45.67
Nuagan	788	513	319	194	65.1
Bendalia	2927	1613	960	653	55.1
Matiapalli	140	105	47	58	75
Barapalli	1197	688	411	277	57.4
Haladiapadar	3857	2797	1506	1291	72.51
Modanamohanpur	2478	1512	926	586	61
Ralaba	3030	2034	1126	908	67.12
Jugudi	2712	1135	722	413	41.85
Jagadalpur	6163	3137	1815	1322	50.9
Nimakhandi	2864	2130	1212	918	74.37
Bhabinipur	564	334	203	131	59.21
Khaira	1037	566	334	232	54.58
Khajuria	56	12	3	9	21.42
Brahmapalli	99	59	29	30	59.59
Rangipur	1484	962	533	429	64.82
Ralabha	4405	2318	1335	983	52.62
Burukudi	1158	768	465	303	66.32
Ambapua	1800	1247	722	525	69.27
Kolathigam	2300	1523	869	654	66.21
Golanthara	5118	3214	1828	1386	62.79
Chikarada	2987	1602	935	667	53.63
Kaithapalli	207	157	89	68	75.84
Dumdumi	674	441	233	208	65.43
Padmapur	1891	1055	645	410	55.79
Pattapur	616	407	234	173	66.07
Hinjalapali	821	608	326	282	74.05
Majhigam	56	7	6	1	12.5
Daspur	2548	1491	810	681	58.5
Keluapalli	1672	1292	692	600	77.27
Belakudi	317	251	132	119	79.17
Gobindanagar	2574	1686	946	740	65.5
Chandapur	896	351	221	130	39.17

Jharapalli	65	24	15	9	36.92
Chandanpur	1488	844	521	323	56.72
Jugudi	2712	1135	722	413	41.85
Kankya	973	581	357	224	59.71
Baliapata	1016	571	342	229	56.2
Betajhari	128	3	2	1	2.34
Raiguda	131	79	52	27	60.3
Barigam	116	3	2	1	2.58
Belapanka	324	169	105	64	52.16
Lochapada	502	358	216	142	71.31
Kanthigada	126	22	10	12	17.46
Nuapalli	143	92	61	31	64.3
Arjunapalli	1144	754	463	291	65.9
Teliapalli	102	21	12	9	20.5
Kumbharajholi	146	24	15	9	16.43
Bodalundi	123	41	21	20	33.33
Bhagabanpur	1461	884	511	373	60.5
Baiganabadi	1593	1015	614	401	63.71
Biribadia	134	78	46	32	58.208
Dakhinapur	1852	1349	758	591	72.84
Raijhala	1385	860	501	359	62.09
Ankusapur	5348	3737	2240	1497	69.87
Krupasindhupur	173	141	77	64	81.5
Borigam	2024	950	608	342	46.93
Brahmapur (M.Corp.)	356598	289590	156787	132803	81

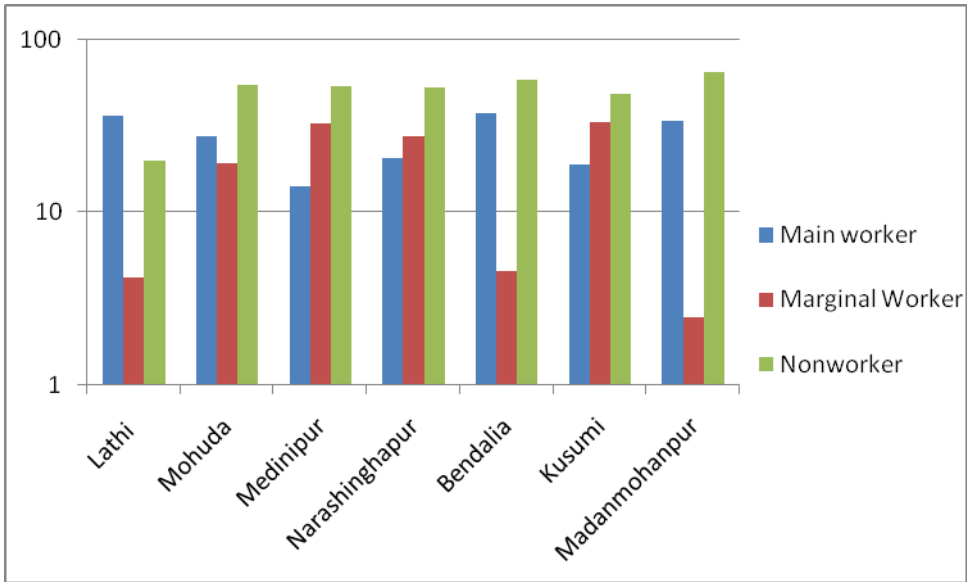
Courtesy: Census report Govt. of India, 2011.

3.16.5 Economic Activity & Livelihood Pattern

The relevance of economic activity and livelihood pattern is important in the context of the study since depending on the existing situation one can predict the impact of the project activity on the economy of the villages and the region.

As per the 2011 census, the workers are classified mainly as main workers, marginal workers and non-workers. In the study area the Madanmohanpur (64%) highest percentage of non worker population, it was followed by Bendalia (54%) and lowest percentages of non worker were found in Lathi (19%). And highest percentage of worker was found in kusumi (51%) followed by Narashinghapur (47%) The occupational pattern of the study area are shown in the Figure

Figure 3.39: Occupational pattern of the study area



Almost 50% of population in the study area villages is employed in the other workers category. Agricultural labourers comprise the second most important work category in the study area constituting about 28 % of the total workforce. The village wise workforce participation within the study area is provided in **Figure 3.40** below. The workforce participation for the study area is shown in the figure

Figure 3.40: Workforce participation for the study area

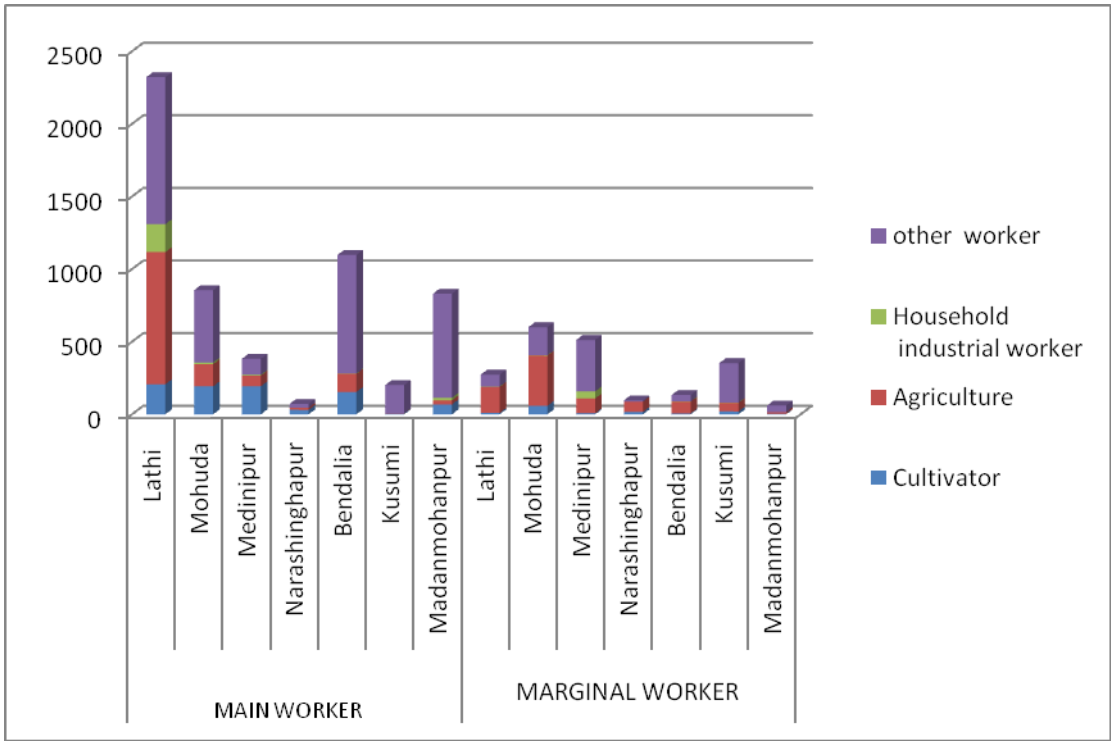


Table 3.32 : Occupational pattern of the study area

Name	TOT_WORK_P	TOT_WORK_M	TOT_WORK_F	MAINWORK_P	MAINWORK_M	MAINWORK_F	MARGWORK_P	MARGWORK_M	MARGWORK_F	NON_WORK_P
Chandapur	504	281	223	196	179	17	308	102	206	495
Medinipur	731	492	239	219	198	21	512	294	218	837
Buragam	72	33	39	10	9	1	62	24	38	62
Nunighara	46	22	24	22	21	1	24	1	23	56
Manahara	568	391	177	390	329	61	178	62	116	657
Sahala	843	585	258	591	476	115	252	109	143	1288
Kumarpur	725	458	267	543	383	160	182	75	107	775
Kusumi	554	333	221	201	126	75	353	207	146	520
Gobindapur	378	226	152	152	147	5	226	79	147	385
Lathi	2595	1946	649	2322	1842	480	273	104	169	3886
Mohada	1455	915	540	855	728	127	600	187	413	1686
Siriapur	54	46	8	46	42	4	8	4	4	84
Matiapalli	22	1	5	5	0	2	1	0	8	
Chakundajhola	41	22	19	2	1	1	39	21	18	20
Langaladei	899	637	262	862	615	247	37	22	15	1242
Chakundajhola	41	22	19	2	1	1	39	21	18	20
Raghunathapur	999	691	308	916	659	257	83	32	51	1906
Narasinghapur	168	86	82	72	63	9	96	23	73	183
Ambagada	549	418	131	447	389	58	102	29	73	993
Madhapur	7	6	1	0	0	0	7	6	1	0
Singabadi	451	281	170	299	252	47	152	29	123	486
Nuagan	227	217	10	65	61	4	162	156	6	561
Bendalia	1230	873	357	1097	850	247	133	23	110	1697
Matiapalli	34	30	4	23	22	1	11	8	3	106
Barapalli	645	364	281	408	277	131	237	87	150	552

Haladiapadar	1425	1135	290	1330	1082	248	95	53	42	2432
Modanamohanpur	891	672	219	830	651	179	61	21	40	1587
Ralaba	1048	763	285	936	713	223	112	50	62	1982
Jugudi	1225	781	444	641	509	132	584	272	312	1487
Jagadalpur	2430	1723	707	2081	1594	487	349	129	220	3733
Nimakhandi	867	765	102	621	562	59	246	203	43	1997
Bhabinipur	256	171	85	91	83	8	165	88	77	308
Khaira	525	302	223	367	262	105	158	40	118	512
Khajuria	31	13	18	6	6	0	25	7	18	25
Brahmapalli	28	28	0	28	28	0	0	0	0	71
Rangipur	681	431	250	507	345	162	174	86	88	803
Ralabha	2046	1251	795	1194	877	317	852	374	478	2359
Burukudi	516	393	123	394	348	46	122	45	77	642
Ambapua	578	521	57	375	358	17	203	163	40	1222
Kolathigam	1014	737	277	801	681	120	213	56	157	1286
Golanthara	2133	1527	606	1709	1350	359	424	177	247	2985
Chikarada	1193	720	473	655	466	189	538	254	284	1794
Kaithapalli	45	43	2	32	30	2	13	13	0	162
Dumdumi	174	132	42	122	97	25	52	35	17	500
Padmapur	951	546	405	570	436	134	381	110	271	940
Pattapur	331	189	142	236	127	109	95	62	33	285
Hinjalapali	360	210	150	263	179	84	97	31	66	461
Majhigam	27	14	13	22	13	9	5	1	4	29
Daspur	920	588	332	772	534	238	148	54	94	1628
Keluapalli	684	476	208	578	431	147	106	45	61	988
Belakudi	107	80	27	102	75	27	5	5	0	210
Gobindanagar	1027	730	297	343	315	28	684	415	269	1547

Chandapur	394	269	125	259	223	36	135	46	89	502
Jharapalli	31	14	17	15	13	2	16	1	15	34
Chandanpur	710	456	254	622	402	220	88	54	34	778
Jugudi	1225	781	444	641	509	132	584	272	312	1487
Kankya	536	273	263	444	242	202	92	31	61	437
Baliapata	384	299	85	308	290	18	76	9	67	632
Betajhari	61	40	21	49	39	10	12	1	11	67
Raiguda	44	35	9	43	34	9	1	1	0	87
Barigam	79	31	48	48	25	23	31	6	25	37
Belapanka	205	98	107	91	88	3	114	10	104	119
Lochapada	135	124	11	94	87	7	41	37	4	367
Kanthigada	71	34	37	5	3	2	66	31	35	55
Nuapalli	96	45	51	39	37	2	57	8	49	47
Arjunapalli	490	342	148	438	325	113	52	17	35	654
Teliapalli	80	37	43	3	1	2	77	36	41	22
Kumbharajholi	83	46	37	40	37	3	43	9	34	63
Bodalundi	69	34	35	10	7	3	59	27	32	54
Bhagabanpur	694	428	266	299	249	50	395	179	216	767
Baiganabadi	624	479	145	564	475	89	60	4	56	969
Biribadia	94	40	54	48	37	11	46	3	43	40
Dakhinapur	767	578	189	661	540	121	106	38	68	1085
Raijhala	581	354	227	256	241	15	325	113	212	804
Ankusapur	1839	1400	439	1413	1219	194	426	181	245	3509
Krupasindhupur	59	52	7	58	51	7	1	1	0	114
Borigam	1011	547	464	535	200	335	476	347	129	1013
Brahmapur (M.Corp.)	120553	97615	22938	110677	91637	19040	9876	5978	3898	236045

Courtesy: Census report Govt. of India, 2011.

3.16.6 Administrative and Legislative Setup of Ganjam

Ganjam has total geographical area of 8206.00 sq.km. It is Sub divided 3 divisions and it has 22 blocks with 475 gram panchayats. This district has 3212 villages out of which 400 villages are uninhabitated. Table below gives brief description of the administrative Setting in Ganjam district.

Table 3.33: Administrative and Legislative Setup of Ganjam district, Odisha

Sl.No.	*Administrative Unit*	*Numbers*
1.	*No. of subdivisions*	3
2.	*No. of* C.D Blocks	22
3.	*No. of* GPs	475
4.	*No. of* Villages	3212
	Inhabited	2812
	Un-inhabited	400
5.	*No. of* Police Stations	37
6.	*No. of* Municipalities	1

Source-: District Statistical Handbook 2009

3.16.7 Health Status

Health care system in Ganjam needs substantial improvement. The strength of doctors is not as per allocation. Besides, due to insecure and inadequate communication system, the doctors are unable to render services to patients and at most times it becomes impossible on their part to attend for follow-up actions in inaccessible and interior parts of the district. Table below gives details of the health centres.

Table 3.34: Health Status of Ganjam district, Odisha

Sl. No.	**Type of Health Centre**	**Nos.**
1	Govt Medical colleges/ Hospital	2
	Subdivision and other hospital	3
2	Community Health centre	30
3	Primary Health centre	89
4	Mobile health Unit	-
5	Ayurvedic Hospital and Dispensaries	49
6	Homoeopathic Hospital Dispensaries	44

Source: District Statistical Handbook 2009

3.16.8 Educational Facilities

The educational facilities in the district are very good due to the presence of good infrastructure for basic education like primary schools (5109 Nos) secondary school (624 Nos), and degree college (165 Nos) for higher education.

The educational facilities available in the district and in the study area are given in the table-3.35

Table 3.35: Educational Facilities in Ganjam District

Sl. No.	TYPE OF FACILITIES	NUMBER
1	Primary School	3607
2	Upper Primary School	1502
3	Secondary School	624
4	Govt. Junior College	5
5	Non Govt. Junior College	105
5	Govt. Degree College	5
6	Non Govt.Degree college	50

Source: District Statistical Handbook 2009

3.16.9 Agriculture

Agriculture is the backbone of the economy and around 80% people of Ganjam district depend on Agriculture and Allied Activities. Gross cropped area of Ganjam is estimated at 6.4 lakh ha.The total irrigated area so far surveyed is 293192 ha. for Kharif and 58730 ha. for Rabi crops. Therefore nearly 50% of the gross cropped area has got the possibility of getting irrigation facilities. As against this potential only 2.83 lakh ha. get actual irrigation facility to grow various crops. Therefore only 41.54% crops get irrigation facility. Different crops are sown under rainfed condition in nearly 58% of the cultivated areas. Except Jagannath Prasad block all the blocks of Ganjam have more than 35% of the cultivable land having irrigation facility from various sources. A variety of crops like paddy, groundnut, sugarcane, maize, oil seeds, millets, green gram, black gram, horse gram etc. are grown in the district. The agriculture data of the district is given in the **Table 3.36.**

Table 3.36 : Agriculture and Irrigation as per 2001 census Particulars

Sl. No.	Description	
1.	Major crop	Rice
		Wheat
		Maize
		Ragi
		Biri
		Mung
		Kulthi
		Cowpea
		Arhar
		Field pea
		Groundnut
		Sesame
		Caster
		Mustard
		Condiments & spices
		Sugarcane
3.	Area Irrigated by	High Capacity Deep Tubewell
		Middle Capacity Deep Tubewell
		Low Capacity Deep Tubewell
		River Lift Irrigation

3.16.10 Industry

The district has three medium scale industrial units namely, M/S Jayashree Chemicals (P) Ltd., M/S Aska Cooperative Sugar Industries and M/S Indian Rare Earths Ltd. Jayashree Chemicals located in Ganjam produces caustic soda, hydrochloric acid and chlorine with 580 employees. The Sugar Mill in Aska produces sugar, rectified spiritand Carbon dioxide and employs 2526 people. Indian Rare Earths produces Illuminite, Silliminite, Zircon, Rutil and Garnet. It is located in Matikhal and employs 1398 people. Aska Spinning Mill, which was earlier under public sector, has been privatized and runs as a private unit.

Table 3.37: Industries in the district

Particulars	Units (In No.)
Large & medium scale industry	5
Small scale industry	7776
Cottage industry	4221
Handloom industry	37

At present, MSW of Behrampur city is being openly dumped at the Chandania Pahad site without any protective base liner. The groundwater level at this site is high and the terrain being rocky, there is high possibility of leachate contaminating the groundwater if the site is left unattended. It is therefore recommended that a new landfill cell be constructed at Chandania Pahad for disposal of the accumulated waste and a SLF be developed at Mahuda village as an alternative site to the current one at Chandnia Pahad.

It has been assumed that the landfill cell at Chandania Pahad will accommodate the existing waste and the waste till the development of the landfill at the new site at Mahuda village. The project transition period has been estimated as 1.5 years from the appointed date. The total area of the site is 20.31 acre and part of the site is earmarked as DLC (District Level Committee) forest land. The non-forest part of the existing site will continue to be used for disposal of waste till the new treatment and disposal facility is commissioned.

Site was selected and judged by SENES consultant *through their study "Preliminary Environmental and Social Impact Assessment Report of Berhampur 2013 by SENES"*, and based on this study the site was selected as an alternative site with respect to presently used site, following site suitability criteria has been utilized in the report prepared by SENES Consultant to see the compatibility of site.

Table 4.1: Site Suitability Criteria for Waste Disposal and Processing Facility

Location Criteria		**Evaluation of the Proposed Site at Mahuda Village**
Aspects	***Exclusion Limit / Desired Criteria***	
Proximity to Residential, Recreation, Agricultural, Natural Protected Areas, or Wildlife Habitat & Areas Prone to Scavenging Wildlife, as well as Other Potentially Incompatible Land uses		
Residential development	250 m from the proposed landfill cell development	The settlements at Mahuda village are at an aerial distance of about 1.1 Km from the boundary of the proposed site. In fact, the settlement is at the other site of the hillock at the base of which the proposed site is being planned. The office and residential campus of GRAM VIKAS - an NGO is located at a distance of approximately 900 m from the boundary of the proposed site. The residential campus has about 70 inhabitants
Visual impacts	Minimized by evaluating locational alternatives	No alternative sites are available. Considering the fact that site is outside municipal limits, sufficiently distant from major settlements, visually screened due to presence of hillocks, any significant

		visual impact is not envisaged.
Airport	3 km of turbojet airport & 1.6 km of pistontype airport	No airports are located within 3 Km of the site
B Proximity & Use of Groundwater & Surface Water Resources		
Private/public drinking, irrigation, or livestock water supply wells located down gradient of landfill	500 m from the site perimeter	No water bodies utilized for private/public drinking, irrigation, or livestock water supply are located within 500 m from the site. The nearest water body is a pond at about 1 Km from the northwestern side of the proposed site.
10-year groundwater recharge area for existing or pending water supply development	Outside the landfill area	No groundwater recharge area for any water supply development (existing /proposed) is located within the site
Perennial stream	300 m down gradient of the proposed landfill cell	No perennial stream is located within 300m (down gradient) of the site
Site Geology and Hydrogeology		
Topography	Located in gently sloped topography, amenable to development using the cell (bund) method, with slopes which minimize need for earthmoving to obtain correct leachate drainage slope of about 2%	Site is bounded by small hillocks and there is a flat land in between the hillocks. The flat land has gradient slope towards the southern side. There is difference of elevation of approx. 2 m from the north end of flat land to south end of the flat land. Rocky elevated areas approx. 2 m high is at the eastern side of the proposed site and also at the southern part (10-15m)
Groundwater's seasonally high table level (i.e. 10 year high)	At least 1.5 m below the proposed base of any excavation or site preparation	Based on the elevation profile of the site from the neighbouring groundwater wells. It is assessed that the post monsoon depth to groundwater at the proposed disposal site is around 10m from the ground level and base of the future landfill is proposed to be at 6m from the ground level which is approximately 4m above the post monsoon water level on site. The neighbouring groundwater wells are located within the campus of GRAM VIKAS and they maintain records of seasonal groundwater levels for open wells within their campus.
Suitable soil cover material	Available on-site to meet the needs for	Cover materials will be available at site resulting from cut-fill operations for

	intermediate and final cover, as well as bund construction	developing the facility (approximately 63000 m^3).
Potential Threats to Landfill Site Integrity from Natural Hazards (Floods, Landslides and Earthquakes)		
Flood Plain	Outside of floodplains subject to 10-yr floods and, if within areas subject to a 100-yr flood, amenable to economic design to eliminate potential for washout	Site is not located in a flood plain
MSW Rules, 2000		
The landfill site shall be away from habitation clusters, forest areas, water bodies monuments, national parks, wetlands and places of important cultural, historical or religious interest	Not Specified	No such features were observed within 500m of the site.
A buffer zone of no-development shall be maintained around landfill site and shall be incorporated in the Town Planning Department's land-use plans	Not Specified	Berhampur Development Authority needs to notify no-development zone around the site

(Source: Preliminary Environmental and Social Impact Assessment Report of Berhampur 2013 by SENES)

CHAPTER -5
IMPACT PREDICTION AND ASSESSMENT

5.1 IMPACT ASSESSMENT OF PROPOSED ISWM PROJECT

5.1.1 Impacts associated with Specific Construction Activities

a. Water Quality: Sources & Types of Impacts

The major sources of construction related impacts on water quality will be from erosion of the disturbed areas required for the construction activities (construction sites, material storage areas, vehicle maintenance areas, spoil disposal areas), from waste water discharge from the construction workforce camps and from contaminated water (oil, grease, petrochemical, cement, chemicals) resulting from various construction activities. The primary impact is the potential for introducing sediments and pollutants to the adjacent water body during the period of construction, thereby affecting aquatic habitats, fishes and water sources for residents & wildlife downstream of the water body. However, since there are no surface water body existing close to the site, this impact is not likely to affect the surface water environment. But cutting, filling, leveling and grading operations might slightly disturb ground water countor. The site formation may produce large quantities of run-off with high suspended solids loading in the absence of appropriate mitigation measures. This potential problem may be aggravated during rainy season. Further, impacts will be temporary in nature and can be controlled by suitable environmental management plan, to be prepared and implemented by the Project developer.

b. Air Quality: Source and Types of Impacts

Construction Phase

Vehicles and stationary equipment will impact air quality at the construction site through emissions from the engines. Additionally, site preparation activities, construction work and movement of vehicles along unpaved road will generate dust and impact air quality. Liner installation on the landfill will also result in air borne particles carried into the ambient air. The burning of the waste from worker camp will also affect air quality. Air quality impact will be temporary in nature and will stop when construction is over. A dust and emission control plan will be prepared and implemented by the project developer.

c. Noise: Source and types of impacts

Sources of noise will be the vehicles and equipment for excavation/drilling and stationary equipment. Other sources of noise and vibration will be activities for the foundation and drilling for superstructures to be built.

Noise in and around the construction site may affect the animal and residents in the surrounding areas. Habitation around site is very less and animals in the area will have tendency to move away from the noise and eventually return to the area when construction is complete. A noise control and management will be prepared and implemented by the project developer.

Impacts of Solid Waste Generation

This category of waste generation in the proposed project is due to different types of raw materials being used during construction stage in general may comprise the following.

- Cement concrete
- Bricks, tiles,
- Cement plaster
- Steel (RCC, door/ window frames, roofing support, railings of staircase etc)
- Rubble, sand, Stone (Marble, granite, sand stone)
- Timber/wood
- Paints/varnishes

Besides above there are some major and minor components namely conduits, pipes, electrical fixtures, panels, etc. all the above items will be segregated and stored at the site and once the facility established will be process the same in respective treatment facilities within the site.

Impact on Flora, Fauna & Wildlife Habitat

All the construction activities of landfill site and waste treatment facility will be taken place in the non-forest area. Therefore, there is no scope of destruction of natural habitat and habitat fragmentation. Again the proposed site has no mature trees only few shrubs and grasses- this may provide the habitat for few ground dwelling birds and reptiles. The site preparation would not have major impact on the flora and fauna. However, review of the ecological conditions of the exploratory block revealed no flora or floral assemblages that are unique to the sites or are listed as protected or threatened plant species and also there is no sensitive ecological habitat in the entire study area.

d. Areas to be cleared: Source and types of impacts

Approximately 33.62 acre of areas will be cleared and leveled to enable storage of equipment, materials and for the construction of the proposed landfill & its facilities. As site is mostly covered with bushes, shrubs there is no major impact.

e. Quarries/ Borrow Pits: Source and types of impacts

Aggregate, sand, Murram may be required for various project uses, such as road base, as well as for works involving concrete constructions. Some potential quarry sites/borrow pits may be identified as sources of these materials.

Opening of the quarries in hilly terrain will cause visual impacts because they remove a significant part of the hills, however, since there is already a quary operational in the surrounding of the site that can be utilized for supplying the demand of the project. In case, project developer decids to go for another quarry/borrow pit then Borrow pits if left without rehabilitation may cause accident. Other impacts will be the noise generated during aggregate acquisition through crushing, which could affect wildlife and habitation in the area. Dust produced during the crushing operation to get the aggregates to the appropriate size and transport of the aggregates will lead to air pollution in the environment. A quarry/borrow pit management plan will be prepared and implemented by the contractor.

f. Work Camps, Work Areas & Labour Force: Source and types of impacts

Potential impacts from the workforce and the work camps in all construction areas will be in terms of additional pressure on land and natural resources. There will be generation of solid

and liquid wastes. Additionally, the spontaneous development near the construction camps could create public health risks.

Around 60 workers will be engaged in the construction work at Mohuda. Approximately 6.480 KLD sewage and 27 kg of solid waste will be generated at this site during construction.Wastewater from the work camps could cause water quality problems in the adjacent water body. Inappropriate solid waste disposal could lead to the contamination of the soil and surface water body, and the spread of communicable diseases. Project developer will prepare a plan for managing work camps and labour force.

5.1.2 Other Impacts associated with Construction Activities & Project Developments

a. Public Health

The influx of migrant labour into the area will be associated with an augmented risk of transmission of diseases, including sexually transmitted diseases. More traffic on the roads during construction could increase accidents within communities living adjacent to the roads.

Aquatic invertebrates known to be vectors of disease could inhabit stagnant water created during construction. The increased prevalence of such diseases may impact the health of communities and the construction workforce.

b. Interference with Movements of Animals

Construction activities, human presence and traffic will interfere with the natural movement of animal in the area especially in the forest and hill side.

c. Damage to Physical cultural and archaeological resources

There is no physical cultural resource within the site and hence this issue is not significant

d. Traffic related Impact

Approximatly 15-18 compactors will be collect the solid waste from the city to landfill. There may be increase in accidents on road due to movement of vehicle with heavy load and increased number of vehicles which will lead to road congestion

5.2 IMPACTS ASSOCIATED WITH OPERATION PHASE ACTIVITIES

Environmental and social impacts during operation phase of the project are mainly divided into six categories for discussion here: (1) Impacts from Compost/RDF plant;(2) impacts from landfill gas emissions ;(3) emissions form the operation of DG set and use of fuel to RDF plant (4) Handling and storage of oil/chemicals and fuels;(5) Handling and disposal of domestic liquid and solid waste;(6) Impact from landfill leachate. These impacts are discussed in detail in following sections.

5.2.1 Impacts from Compost/ RDF plant

Following are the key impacts that can be linked to compost and RDF plant operation:

- Odour nuisance in the surrounding
- Noise pollution in the close vicinity
- Air pollution is not likely to be significant although small effect is foreseen
- Visual impact for local habitants

5.2.2 Potential impacts from landfill gas

As per our proposal there will be there will be segregatin of inert waste and biodegradable waste. And biodegradable waste will go to compost plant and inert material will go to landfill. 100 % segregation in Indian condition might not be possible so very small amount of landfill gas will be released to the atmosphere.

5.2.3 Emission from operation of DG set occasionally and use of support fuel

DG set will emit air pollution during its occasional operation in times of power failure.

5.2.4 Spillage and leakage of oil/chemicals

Oil and chemical spillage during handling and storage process may lead to water and land contamination in the immediate vicinity of the activity area. During rains, water contamination may extend to larger distance.

5.2.5 Discharge of domestic liquid & solid waste

Office setup and daily routine activities at the site will generate domestic wastewater, which if discharged without proper treatment and disposal, will cause pollution of nearby surface and ground water body. Municipal solid waste, generated from daily activities, will require proper collection and disposal for good housekeeping and sanitation purposes.

Impact on Bird

The landfill will provide a ready source is of food. The number and abundance of bird species at the site may increase and scavenger bird species may increase. If birds feed on contaminants present in the waste, the effects of bio-accumulation may spread across enormous distances and affect stock of birds which live and breed far away from the project area. These impacts are temporary in duration, with no-long term effects. They will be minimized by the application of daily cover to active waste area.

5.2.6 Leachate from landfill

Leachate from landfill operation has great potential to cause damage to water receiving bodies. Proposed site faces the same issue and project developer shall have to plan leachate management in adequate manner.

5.3 IMPACT ASSOCIATED WITH CLOSURE AND POST CLOSURE PHASE ACTIVITIES

It has been experienced that occasional explosion takes place in closed landfill site due to methane gas release. This causes accident and health impact on the local people who may be there at the location by chance. There may be possibility of similar occurrence at proposed site

Decommissioning of the landfill site alongwith compost/RDF plant will generate dust, noise and debris, which may create pollution if not handled properly.

After the closure of the landfill, there can still be need for continuing operation of leachate treatment plant until a time by when it could be established that leachate is no longer an issue at the site.

5.4 IMPACT ASSOCIATED WITH COMMUNITY ISSUES

(a) Breeding of mosquitoes, vectors and flies

This will be an adverse impact, as landfill site will be cause risk of breeding.

(b) Littering of waste in residential and commercial area

Littering of waste from the waste transport vehicles may cause nuisance to local public whose houses and shops may be located on the sides to road for transport of garbage vehicles. There will be litering from blown wind from landfill site. This need to be addressed by providing a nylon wire net of up to 10 – 15 m high towards the prominent wind direction.

(c) Unauthorized entry in landfill

Operation of the landfill site may cause unauthorized entry which may lead to accidents and health impact of intruders. So this land fill area will be fenched or hedged with a proper gate to prevent unauthorized entry.

(d) Increase in disease occurrence rate in local community

Currently there is no significant settlement around the site,however,it may increase after the landfill site is operational. In that case,there will be chances of disease in local people from the impact of landfill.A bufferzone must be developed around site to prevent local settlement around site.

(d) Social conflict among construction workers and labour camps

Migrated workers may create law and order problems with local community in the area.However, this is not anticipated to be severe issue because there not much settlements at and around site.

(f) Social conflict between transport drivers and local community

Rash and unsafe driving practices causing accident may create conflict between drivers and local community.

(g) Health impact from landfill gas

Unauthroised persons in the landfill site may be exposed to the health impact from landfill gas. This need to be addressed by providing fence all around along with security guard.

(h)Health and safety of scavengers

Scavenging activity if done in uncontrolled manner without PPEs (Personal Protective Equipment) will cause health and safety concerns for scavengers**.** This need to be addressed by providing fence all around along with security guard

5.5 SUMMARY

Table 5.2 below summarizes the environmental, community, health & safety issues and significance level of their impacts that may be generated by the proposed integrated municipal solid waste landfill project. Suitable mitigation measures will be planned and implemented to control these impacts. Nature of impacts has been analyzed on the basis of following criteria.

Nature	: Positive/ Adverse
Duration	: Short term/ Long term/ Continuous
Likelihood	: Low/ Medium/High
Duration significance	: Localised/Minor/Major
Reversible/irreversible	: Can the Impact be reversed?

An objective judgment has been made on the basis of above criteria for arising at potential of impact due to activities of the project.

Table 5.1: Environmental, Community, Health & Safety Issues and Significance level of their Impacts from project

S.N.	Environmental/Social Aspect	Main source of Aspects	Impact					
			Nature	Duration	likelihood	Significance	Reversible/ Irreversible	Potential
Environment								
Construction phase								
1	Air quality Degradation	Land preparation for construction activity	Adverse	Short term/ Continuous	High	Minor	Reversible	Medium
		Emissions from DG set and vehicular movement	Adverse	Short term	Medium	Localized	Reversible	Low
		Installation of plant equipment and cover over the landfill	Adverse	Long term	High	Major	Reversible	High
		Quarrying activity	Adverse	Long term	Low	Localized	Reversible	Low
2	Ground water and land contamination	Liquid and solid waste discharge from labour camp and work area	Adverse	Short term	High	Minor	Reversible	Medium
3	Noise	Land preparation and plant construction activity	Adverse	Short term	Medium	Localized	Reversible	Low
4	Change in drainage pattern	Interference with natural drainage of the area due to construction activity	Adverse	Long term	Low	Localized	Irreversible	Low

5	Damage to vegetation and Biodiversity	Construction activity and land clearance for site set up	Adverse	Short term	Medium	Minor	Irreversible	Medium
6	Oil/chemical spillage and leakage	Construction activity	Adverse	Short term	High	Localized	Reversible	Low
7	Damage to acquitic environment	Liquid and solid waste discharge in nearby aquatic body	Adverse	Short term	Low	Minor	Reversible	Low
8	Damage to aesthetic value and landuse of the area	Site setting and quarry/borrow pit use	adverse	Short term	Low	Minor	Reversible	Low
9	Disturbance to traffic	Increased vehicular movement of construction vehicles	adverse	Short term	low	Minor	Reversible	Low
Operation phase								
9	Air pollution	Landfil operation activities, Composting and RDF Plant activities	Adverse	Long term	Low	Minor	Irreversible	Low
10	Odour nuisance in the surrounding		Adverse	Long term	High	Minor	Irreversible	High
11	Noise pollution in the close vicinity		Adverse	Long term	Medium	Minor	Reversible	Low

13	Visual impact for local habitants		Adverse	Long term	Medium	Minor	Irreversible	Low
15	Leachata generation	Landfill layers without liners	Adverse	Long term	High	High	Irreversible	High
16	Air emission and noise	Operation of DG set	Adverse	Localized	Low	Localized	Reversible	Low
17	Water and land contamination	Handling and storage of oil/chemical and fuels	Adverse	Short term	Low	Minor	Reversible	Low
18	Water and land contamination	Handling and disposal of domestic waste water and solid waste	Adverse	Short term	Low	Minor	Reversible	Low
19	Water and land contamination	Handling and disposal of solid waste from conditioning process of flaring activity	Adverse	Short term	Low	Localized	Reversible	Low
Closure/Post closure								
20	Leachate generation	From landfill where leachate generation can continue even after life of site is over	Adverse	Long term	Medium	Minor	Reversible	Medium
21	Air emission, noise and solid waste generation	Decommissioning of landfill site	Adverse	Localized	Medium	Low	Reversible	Low
Community Issues								

22	Breeding of mosquitoes,vectors and flies	Landfill operation	Adverse	Long term	High	Minor	Reversible	Medium
23	Littering of waste in residential and commercial area	Waste transportation to the site	Adverse	Short term	High	Minor		High
25	Unauthorized entry in landfill	Unfenced and unguarded landfill site operation	adverse	Long term	Minor	Localized		Medium
26	Increase in disease occurrence rate in local community	Operation without buffer zone development	Positive	Long term	Minor	Localized		Medium
26	Social conflict among construction workers and labour camps	Migrated workers may create law and order problems with local community in the area	Adverse	Short term	Medium	Minor	Reversble	Medium
29	Social conflict between transport drivers and local community	Littering of waste,Rash and unsafe driving practices causing accidents may create conflict between drivers and local community	Adverse	Short term	Medium	Minor	Reversible	Medium

Occupational Health & Safety								
30	Occupational health and safety	For labour and workmen during construction and operation activity at landfill,compost and RDF plants	Adverse	Long term	High	Minor/Major	Reversible	High
31	Health and safety of scavengers	Seggregation of waste by scaveners on running landfill	Adverse	Long term	High	Localized	Reversible	High
32	Health and safety	Uncontrolled flaring of landfill gas and explosions thereof causing danger to onsite workmen as well as scaveners on the landfill	Adverse	Longterm	High	Localised	Reversible	High

CHAPTER-6
ENVIRONMENTAL MANAGEMENT PLAN

Environment Management Plan (EMP) is a site specific plan developed to ensure that the project is implemented in an environmental sustainable manner. EMP also ensures that project implementation is carried out in accordance with design by taking appropriate mitigation measures to minimize impacts on the environment during construction and operational phase. EMP will outline Environmental aspects of concern as well as their level of risk and environmental protection measures to diminish this risk. It emphasizes how the development may impact on relevant environmental factors and how these impacts may be mitigated and managed so as to be environmentally acceptable. Environment Management Plan (EMP) plays a vital role in safeguarding the environment and ensures, all involved parties understand the potential environmental risks arising from the proposed project. Environmental monitoring, mitigation program and implementation arrangements are detailed out in subsequent sections of this chapter

6.1 AIR ENVIRONMENT

Construction Phase

- The control measures proposed to be taken up are given below.
  There is a quarry close to the proposed site which can supply raw material for construction work. However, if project developer needs to go for new boroow pit for some reasons,siting of borrow areas shall be away from human settlement/habitation and sensitive receptors.
- Vehicles delivering raw materials like soil and fine aggregates shall be covered to prevent fugitive emissions.
- Storage and handling of raw material and debris to be carefully managed to prevent generation of fugitive dust.
- Sprinkling of water on earthworks, material haulage and transportation routes on a regular basis during dry season.
- All vehicles, equipment and machinery used for construction will be subjected to preventive maintenance as per manufacturer norms.
- All vehicles utilized in transportation of raw material and personnel will have valid Pollution under Control Certificate (PUC). Vehicular exhaust will be complying with the CPCB specified emission norms for heavy diesel vehicles.
- The top soil generated from site clearance activities will be stored in designated area for further use and stabilized to prevent fugitive dust emissions.
- Adequate stack height shall be provided to DG sets in accordance CPCB standards.

Operation phase

Mitigation measures to address the air quality impacts resulting from vehicular movement, operation of heavy construction machineries and material handling are similar as discussed above with additional mitigation measures below:

- Ensure covered transportation for waste haulage to the landfill site.
- Regular water sprinkling will be done along haulage roads utilized for transportation of cover material. Dust suppression will be carried out along project traffic routes lying close to residential areas and other sensitive locations viz. schools, colleges etc;
- Routine and scheduled maintenance of engine of vehicles and equipments (compressors, generators etc) will be ensured so that exhaust emissions do not breach

statutory limits set for that vehicle/equipment type and mode of operation. All vehicles and equipment will be maintained in accordance with manufacturers guidance;

- Green belt will be developed in accordance to "Green Belt Development Plan" along internal roads and boundary of site to prevent any offsite dispersion of air pollutants. The green belt will also be serving as wind abatement system to prevent any generation of wind blow dust onsite. Approximately green belt will be developed in 11 acrea land. And species like Anacardium occidentale (Cashew), *Bambusa arundinacea (*Baunsa*), Cassia siamea* L.(Chakunda).
- Establishing frequent waste collections schedules and optimize waste collection routes to minimize distance traveled and overall fuel use and emissions.
- Instituting a washing program for waste collection vehicles to prevent generation of dust and bioaerosols.
- Use of herbicide/mist sprays to keep down dusts and odors, especially during and prior to waste loading and other handling procedures.
- Use of windrow turning equipment that is specially designed to minimize air emissions
- Use of dust suppression sytems on conveyers used in compost plant
- Enclose leachate drains to reduce the emission of odors.
- Optimize water use in the composting process to avoid anaerobic conditions that can cause hydrogen sulfide odors if the compost mixture contains sulfur-containing materials.
- Application of daily soil cover and compaction of landfill waste to reduce odor generation.
- Adequate stack height shall be provided to DG sets in accordance CPCB standards
- Address letring issue from landfill operations and also odour problem from compost yard by spraying inoculums over windrose

6.2 WATER ENVIRONMENT

Construction Phase

Leveling and grading operations will be undertaken with minimal disturbance to the existing contour thereby maintaining the general slope of site.

- Disruption/alteration of micro-watershed drainage pattern at the project will be minimized to the extent possible through provision of alternate drainage thereby preventing localized water logging.
- Minimize clearing and construction activities during monsoon season (as far as practicable). Construction work close to the streams or water bodies will be avoided during monsoon
- During site preparation and construction, surface water run-off will be managed through implementation of proper stormwater drainage system onsite.
- Fuel and lubricant drums will be stored in bunded and lined area equipped with proper spill control equipment.
- Sediment filters and oil-water interceptor will be installed by the Contractor to intercept run-off and remove sediment before it enters drainage water courses.
- Cutting and filling operations will be undertaken in accordance to existing ground water contours. Site is undulating so cutting and filling will be maximized for balancing each other.
- Care will be taken to prevent any damage to fracture and joints serving as ground water reservoirs generally manifested in the form of gravity springs in this area.

Operation Phase

- Regular inspection of surface water drainage/diversion system and sediment controls will be done.
- Run-off from vehicular wash areas will be channeled through closed drainage system provided with an oil-water separator prior to disposal to nearby drainage channels/surface water bodies. Spill kits will be made available in these areas.
- Drip trays will be used during preventive maintenance of vehicles and machineries.
- Regular supervision of landfill embankment will be done by onsite personnel.
- Rainwater running off slopes above and outside the landfill area should be intercepted and channelled to siltation chamber without entering the operational area of the site. This diversion channel may require a low permeability lining to prevent leakage into the landfill.
- Discharge of collected run-off in the siltation chamber to nearby drainage channels will be conforming to CPCB Inland Water Discharge Standards.
- Rain falling on active tipping areas should be collected separately and managed as leachate, via the leachate collection drain and leachate collection sumps to the leachate treatment and disposal system.
- Domestic waste problem will be solved by diverting sewage to leachate treatment system.

6.3 NOISE LEVELS

Construction

- Use of low noise generating equipment equipped with engineering controls viz. mufflers, silencers etc
- Periodic preventive maintenance of DG sets and vehicles will be carried out as per manufacturer□s schedule to ensure compliance with noise limits specified by CPCB for vehicles and DG sets.
- All high noise generating equipments will be identified and subjected to periodic preventive maintenance.
- No night time operation of vehicles and construction activities will be undertaken.

Operations

- Mitigation measures to address the noise quality impacts resulting from vehicular movement, operation of heavy construction machineries and material handling are similar to as discussed above with additional mitigation measures are given below:
- Provision of peripheral green belt will be provided in accordance with "*Green Belt Development Plan*" to serve as an acoustic barrier;
- Equipment with low noise emission levels will only be procured and all noise generating operations will be restricted during daytime;
- Periodic monitoring of noise levels on site and at nearby receptors shall be carried out to ensure compliance with Noise Pollution (Regulation & Control) Rules 2000.

6.4 SOLID WASTE

- The solid waste will be predominantly inert in nature. Hence effort would be made to reuse and recycle all solid waste for filing/ levelling of low-laying areas with in the site.
- Construction waste shall be stored within the site and covered by a net in order to scattereing of waste causing pollution.

- Waste will be segregated into heaps as far as possible to facilitate further gradation and reuse
- Materials, which can be reused for purpose of construction, levelling, making roads/ pavement will also be kept in separate heaps from those which are to be sold or land filled.
- A majority of construction materials are durable and therefore, have a high potential for reuse. It would, however, be desirable to have quality standards for the recycled materials. Unusable material will be sold off in the open market

6.5 COMMUNITY HEALTH & SAFETY

Community health and safety impacts in operation stage of the landfill will be managed in accordance with specific provision outlined in the Landfill Gas Management Plan & Leachate Management Plan with additional mitigation measures enumerated below:

(i)Traffic: Heavy vehicular traffic will be managed through (a) routing to avoid residential areas (b) using time division for one-way routes to avoid traffic conflict in narrow roads (c) carrying out road improvements on urgent basis whenever situations arise (d) restrictions on traffic movement hours which are staggered with respect to peak traffic hours.
(ii) Noise: Adverse impacts on the local community from noise may arise from a number of sources including - throughput of vehicles and fixed and mobile plant, for example compactors, generators at the site. Peripheral noise abatement site measures will be implemented.

(iii) Odour: Offensive odours at landfill sites may emanate from a number of sources, including waste materials, which have decomposed significantly prior to landfilling, leachates and leachate treatment systems, compost plant, and landfill gas. Good landfill practices will greatly reduce general site smell and reduce impact from odours which could lead to complaints from the local community, site users and site staff. Good practice includes: (a) adequate compaction of waste on daily and immediate basis; (b) speedy disposal and burial of malodorous wastes; (c) Efficient use of appropriate types of daily cover; (d) progressive capping and restoration of landfill cells; (e) Scientific landfill gas management; (f) effective leachate management and (g) consideration of prevailing wind direction when planning leachate treatment plants, gas flares, and direction of tipping, (h)Spraying of inoculums over waste storage for odour control.

(iv) Litter: Poor litter control both on and off site is particularly offensive to neighbouring communities. Good operational practice should be adhered to in terms of waste discharge, placement, compaction and covering to minimize the occurrence of windblown litter. Measures for controlling litter include: (a) consideration of prevailing wind direction and strength when planning the filling direction and sequence (b) Strategically placed mobile screen close to the tipping area or on the nearest downwind crest (c) Temporary banks and bunds immediately adjacent to the tipping area (d) Permanent catch fences and netting to trap windblown litter (e) covered waste transport vehicles shall be used (f) Restricting incoming vehicles to only those which are sheeted and secured will reduce litter problems on the highways. Litter pickers should be employed to collect litter which escapes the preventative measures. Litter screens, fences, nets and perimeter ditches should be maintained free of litter.

(v) Bird Control: Birds are attracted to landfill sites in large numbers, particularly where sites receive appreciable amounts of food wastes. Bird control techniques should be carefully planned taking into account the species likely to be affected. Measures which can be used to mitigate bird nuisance include the employment of good landfill practice, working in small active areas and progressive prompt covering of waste, together with the use of bird scaring techniques.

(vi) Vermin and Other Pests: Landfills have potential to harbour flies and vermin. Modern landfilling techniques including prompt emplacement, consolidation and covering of wastes in well defined cells are effective in the prevention of infestation by rodents and insects. Rats and flies are the main pests which require control. Effective measures to deal with rodent infestation will include regular visits by pest control contractors or fully trained operatives. The use of insecticides on exposed faces and flanks of the tipping area, by spraying and fogging, will be used as an effective means of exterminating insects.

(vii)Dust from roads: Dust suppression on road will be acheived by (a) limiting vehicle speed; and (b) spraying internal roads with water.

6.6 SOCIO-ECONOMIC

The Socio–economic impacts from the project will be mitigated by multiple measures such as greenbelt development plan, leachate treatment plan, odor control & mitigation measures and dust & noise control measures. These are further explained in detailed Closure Plan.

6.7 ROAD SAFETY & TRAFFIC MANAGEMENT PLAN

- Vehicular movement involved in sourcing and transportation of borrow material will be restricted to defined access routes in consultation with concerned authorities.
- Precautions will be taken by the contractor to avoid damage to the public access routes including highways during vehicular movement.
- Provision will be made for safe and convenient passage for vehicles, pedestrians and livestock to and from side roads and property accesses along defined project routes.
- Movement of vehicles during night time will be restricted. Speed limits will be maintained by vehicles involved in transportation of raw material and segregated waste.
- Regular supervision will be carried out control vehicular traffic movement along defined traffic routes particularly near identified sensitive receptors.
- Routine maintenance of project vehicles will be ensured to prevent any abnormal emissions and high noise generation.
- Adequate training on traffic and road safety operations will be imparted to the drivers of project vehicles. Road safety awareness programs will be organized in coordination with concerned authorities to sensitize target groups viz. school children, commuters on traffic safety rules and signages.

6.8 OCCUPATIONAL HEALTH & SAFETY MANAGEMENT PLAN

Construction Phase

- All machines to be used in the construction will conform to the relevant Indian Standards (IS) codes, will be kept in good working order, will be regularly inspected

and properly maintained as per IS provisions and to the satisfaction of the site Engineer.

- Contractor workers involved in the handling of construction materials viz. borrow material, cement etc will be provided with proper PPEs viz. safety boots, nose masks etc.
- No employee will be exposed to a noise level greater than 85 dB(A) for a duration of more than 8 hours per day. Provision of ear plugs, ear muffs etc and rotation of workers operating near high noise generating areas.
- Health problems of the workers should be taken care of by providing basic health care facilities through health centres temporarily set up for construction workforce.
- The sewage system for the construction camp will be properly designed, built and operated so that no health hazard occurs. Adequate sanitation and drinking facilities will be provided onsite for the operational workforce both during construction and operational phase of the project.
- Training programs will be organized for the operational workforce regarding proper usage of PPEs, handling and storage of fuels and chemicals etc.

Operations

Following measures are suggested for occupational health and safety of operators at landfill site during operation phase.

- Compaction of wastes will be regularly done in thin layers using heavy equipment and placement of regular cover material over each compacted layer of waste, so that any underground fires within a waste cell are not able to spread throughout the landfill and lead to significant cave-ins,which are common phenomenon in poorly managed landfills
- Properly planned Ventilation of landfill gas shall be ensured so that underground fires and explosions do not occur.
- Use maximum side slopes of 3:1 in non-seismic areas and lower slopes (e.g., 5:1) in seismic areas, with regular drainage of water so that saturated conditions do not develop and lead to slope subsidence;
- Provide workers with appropriate protective clothing, gloves, respiratory face masks and slip-resistant shoes for waste transport workers and hard-soled safety shoes for all workers to avoid puncture wounds to the feet.
- Provide refuse collection vehicles and landfill equipment with audible reversing alarms and visible reversing lights;
- Restrict access to disposal sites such that only safety trained personnel with protective gear are permitted to high-risk areas;
- Use automated systems to sort waste to the extent practical in order to minimize contact with the waste;
- Establish engineering and materials norms for special facility and stationary equipment design requirements that minimize exposure to hazards (e.g., ventilation, air conditioning, enclosed conveyor belts, low loading
- The workplace must be equipped with fire detectors, alarm systems and fire-fighting equipment. The equipment shall be periodically inspected and maintained in good working condition.
- Provision of adequate ventilation of occupied buildings to avoid accumulation of hydrogen sulfide gas.
- Control and characterize incoming waste

- Provide adequate personnel facilities, including washing areas and areas to change clothes before and after work.
- Monitor breathing zone air quality in work areas at processing and disposal facilities. Direct-reading instruments that measure methane and oxygen deficiency are of primary importance; these include combustible gas indicators, flame ionization detectors, and oxygen meters.
- Provide worker immunization and health monitoring (e.g. for Hepatitis B and tetanus).
- Maintain good housekeeping in waste processing and storage areas.
- Use automatic (non-manual) waste handling methods if practical.
- For landfills, promptly emplace, compact and cover of wastes in defined cells, especially for waste with the potential to attract vermin and flies.
- Clean and wash with disinfectant the cabins of heavy mobile equipment used at regular intervals;
- For composting, maintain aerobic conditions and proper temperatures in the windrows. Isolate workers from spore dispersing components of the composting process such as mechanical turning.
- Maintain adequate temperature and retention time in biological treatment systems to achieve pathogen destruction.
- Pre-process and post-process rejects need to be removed from the processing facility on regular basis and will not be allowed to pile at the site.
- Grade the area properly to prevent ponding (to minimize insect breeding areas);
- Use integrated pest control approaches to control vermin levels, treating infested areas, such as exposed faces and flanks with insecticide, if necessary.
- Provide and require use of dust masks or respirators under dry and dusty conditions (e.g., when compost is being turned).
- Provide prompt medical attention for cuts and bruises. Cover open wounds to prevent contact with the incoming loads or feedstock.
- Fully enclose the waste management site with fencing so that no livestock or wildlife is able to come in contact with the waste, which contains significant potential to enable the spread of livestock and zoonotic disease, as well as spillover disease to wildlife. Provide daily cover of wastes to minimize the attraction to birds, which can become infected with avian influenza and other bird diseases that can then be carried off-site.

Post Closure Operation and Maintenance Plan for the Landfill

This chapter includes the Operation and Maintenance plan for the sanitary landfill after closure and post closure scenario:

Closure Plan

The closure for the landfill includes

- Development of Closure Plan comprising of plans for compaction and movement of waste in appropriate manner
- Laying of Cover Layers Comprising of Placing of HDPE liner, protective layers on both sides of the HDPE liner, Drainage layers and final top soil and green cover
- Construction of Leachate collection systems
    - Construction of Gas collection wells, gas collection manifold and flaring system.
    - Construction of Strom water drains

- Construction of access roads

The steps for the closure plan are: Waste Compaction and Movement The incoming waste will be transported to the appropriate area within the landfill and compacted. Lying of Cover Layers As a waste management unit, a landfill, when completed, must continue to function effectively as an environmental control unit for solid wastes for a long time into the future. As landfill regulations have become more prescriptive, many states have required the development of a landfill closure plan as a part of the site approval process, before construction and land filling operations begin. The closure plan must show all features of the completed site and identify the agencies responsible for implementing closure of facilities. The components of the landfill closure would be:

Section level and compact the final a formation of the MSW as per the MSW Rules 2000. The slopes provided will be 1:3.

- Gravel Layer: This layer will be 30cm thick and made up of C & D debris or gravel as the case may be, both on top and slopes. This layer will be compacted with 5T roller. Light bull Dozer will be used to obtain uniform thickness of the layer.
- Silt Layer: This layer of silt will be 20 cm thick. The silt is borrowed from the authorized sources. It will be ensured that this silt will be comparatively dry to spread it and consolidate with 5T roller. Light bull dozer will be employed for level spreading the silt. This will form a perfect base for the HDPE liner to be laid over this and prevents any possible mechanical damage.
- HDPE Liners: The proposed HDPE liner will be of 1.5mm thick. The site welding and anchoring of the liner shall be scientifically done with special purpose welding equipment and special technique to anchor the liner on all the sides without any puncturing of the liner.
- Silt Protective layer: This protective layer to be laid over the HDPE liner is 20cm thick. This layer helps protecting the HDPE layer from any kind of mechanical damage.
- Gravel Layer: This layer of gravel or C & D debris will be 30 cm thick and acts as drainage layer. The spreading of this layer will be done with a small tractor dozer and consolidated with a 5T roller.
- Top soil: Virgin and rich top soil will be conveyed to the site and spread in an uniform layer of 30cm. This layer after uniformly spreading will be rammed into place with powered earth rammer ensuring moderate compacting for the easy penetration of roots of the proposed shrubs and grass on this layer. This layer will be suitably watered to maintain the required moisture levels till plantation takes place.
    - Shrubbery and lawns and pathways: Appropriate landscaping plan will be presented for approval. The proposal will be with a minimum of 3 alternatives. The shrubs selected will be hardy and at the same time ornamental and flowering. The lawns will be developed by transplanting with selected variety of dhoop grass or seeding. The landscape concept would be to create a „park-like environment within the Dump Site. Lush greenery with extensively landscaped areas are set aside within the site, such as the central commercial hub, entrance plaza, pocket parks and perimeter fringes to ensure that forested, landscape areas achieved. These areas shall not be used for any use other than the prescribed use. However these areas may be used to have natural drains, which are not cemented but lined with interlocking blocks to ensure percolation of rainwater and such drains will only be used to convey rainwater runoff.

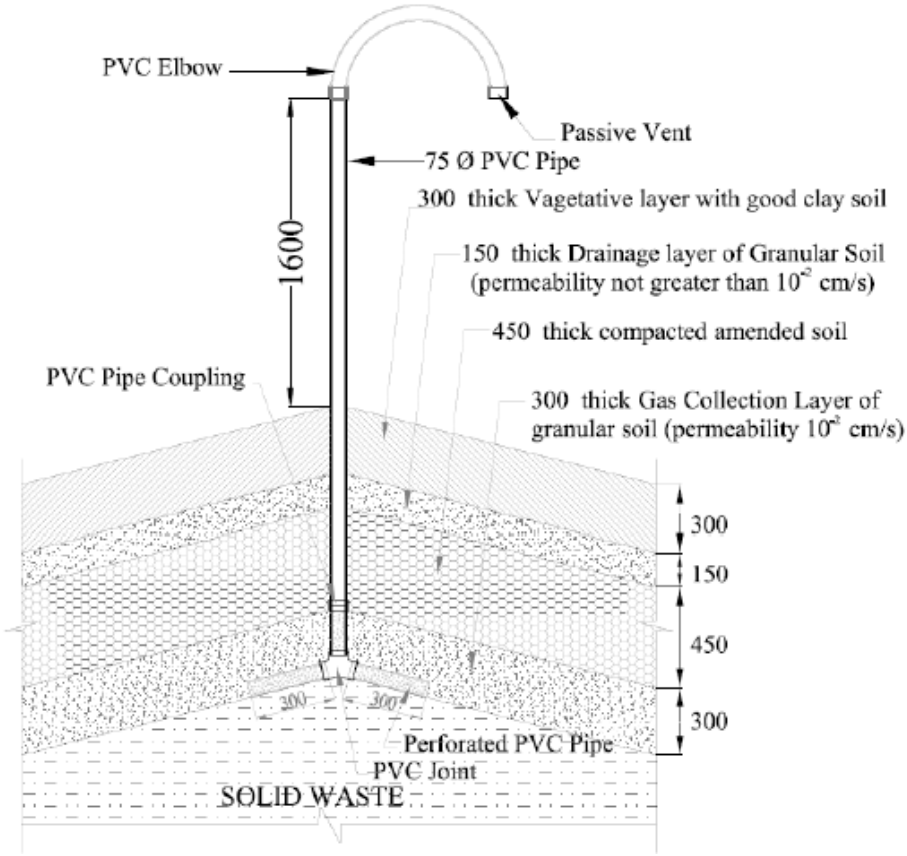
Landfill Gas Management Plan

Landfill gas is generated as a product of waste biodegradation. In landfill sites organic waste is broken down by enzymes produced by bacteria in a manner comparable to food digestion. Considerable heat is generated by these reactions with methane, carbon dioxide, nitrogen, oxygen, hydrogen sulphite, and other gases as the by-products. Methane and carbon dioxide are the principle gases produced with almost 50 – 50 per cent share. When methane is present in the air in concentrations between 5 to 15 per cent, it is explosive. Landfills generate gases with a pressure sufficient enough to damage the final cover and largely have impact on vegetative cover. Also, because only limited amount of oxygen are present in a landfill, when methane concentration reach this critical level, there is a little danger that the landfill will explode. As suggested by CPHEEO Manual the gas management strategies should follow the following three plans,

- Controlled Passive Venting
- Uncontrolled Release
- Controlled Collection and Treatment

As 100 % segregation in Indian condition might not be possible so very small amount of landfill gas will be released to the atmosphere. Therefore here Controlled Passive Venting process will be followed as per CPHEEO Manual of SWM. MSW Landfills are supposed to receive the inert part of the treated waste and hence no biodegradation is expected as such from the site. As a result, odor is expected to be minimal from the landfill cells. Controlled passive venting ill be done by installation of passive gas vents at regular interval as per the engineering design. A typical passive gas venting system is shown in **Figure 6-1**.

Fig 6.1- TYPICAL PASSIVE GAS VENTING SYSTEM



Uncontrolled Release of Gas As per MSW Manual only small (less than 100 tons per day), shallow (less than 5 m deep) and remotely located landfills, should uncontrolled release be allowed. In such cases, landfill gas monitoring will be adopted at all sites and remedial measure (such as flaring) undertaken if the gas concentrations are above acceptable limits. For Berhampur, no uncontrolled release of gas has been recommended during the operational phase of the project. Controlled Collection and Treatment Controlled collection and treatment/use will be adopted only after the feasibility of such a system is established and proven by an agency having experience in this area. In case of the proposed project only controlled passive venting will be adopted and no treatment of the landfill gas would be undertaken.

Surface Runoff Management System

The design scheme would be formulated to cater all the storm water that would be accumulated during the precipitation in the entire waste management facility. For this purpose peripheral drains along the road and internal drain adjoined to the different individual facilities would be constructed. The drains will be with respect to the finished ground level wherever possible and/ or provided with sufficient longitudinal slopes in order to enable the gravity flow of water. Desilting chamber will be provided to separate the silt particles, earths and soils. The supernatant shall be recycled within the facility for landscaping or disposed off.

Leachate Management Plan

Design of Leachate Collection System: The primary function of Leachate Collection System is to collect and convey leachate out of the landfill unit and to control the depth of the leachate above the liner. The leachate management & collection system should be designed as per the guidelines suggested CPHEEO Manual. Flow of leachate through imperfections in the liner system increases with an increase in leachate head above the liner. Maintaining a low leachate level above the liner helps to improve the performance of the composite liners. The main components of leachate collection system are drainage layer and conveyance system. Leachate conveyance system is a network of pipes by which the leachate is collected through perforated HDPE pipes and collected in a sump. The drainage shall be provided as per the standards recommended by MSW Rules, 2000. The other design parameter, which governs the leachate collection is the spacing between the pipes.

Assessment of Leachate Quantity Leachate refers to the liquid that has passed through or emerged from solid waste and contains dissolved and suspended materials removed from the solid waste. The leachate generation is primarily a function of precipitation and it is directly proportional to rainfall intensity and surface area.

Leachate collection system

The leachate collection system is a network consisting HDPE feeder pipes and header pipes. The pipes are HDPE perforated pipes with sufficient strength (minimum 6 kgf) and are safe from particulate and biological clogging and deflections. The main header pipe shall be connected to leachate collection sump. The purpose of leachate collection sump is to collect the leachate from entire landfill on daily basis.

Leachate treatment: The leachate will be treated by filtration method.

Cost estimation for Environmental Mangement Plan (EMP)

S.N	EMP Details	Approximate Cost (INR)
1	Pollution Prevention and Abatement Plan	**243600**
2	Landfill Gas Management Plan	**426300**
3	Leachate Management Plan	**548100**
4	Road Safety and Traffic Management Plan	**243600**
5	Occupational Health & Safety Management Plan	**243600**
6	Community Health & Safety Management Plan	**243600**
7	Green Belt Development Plan	**609000**
8	Post Closure & Maintenance Plan	**487200**
9	**Total**	**30,45000**

The company will invest 30,45,000 Lakhs (around 0.75 % of total project cost Phase-I & II) as capital investment towards implementation of Environmental Management Plan for the site Mohuda**.**

Green Belt Development Plan

Need of the Plan: During the operational phase of the proposed facility, plantation shall be done for following specific reasons –

- Plantation for beautification of the area
- Plantation to absorb air pollutant
- Plantation to mitigate incremental noise
- Re-plantation, pertaining to the cutting of trees, if any

During the operational phase, air emissions will be from the vehicular traffic and operation of the DG sets. Based on the location, suitable type of trees and plants will be recommended as a part of the greenbelt development plan to mitigate the impact and to restore the damaged habitat of the region.

Guideline for Plantation & Landscaping Selection of plant species is to be done on the basis of their adaptability to the existing geographical conditions and the vegetation composition of the topography of the region. Selection of plant species will be done carefully, as such they are of fast growing variety, perennial and evergreen with thick canopy cover, large leaf area index (LAI) and a high pollution attenuation factor (PAF) for effective dry deposition of particles and fibers.

- Detailed Landscaping Plan In order to assure proper greenbelt development, following management plan will be adopted:
- Healthy and established sapling having 1m height should be selected for planting in greenbelt to avoid mortality
- Pit measurements of 0.6 m x 0.6 m x 0.6 m are to be dug up at desired point in triangular pattern
- The tall shrubs and dwarf trees with 3 m spacing between plants and rows is sufficient while medium and tall trees in middle and rear rows are to be planted at a distance of 6-7m and 8-10m apart respectively depending upon the space available.

Close plantation is recommended for accommodating more number of trees per unit area resulting in more leaf surface.

The pit should be filled with mixture of cow dung manure and soil in ratio of 1: 4. 10 gm BHC of 10% concentration should be properly mixed with the soil and manure to kill the termites and insect.

Close plantation with three tiers system keeping dwarf trees with round canopy exposed to the source of emission followed by medium and tall trees with cylindrical canopy is ideal design for the polluted area, because all plants are exposed to the pollutants.

Close plantation also result in tall trees with deeper roots and ultimately yield more bio-mass per unit area and more efficient absorption of pollutants. Plantation of trees in staging arrangement in multiple rows across the direction of the wind is recommended for better trapping and absorption of the pollutants

Recommendation of Species for Plantation

Following is a suggestive list of the plants, which could be considered for pollution abatement:

List of the plants recommended for Green Belt

Botanical name	**Local name**
Tree	
Acacia auriculoformis	*Acacia*
Anacardium occidentale	Cashew
Terminalia arjuna	*Arjuna*
Cassia siamea L.	Chakunda
Acacia nilotica	Babool
Ficus religiosa	*Aswath*
Emblica officinalis	*Anla*
Zizphus maurutiana	Barkuli
Aegle marmelos	Bel
Ficua benghalensis	Bara
Pongamia pinnate	Kranj
Schelchera oleosa	Kusam
Azadirachta indica	Neem
Artocarpus heterophyllussss	Pansa
Shorea robusta	Sal
Vitex negundo	Begunia
Zizhyphus oenoplea	*Kanteikil*
Dendrophthoe falcata	*Madanga*
Glycoswmis pentaphylla	*Chawaldua*

CHAPTER-7
ADDITIONAL STUDIES

Public Hearing

- On receiving letter from collector, Ganjam, SPCB Odisha made advertisement through an Oriya daily "The Samaj" dated 02/08/14 and an English Daily "The New Sunday Express" dated 02/08/2014 regarding venue, date and time of the public hearing for MSW Berhampur project of UPEEL Ltd., Vadodar, along with the places of availability of Environmental Impact Assessment (EIA) report, Executive Summaries for public to go through. Announcement wew also made through beating drums regarding Public hearing for information of the public in the surrounding villages.

- Public Hearing was conducted on 04/09/2014 and proceeding of PH is enclosed below

ODISHA

Tel : 0674-2564033
FAX : 0674-2564033/2564573
EPABX : 2561909/2562847
E-mail: paribesh1@dataone.in
Website: www.ospcboard.org

STATE POLLUTION CONTROL BOARD, ODISHA
[DEPARTMENT OF FOREST & ENVIRONMENT, GOVERNMENT OF ODISHA]
Paribesh Bhawan, A/118, Nilakantha Nagar, Unit – VIII
Bhubaneswar – 751 012, INDIA

No. 15987 / IND-II-PH-671 Date: 29-9-14/

To
The Member Secretary,
SEIAA, Odisha, Qr. No 5 RF -2/1,
Unit – IX, Bhubaneswar -22

Sub: Proceeding of Public hearing in respect of Environmental Assessment for public hearing for **M/s Berhampur Municipal Corporation for integrated Solid Waste Management Project over an area of 33.62 acre at Mahuda village, Berhampur in the district of Ganjam.**

Sir,

Inviting reference to above, this to inform that public hearing of the above mentioned project proposed by **M/s Berhampur Municipal Corporation for Integrated Solid Waste Management Project in Ganjam district** was conducted on **4-09-2014** at **11.00AM at Bhairabi High School, Mahuda under Kukudakhandi Block, Ganjam district** in accordance with the Ministry of Environment & Forest, Govt. of India, EIA Notification No. SO-1533(E) dt. 14.09.2006.

As per the above notification, notice inviting comments, views, objection, and suggestions from the public in respect of the above project was published in newspapers namely **The New Indian Express** and **Samaj** on **3-08-2014.**

A copy of the proceedings of the public hearing along with the following documents is enclosed for kind information and necessary action at your end.

1. Video CD of public hearing
2. Statement of issues raised by public hearing meeting and comments of applicant prepared in local language and in English.
3. Copies of the newspaper advertisement.
4. List of persons who participated in the public hearing.
5. Views and suggestions from the public received by the Board during the public hearing.
6. Soft copy of the proceedings in PDF format.
7. List of complaints/suggestion received directly by the Board.

Yours faithfully,

Encl: As above

MEMBER SECRETARY

//2//

Memo No 15988 /dt. 29.9.14

Copy alongwith copy of the proceedings of public hearing forwarded to the Principal Secretary, Forest & Env. Department, Govt. of Odisha for information and necessary action.

Encl: As above

MEMBER SECRETARY

Memo No 15989 /dt. 29.9.14

Copy forwarded to the Additional Director, Eastern Regional Officer, MoEF Govt. of India, A-3, Chandrasekharpur, Bhubaneswar for information and necessary action.

MEMBER SECRETARY

Memo No 15990 /dt. 29.9.14

Copy alongwith copy of proceeding of public hearing forwarded **The Municipal Commissioner, Berhampur Municipal Corporation, Near Town Police Station, Berhampur – 760002** for information.

Encl: As above

MEMBER SECRETARY

Annexure

List of Complaints directly received by the Board

1. President, Sarvamangala Athma Sabhayak Sanga, Mahuda village dt. 3-9-2014.
2. Secretary, Maa Biraja Athma Shayak Sanga, mahuda village, dtd. 3-9-2014.
3. President, Maa Tara Tarini Athma Sahayak Sanga, Mahuda village, dtd. 3-9-2014.
4. Sarpanch, Lathi Gram Panchyat dtd. 3-9-2014.
5. Sarpanch, Mahuda Gram Panchyat dtd. 3-9-2014.
6. President, Maa Gathagaon Tarini S.H.G. dtd 3-9-2014.

(a

PROCEEDINDGS OF PUBLIC CONSULTATION / HEARING OF M/S BERHAMPUR MUNICIPAL CORPORATION HELD ON 04.09.2014 (11 AM) AT BHAIRABI HIGH SCHOOL, MAHUDA UNDER KUKUDAKHANDI BLOCK OF GANJAM DIST. IN THE STATE OF ODISHA FOR INTEGRATED SOLID WASTE MANAGEMENT PROJECT.

- Sri S. K. Rout, Addl. Dist. Magistrate (Revenue) of Ganjam district presided over the meeting.

- Dr. P. K. Mohapatra, Regional Officer, Berhampur of State Pollution Control Board, Odisha welcomed the public present for the public hearing and explained them about the aspects of the public hearing for the environmental clearance of the project as per provisions of the E. I. A. Notification, 2006 framed under the Environment (Protection) Rules, 1986. Dr. Mohapatra then invited the project proponent or his / her representative to present details of the project, its environmental aspects and proposed pollution control measures / systems before the public to make them aware on the matter before they opine their views.

- Smt. Anjana Panda, Commissioner, Berhampur Municipal Corporation presented the project details, its various environmental aspects and proposed pollution control measures to be taken by them. She told that transport vehicles will be covered and there will no littering of garbage on the transport roads. There will be no water pollution. Plantations will be done.

- The President, Sri Rout, ADM (R) then invited the public to register their names one by one and put their signature with name and address / village on the attendance sheet and serially to offer their views on the project.

- 13 nos. of persons registered their names for the purpose and presented their views on the project as mentioned below. Attendance sheets of 147 nos. of people present in the public hearing meeting taken with their name, address / village and signature with the project personnel are enclosed.

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1. Sri Udaynath Pradhan, Mahuda village: Sri Pradhan initially opposed the project and later told that there will be problem on water (pollution) and climate.

2. Smt. Rajeswari Sahoo, Uttaramukhi, Haridakhandi: Smt. Sahoo told that there will be job opportunity and people will be benefitted from the project.

3. Sri Kura Behera, Haridakhandi: Sri Behera did not tell anything. He requested the people to maintain silence.

4. Sri Badrinarayan Nayak, Berhampur: Sri Nayak told that when he was the corporator of the municipality in 2007, they had a visit to the municipal garbage processing plant at Ahmedabad and told that the solid wastes lifted from the town will be transported by covered vehicles, there will be plantations and no nuisance of foul gas outside the plant.

5. Smt. Sadhana Mohanty, Mahuda village: Smt. Mohanty told that the govt. has planning to have the project on the cattle feeding land of our village where earlier, Prime Minister P. V. Narasimha Rao had laid foundation of a medical college which was welcomed by the villagers. This solid waste project will have harmful effect on the village, flora & fauna and poor people. So the villagers oppose the project and have gone to the High Court. We request to look into our problem.

6. Sri Radhamadhab Mohanty, Mahuda village: Sri Mohanty told that they do not welcome the garbage disposal project of Berhampur municipality at Mahuda. This will cause a lot of health problem. They will also loss 33 acres of agricultural fields for cattle grazing. They may welcome any other project other than garbage disposal and will go to the High Court.

7. Sri Paresh Chandra Sahoo, Mahuda village: Sri Sahoo initially told that the President of the School can tell regarding the hearing being taken inside the school premises amidst disturbances. Since 2006, they requested the District Collector and Tahasildar, Kukudakhandi not to have the solid waste plant here; when they have failed, they have taken shelter of the High Court. He

told that they will loss about 33 acres of agricultural / cattle grazing fields and there will be pollution on climate. He also told that the govt. is in search of 200 acres of land here for a medical institution which may be better. They are prepared to oppose the project of garbage disposal and at the end, he opposed the project on behalf of the area people.

8. Sri Sukanta Patra, Mahuda village: Sri Patra told regarding the drain water problem of Berhampur township during rain. He also told on the difference of environment and road condition between Mahuda and Berhampur. He asked the Berhampur municipal corporators regarding their work at Berhampur and opposed the project. He also told that it would have been better to set up the medical here.

9. Sri Jiban Dalai, Mahuda village: Sri Dalai told that Berhampur municipal corporation has proposed to dispose garbage of the municipality and nearby areas at Mahuda and will provide jobs to the local people. The project will affect about 30,000 houses and 15 water bodies of habitations here. So, people of the area have taken shelter of the court to oppose the project. He told that decision shall be taken thoughtfully to keep the area environment pollution free.

10. Smt. Tulusa Sasmal, Mahuda village: Smt. Sasmal told that when they will suffer from diseases due to the factory in the area, who will take care of them.

11. Smt. Sukuri Majhi, Mahuda village: Smt. Majhi told that why you have come here, what has happened to the earlier one and we will not provide the place here.

12. Sri Binen Patnaik, Corporator, BMC Ward No. 12: Sri Pattnaik told that there will be overall development of the area, school, education, road, health facilities etc. due to the project coming up here.

13. Sri Hrushikesh Patra, Bendalia village: Sri Patra told that if the project will be here, they will fire themselves for which the govt. and administration will be responsible.

- During the meeting, a group of people from local villages shouted not to hold the Public Hearing Meeting on the plea that they are against the project. They did not register their names to deliver opinion in spite of repeated requests by the President.

- In the end, Dr. P. K. Mohapatra, Regional Officer, Berhampur of State Pollution Control Board, Odisha read over the summary of the proceedings reflecting all the views and concerns expressed by the public in local / vernacular language and asked the project proponent or his/her representative (s) to explain the public on the following issues raised by them.

  I. Water pollution, air pollution, odour nuisance and overall environment pollution to be caused by the project.
  II. Damages to be caused on agricultural / cattle grazing fields by the project.

Smt. Anjana Panda, Commissioner, Berhampur Municipal Corporation on behalf of the project proponent explained details of the above issues raised by the public in vernacular/local language.

- There will be no generation or discharge of a droplet of waste water from the project.
- There is also no river or other water body in the nearby area for water pollution.
- Garbages will be disposed off here in a polythene lined pit followed by soil cover and plantations unlike the present earth disposal practice at Chandania hills.
- Plantations will be done and there will be no air pollution or odour nuisance.
- There will be no damage to the nearby agricultural / cattle grazing fields by the project.

Statements of issues raised by the public in English and in vernacular language are annexed (Annexure – I & II).

- Enclosed are three nos. of representations from the Sarapanch & others of Mahuda and Lathi G. P.s and Sri Bijama Kumar Mishra of Narasinghpur village on non establishment and shifting of the project at the proposed place.

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- The meeting then came to an end. Dr. P. K. Mohapatra, Regional Officer, Berhampur of State Pollution Control Board, Odisha tendered vote of thanks to the President of the meeting, the public present and participated in the hearing, the police personnel, the media and the representative (s) / consultant (s) of the project proponent. The President of the meeting then declared closure of the hearing.

Agreed

Regional Officer, Berhampur,
State Pollution Control Board, Odisha

Addl. Dist. Magistrate (Rev.),
Ganjam, Chatrapur
A.D.M. (Revenue)
Ganjam, Chatrapur

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Annexure - I

STATEMENT OF ISSUES

Statement of the issues raised by the public and comments of the project proponent or representative (Smt. Anjana Panda, Commissioner, Berhampur Municipal Corporation) are mentioned below.

Sl. No.	Issues	Comments
1	Water pollution, air pollution, odour nuisance and overall environment pollution to be caused by the project.	• There will be no generation or discharge of a droplet of waste water from the project. • There is also no river or other water body in the nearby area for water pollution. • Garbages will be disposed here in a polythene lined pit followed by soil cover and plantations unlike the present earth disposal practice at Chandania hills. • Plantations will be done and there will be no air pollution or odour nuisance.
2	Damages to be caused on agricultural / cattle grazing fields by the project.	• There will be no damage to the nearby agricultural / cattle grazing fields by the project.

Regional Officer, Berhampur,
State Pollution Control Board, Odisha

Addl. Dist. Magistrate (Rev.),
Ganjam, Chatrapur

A.D.M. (Revenue)
Ganjam, Chatrapur

Annexure - II

ଆଲୋଚ୍ୟ ବିଷୟର ବିବୃତି

ଜନ ସାଧାରଣଙ୍କ ଦ୍ୱାରା ଆଗତ ହୋଇଥିବା ପ୍ରଶ୍ନ ଓ ପ୍ରକଳ୍ପ ପ୍ରସ୍ତାବକ କିମ୍ବା ତାଙ୍କ ପ୍ରତିନିଧି (ଶ୍ରୀମତୀ ଅଞ୍ଜନା ପଣ୍ଡା, କମିଶନର, ବ୍ରହ୍ମପୁର ମହାନଗର ନିଗମ)ଙ୍କ ମନ୍ତବ୍ୟର ଏକ ବିବୃତି ନିମ୍ନମତେ ଉଲ୍ଲେଖ କରାଗଲା ।

କ୍ର. ନଂ.	ବିଷୟ	ମନ୍ତବ୍ୟ
୧.	ପ୍ରକଳ୍ପ ଦ୍ୱାରା ସୃଷ୍ଟି ହେବାକୁ ଥିବା ଜଳ ଓ ବାୟୁ ପ୍ରଦୂଷଣ ତଥା ଦୁର୍ଗନ୍ଧ ଏବଂ ପୂରାପୂରି ପରିବେଶ ପ୍ରଦୂଷଣ ।	• ପ୍ରକଳ୍ପ ଦ୍ୱାରା ଏକ ବୁନ୍ଦା ଦୂଷିତ ଜଳ ଉତ୍ପନ କିମ୍ବା ନିଷ୍କାସନ ହେବ ନାହିଁ । • ପ୍ରକଳ୍ପର ପାର୍ଶ୍ୱବର୍ତ୍ତୀ ଅଞ୍ଚଳରେ କୌଣସି ନଦୀ କିମ୍ବା ଜଳରାଶି ଅବସ୍ଥିତ ନାହିଁ । • ବର୍ତ୍ତମାନର ଚହନିଆ ପାହାଡ଼ର ପାର୍ଶ୍ୱବର୍ତ୍ତୀ ଅଞ୍ଚଳରେ ଯେପରି ଆବର୍ଜନା ନିଷ୍କାସିତ ହେଉଛି ସେପରି ନ'କରି ଆବର୍ଜନା ସବୁ ଏକ ପଲିଥିନ ଆଚ୍ଛାଦିତ ଗର୍ତ୍ତ ମଧ୍ୟରେ ପୋତା ଯାଇ ତା'ଉପରେ ମୃତ୍ତିକାର ସ୍ତର ଦିଆଯିବ ଓ ବୃକ୍ଷରୋପଣ କରାଯିବ । • ବୃକ୍ଷରୋପଣ କରାଯିବ ଯଦ୍ୱାରା ବାୟୁ ପ୍ରଦୂଷଣ କିମ୍ବା ଦୁର୍ଗନ୍ଧ ହେବ ନାହିଁ ।
୨.	ପ୍ରକଳ୍ପ ଦ୍ୱାରା ସୃଷ୍ଟି ହେବାକୁ ଥିବା ଚାଷ ତଥା ଗୋଚର ଜମିର କ୍ଷତି ।	• ପ୍ରକଳ୍ପ ଦ୍ୱାରା ପାର୍ଶ୍ୱବର୍ତ୍ତୀ ଚାଷ ତଥା ଗୋଚର ଜମିରେ କୌଣସି କ୍ଷତି ହେବ ନାହିଁ ।

ପ୍ରକାଶ କୁମାର ମହାପାତ୍ର
ଆଞ୍ଚଳିକ ଅଧିକାରୀ, ବ୍ରହ୍ମପୁର
ରାଜ୍ୟ ପ୍ରଦୂଷଣ ନିୟନ୍ତ୍ରଣ ବୋର୍ଡ଼,
ଓଡ଼ିଶା

ଅତିରିକ୍ତ ଜିଲ୍ଲା ମାଜିଷ୍ଟ୍ରେଟ (ରାଜସ୍ୱ),
A.D.M. (Revenue)
Ganjam, Chatrapur

ATTENDANCE SHEET

Project: Integrated Solid Waste Management

Proponent: Berhampur Municipal Corporation

Venue: Bhairabi High School, Mahuda

Date & Time: 04.09.2014 (11 AM)

Sl. No.	Name & address	Signature
1	Rajeswari Sahoo Utara Mukhi, Haridakhudi	
2	Murali Sahoo Utara Mukhi	L.T.I of Murali Sahu
3	Gantayat Dakua Utara Mukhi	
4	K. Gopinath Reddy Haridakhudi	
5	Kura Behera Haridakhudi	L.T.I of Kura Behera
6	Dandapani Behera Utara Mukhi	L.T.I. of Dandapani Behera
7	D. Appanna Matiagaon	L.T.I of D. Appan
8	Debaraj Behera Utaramukhi	L.T.I of Debaraj Behera
9	Santosh Kumar Sahoo Utaramukhi	L.T.I Santosh Kumar Sahoo

ATTENDANCE SHEET

Project: Integrated Solid Waste Management

Proponent: Berhampur Municipal Corporation

Venue: Bhairabi High School, Mahuda

Date & Time: 04.09.2014 (11 AM)

Sl. No.	Name & address	Signature
10	Ajaya Kumar Behera B.M.C	
11	BMC	
12	BERHAMPUR	
13	Bolaram Parda Berhpr	Baleram Parda
14	Tena Ch Naeyak Ex Councillor Berhampur Municipality	4/9/14
15	Udayanath Pradhan Mahuda	
16	Sadhana Mohanty, Mahuda	Sadhana mohanty
17	Radhe Madhaba Mohanty Mahuda	R. M. Mohanty
18	Paresh chandra Sahoo Mahuda	

ATTENDANCE SHEET

Project: Integrated Solid Waste Management

Proponent: Berhampur Municipal Corporation

Venue: Bhairabi High School, Mahuda

Date & Time: 04.09.2014 (11 AM)

Sl. No.	Name & address	Signature
19	Prafulla Kumar Satpathy	BMC
20	Pradeep Kumar Hati (BeMC)	
21	Poulami Das (BMC)	
22	Ajit Kumar Deli (BMC)	
23	Tarini Charan Sahu (BMC)	
24	Alikrishna Pandit, Berhampur	
25	Lilla Bangari, Berhampur	
26	Babula Nimai, Mohuda	
27	Prabhakar Nayak, Berhampur	

ATTENDANCE SHEET

Project: Integrated Solid Waste Management

Proponent: Berhampur Municipal Corporation

Venue: Bhairabi High School, Mahuda

Date & Time: 04.09.2014 (11 AM)

Sl. No.	Name & address	Signature
28	Purna Chandra Behera Uttaramukhi	
29	ଭୈରବୀ ଉତ୍ତରମୁଖୀ ଯୁବକ ସଂଘ ମହୁଡା Uttara mukhi	ଭୈରବୀ ଉତ୍ତରମୁଖୀ
30	Prasanta Sahu Ramhari Nagar 2nd Lane	Prasanta Sahu Ramhari Nagar 2nd Lane
31	Sankar Kundu Berhampur	Sankar Kundu
32	ମହୁରୀପଲ୍ଲୀ BMC	
33	Umesh Ch Sahu BMC BAM	
34	Sitaram Nayak BMC. BAM	Berhampur B.M.C
35	Subhendu Ghadei BMC. BAM	
36	Dilip Kumar Nayak B.M.C (B.M)	

ATTENDANCE SHEET

Project: Integrated Solid Waste Management

Proponent: Berhampur Municipal Corporation

Venue: Bhairabi High School, Mahuda

Date & Time: 04.09.2014 (11 AM)

Sl. No.	Name & address	Signature
37	Sukanta Kumar Sabat Asst - Engineer BMC	4/9/14
38	Bijay Kumar Panda Berhampur	4.9.
39	A. Kesharb Reddy. Berhampur	4/9/14
40	Prafulla Kishore Rath. Berhampur	4-9-14
41	Satya Narayan Acharya Berhampur BMC	4/9/14
42		
43	Mangulu Bisoi Berhampur	
44	BMC	
45	Subha Kanta Singh Deo 13. M. C	

ATTENDANCE SHEET

Project: Integrated Solid Waste Management

Proponent: Berhampur Municipal Corporation

Venue: Bhairabi High School, Mahuda

Date & Time: 04.09.2014 (11 AM)

Sl. No.	Name & address	Signature
46	Jamandem Ghadu. (B.M.C) Aska Road Dhanamera	4.9.14
47	Kamakshi Bahuf Panda CBMC	
48	Santosh Kum Pradhan BMC	
49	Prasanta Kumar Pechera Berhampur	04-09-14
50	Ashwini Kumar Tripathy BMC	
51	Amal Kumar Bohera (B.M.C)	
52	Basudev Ghadai B.M.C	
53	P. Anandra Rao BMC	PARao
54	Medhusudan Patra B.M.C	

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ATTENDANCE SHEET

Project: Integrated Solid Waste Management

Proponent: Berhampur Municipal Corporation

Venue: Bhairabi High School, Mahuda

Date & Time: 04.09.2014 (11 AM)

Sl. No.	Name & address	Signature
55	ଲିଲିଗା ସେଠୀ Uttaramukhi	ଲିଲିଗା ସେଠୀ
56	ନିମିଚ ସାହୁ, Uttaramukhi	ନିମିଚ ସାହୁ
57	Bhanu panda Uttaramukhi	ଭାନୁ ପଣ୍ଡା
58	Sanju patra Uttaramukhi	ସଞ୍ଜୁ ପାତ୍ର
59	Amulya Sahu Uttaramukhi	ଅମୂଲ୍ୟ ସାହୁ
60	Sunita Padhial Uttra mukhi	ସୁନିତା ପଢିଆଲି
61	R. Sukanti Reddy Uttaramukhi	R SUKANTI REDDY
62	Mani Behera Uttaramukhi	ମଣି ବେହେରା
63	Keerta Maharana Uttaramukhi	କୀର୍ତ୍ତି ମହାରଣା

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ATTENDANCE SHEET

Project: Integrated Solid Waste Management

Proponent: Berhampur Municipal Corporation

Venue: Bhairabi High School, Mahuda

Date & Time: 04.09.2014 (11 AM)

Sl. No.	Name & address	Signature
64	Bideshi Maharana Uttaramukhi	ବିଦେଶୀ ମହାରଣା
65	prakash chandra Gouda Uttaramukhi	ପ୍ରକାଶ ଚନ୍ଦ୍ର ଗଉଡ଼
66	Satya Narayan mahuta ସତ୍ୟ ନାରାୟଣ ମହୁତା	ସତ୍ୟନାରାୟଣ ମହୁତା
67	Pradeep kumar Das Haridakhandi	Pradeep Kumar Das
68	Rajendra Maharana Uttaramukhi	ରାଜେନ୍ଦ୍ର ମହାରଣା
69	Manu Pattanaik Uttaramukhi	ମନୁ ପଟ୍ଟନାୟକ
70	J. Mohan Rao Uttaramukhi	J. Mohan Rao
71	Rinku Mahapatro Uttar mukhi	Rinku Mahapatro
72	Bhabani Shankar Behera Uttar mukhi	Bhabani Shankar Behera

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ATTENDANCE SHEET

Project: Integrated Solid Waste Management

Proponent: Berhampur Municipal Corporation

Venue: Bhairabi High School, Mahuda

Date & Time: 04.09.2014 (11 AM)

Sl. No.	Name & address	Signature
73	Pasa Behera Uttaramukhi	
74	Narasingh Pradhan Uttaramukhi	
75	Prakshant Behera Uttaramukhi	
76	Rabindra Routa	Rabindra Routo
77	Jatu Behera Uttara mukhi	
78	Subash Nayak Uttaramukhi	Subash Nayak
79	pentu Maharana Haridakhandi	
80	Mahendra Kumar Sahu	
81	Muna Pradhan Haridakhandi	

ATTENDANCE SHEET

Project: Integrated Solid Waste Management

Proponent: Berhampur Municipal Corporation

Venue: Bhairabi High School, Mahuda

Date & Time: 04.09.2014 (11 AM)

Sl. No.	Name & address	Signature
82	Basanath Sahu Uttra mukhi	L.T.I of Sahu
83	Jamuna Sethi Uttra mukhi	L.T.I. of Sheti
84	Jhunu Sethi Uttra mukhi	L.T.I. of Jhunu
85	Bhinu Maharana Uttra mukhi	L.T.I. of Bhinu Maharana
86	Kumari Behera Uttramukhi	L.T.I. of Kumari Behera
87	Manasa Maharana Uttramukhi	L.T.I. of manasa Maharana
88	Dilip Ku W-No-9 Berhampur	Dilip kumar
89	Dharanidhar Nayak Mahuda	
90	Benoj [illegible] Berhampur	4.9.14

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ATTENDANCE SHEET

Project: Integrated Solid Waste Management

Proponent: Berhampur Municipal Corporation

Venue: Bhairabi High School, Mahuda

Date & Time: 04.09.2014 (11 AM)

Sl. No.	Name & address	Signature
91	Mahadev Pradhan Mahuda	
92	Budhia Nahak Mahuda	
93	Labha Nahak Mahuda	
94	Biswanath Dalai Mahuda	Biswanath Dalai
95	Anjana Nayak Berhampur	Anjana Nayak
96	Mahesh Ghadai Mahesh Ghadai	Mahesh Ghadai Berhampur
97	Raju Das Mahuda	Raju Das
98	Chhelua Dash Mahuda	
99	Narasingh Nayak Berhampur	Narasingh Nayak

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ATTENDANCE SHEET

Project: Integrated Solid Waste Management

Proponent: Berhampur Municipal Corporation

Venue: Bhairabi High School, Mahuda

Date & Time: 04.09.2014 (11 AM)

Sl. No.	Name & address	Signature
100	Bunda Dakua Uttra Mukhi	[Odia signature]
101	Siba Panigrahy Uttra mukhi	SIBA PANIGRAHY
102	B. Madhaba Patro [Odia text] Uttra mukhi	B. Madhaba patro
103	Urmila Behera Uttra mukhi	[thumb impression] Umila Behara
104	Rajendra Maharana Uttra mukhi	[thumb impression] Rajendra maharana
105	Simanchal Sarangi Gampeta, Berhampur.	[signature]
106	[illegible] Ku. [illegible] Khodasing [illegible] Berhampur	[signature]
107	Ashok Ku Rout Industrial Estate, Berhampur	[signature]
108	Santosh Sahu Uttra mukhi	[Odia signature]

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ATTENDANCE SHEET

Project: Integrated Solid Waste Management

Proponent: Berhampur Municipal Corporation

Venue: Bhairabi High School, Mahuda

Date & Time: 04.09.2014 (11 AM)

Sl. No.	Name & address	Signature
109	Ramesh chandra Nath [illegible]	[signature] 4.9.2014
110	Upendra [illegible] Berhampur	[signature] 4.9.14
111	Sita Behera Uttramukhi	[signature]
112	Banabasi Bhoi Uttramukhi	L.T.I. of Banabasi Bhoi
113	Kumari Gouda Uttramukhi	[signature]
114	Sudasna Tarei Uttra mukhi	[signature]
115	Tanuja Behera Uttaramukhi	[signature]
116	Kuni Sahu Uttaramukhi	[signature]
117	Kuni Jena Uttaramukhi	[signature]

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ATTENDANCE SHEET

Project: Integrated Solid Waste Management

Proponent: Berhampur Municipal Corporation

Venue: Bhairabi High School, Mahuda

Date & Time: 04.09.2014 (11 AM)

Sl. No.	Name & address	Signature
118	Pratibha Jena Uttaramukhi	ପ୍ରତିଭା ଜେନା
119	Bhusan Sethi Uttra mukhi	L.T.I ଦ୍ୱାରା Bhusan Sethi
120	Sanyasi Gouda Uttaramukhi	L.T.I. ଦ୍ୱାରା Sanyasi Gouda
121	Kuni Sahu Uttra mukhi	L.T.I. ଦ୍ୱାରା Kuni Sahu
122	Radha Dalei Uttaramukhi	ରାଧା ଦଳେଇ
123	Bishnu Padka Uttaramukhi	ବିଷ୍ଣୁ ପାତ୍ର
124	Mami Subudhi Uttaramukhi	ମମି ସୁବୁଦ୍ଧି
125	Jhunu Jena Uttaramukhi	L.T. ଦ୍ୱାରା Jhunu Jena
126	Kanu Sethi Uttaramukhi	L.T.I. ଦ୍ୱାରା Kanu Sethi

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ATTENDANCE SHEET

Project: Integrated Solid Waste Management

Proponent: Berhampur Municipal Corporation

Venue: Bhairabi High School, Mahuda

Date & Time: 04.09.2014 (11 AM)

Sl. No.	Name & address	Signature
127	Sukanta Patra Mahuda	Sukanta Patra
128	Siban Dalei Mahuda	Siban Dalei Mahuda
129	Tulusa Basmal Mahuda	
130	Sukuri Majhi Mahuda	
131	Biren Pattnaik Corporator WNR-12	
132	Harkesh Patra Bendalua	

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ATTENDANCE SHEET

Project: Integrated Solid Waste Management

Proponent: Berhampur Municipal Corporation

Venue: Bhairabi High School, Mahuda

Date & Time: 04.09.2014 (11 AM)

Sl. No.	Name & address	Signature
133	Basanti Sahoo Uttara mukhi	L.T.I. of Basanti Sahoo
134	Narayana Patio Bmc si	9.9.14
135	Joe Madiath Narasinghpur Village Mahuda	Jm
136	Sushree Jayatri Jena Mahuda Village.	
137	Gopal Sahu Uttaramukhi	
138	Jatendra Kumar Nahak Uttaramukhi	

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ATTENDANCE SHEET

Project: Integrated Solid Waste Management

Proponent: Berhampur Municipal Corporation

Venue: Bhairabi High School, Mahuda

Date & Time: 04.09.2014 (11 AM)

Sl. No.	Name & address	Signature
139	Anjana Panda Comissioner BMC.	4.9.2014.
140	Dipti Mohapatra Dy. Comissioner B.M.C.	4/9/14.
141	Sangram Sakher Parda Slum Improvement officer	S10, BMC 4.9.14
142	Dr. Subha Kanta Das Health officer BMC.	4.9.2014.
143	Asim Mishra Ex. Engg. BMC	
144	Manoranjan Nayak Global Experts	
145	B.P. Nanda Global Experts	4.9.14
146	Amitav Murarka UPL EEL	
147	Saugat Kumar UPL EEL.	04.09.2014

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ଅତିରିକ୍ତ ଜିଲ୍ଲାପାଳଙ୍କ ବୈଠକରେ ଦରଖାସ୍ତ

ମହୋଦୟଙ୍କୁ .... ପ୍ରେରିତେଷୁ।

ତା:-୪-୮-୨୦୧୪

ସ୍ଥାନ:- ନରସିଂହପୁର

ମହାଶୟ:-

ଆମ୍ଭେ ଗୋପୁରା ପଞ୍ଚାୟତର ନରସିଂହପୁର ଗ୍ରାମର ପରିବେଶ କମିଟି ଙ୍କ ପକ୍ଷରୁ ଜଣାଉ ଅଛୁ ଯେ, ଆମ ଗୋପୁରା ପଞ୍ଚାୟତରେ ସ୍ଥାପନ କରାଯାଉଥିବା ଆବର୍ଜନା ବସ୍ତୁର ଗଦା କରିବା, ଜାଳିବା ଆଦି ଅଞ୍ଚଳର ପରିବେଶ ଦୂଷିତ ହେବା ସହିତ ଜଳ ଓ ପରିବେଶ ଦୂଷିତ ହେବାର ସମ୍ଭାବନା ରହିଛି, ଯାହାଫଳରେ ଜନସାଧାରଣଙ୍କ ସ୍ୱାସ୍ଥ୍ୟ ଉପରେ ପ୍ରଭାବ ପଡ଼ିବା ଫଳରେ ବିଭିନ୍ନ ପ୍ରକାରର ରୋଗ ହେବାର ସମ୍ଭାବନା ରହିଛି, ଅତଏବ ଆମ୍ଭେ ଗୋପୁରା ପଞ୍ଚାୟତର ନରସିଂହପୁର ଗ୍ରାମର ଜଳ ଓ ପରିବେଶ କମିଟି ତରଫରୁ ଲେଖି ଜଣାଉଛୁ, କି ଉକ୍ତ ଆବର୍ଜନା ବସ୍ତୁର ଗଦା କରିବା ଆମ ପଞ୍ଚାୟତରେ କରାଯିବା ନାହିଁ, ଆମ୍ଭେ ପରିବେଶ କମିଟିର ଆପଣଙ୍କୁ ବିନମ୍ର ପ୍ରାର୍ଥନା ଜଣାଉଛୁ।

R.O
SPCB
4/9/14

(ଇତି)

ଆପଣଙ୍କ ବିଶ୍ୱସ୍ତ

Bi Jama Kumar Mishra

ଗ୍ରାମ ପଞ୍ଚାୟତ କାର୍ଯ୍ୟାଳୟ, ଲାଠି

ତା._____

ପ୍ରାପ୍ତେଷୁ

ଶ୍ରୀଯୁକ୍ତ ସଦସ୍ୟ ସଚିବ
ରାଜ୍ୟ ପ୍ରଦୂଷଣ ନିୟନ୍ତ୍ରଣ ବୋର୍ଡ, ଓଡିଶା ।
ଭୁବନେଶ୍ୱର ।

ବିଷୟ-ବ୍ରହ୍ମପୁର ପୌର ନିଗମ ଦ୍ୱାରା ପ୍ରସ୍ତାବିତ କଠିନ ଆବର୍ଜନା ପରିଚାଳନା ପ୍ରକଳ୍ପ ର ସ୍ଥାନାନ୍ତର ସମ୍ବନ୍ଧେ ।

ମହାଶୟ,

ନିବେଦନର କାରଣ ଏହି କି ଯେ, ଗଞ୍ଜାମ ଜିଲ୍ଲା ଅନ୍ତର୍ଗତ କୁକୁଡାଖଣ୍ଡି ବ୍ଲକ ଅଧିନସ୍ଥ ମହୁଡା ଗ୍ରାମରେ ବ୍ରହ୍ମପୁର ପୌର ନିଗମ ଦ୍ୱାରା କଠିନ ଆବର୍ଜନା ପରିଚାଳନା ପ୍ରକଳ୍ପ ସ୍ଥାପନ ନିମନ୍ତେ ସରକାରଙ୍କ ଦ୍ୱାରା ନିଷ୍ପତ୍ତି ନିଆ ଯାଇ ଅଛି । ଏହା ଆମ୍ଭ ପଞ୍ଚାୟତର ନିକଟବର୍ତ୍ତ ହୋଇଥିବା ହେତୁ ଆମ୍ଭ ଅଞ୍ଚଳର ପରିବେଶ ଦୂଷିତ ହେବ ଓ ପଞ୍ଚାୟତ ବାସି ବିଶୁଦ୍ଧ ପାନିୟ ଜଳ ପାଇବାରେ ବଞ୍ଚିତ ହେବେ ।

ଏଥି ପାଇଁ ପଞ୍ଚାୟତର ନିର୍ବାଚିତ ପ୍ରତିନିଧି ହିସାବରେ ମୁଁ ଏହାର ଦୃଢ ବିରୋଧ କରୁଅଛି ।

ଉକ୍ତ ପ୍ରକଳ୍ପଟିକୁ ଜନବସତିଠାରୁ ବହୁ ଦୂରକୁ ସ୍ଥାନାନ୍ତର କରାଗଲେ ଆମ୍ଭେ ଆପଣଙ୍କ ପାଖରେ ଚିର ଉପକୃତ ହେବୁ ।

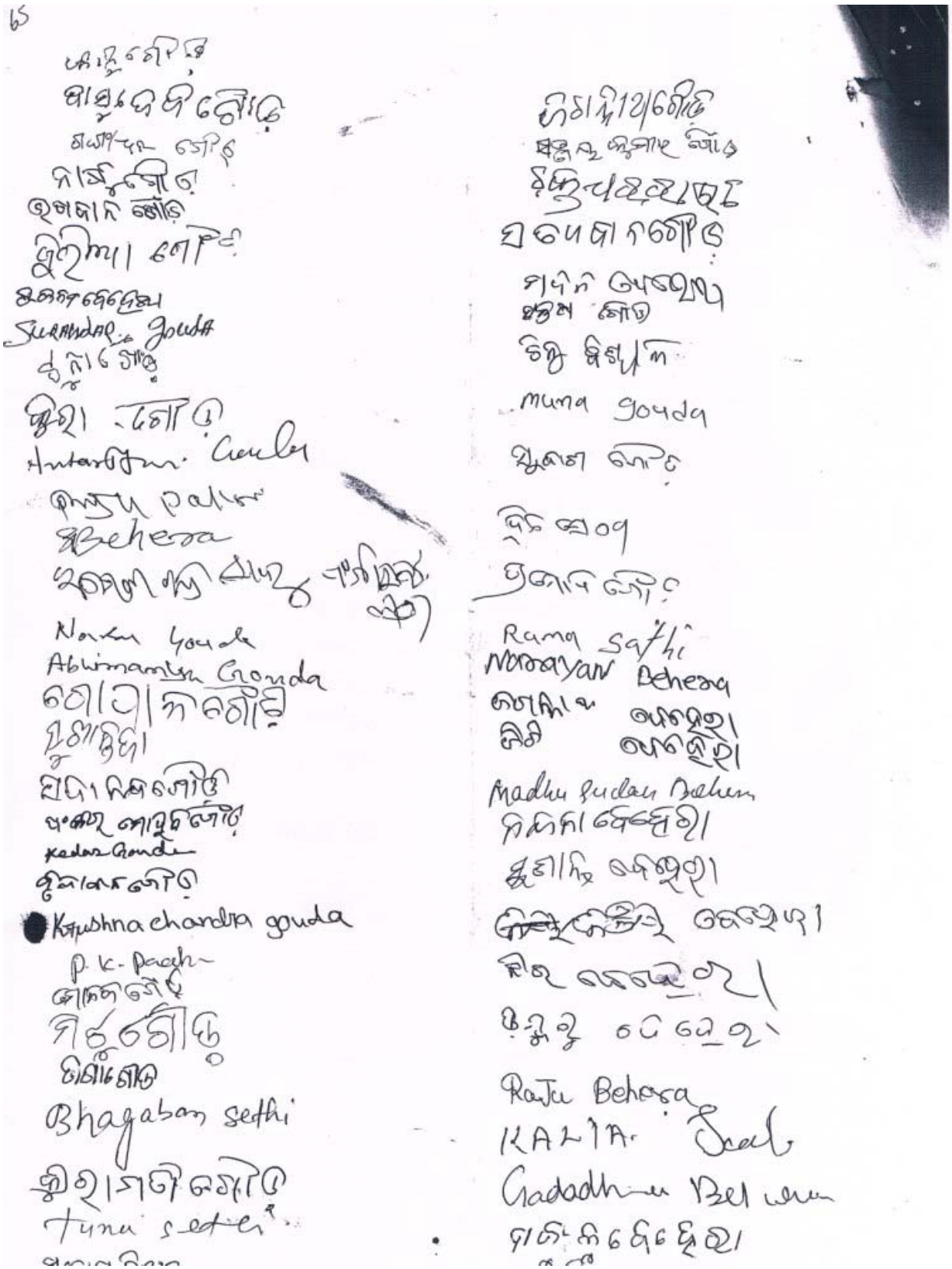
।।ଇତି।।

ଆପଣଙ୍କ ବିଶ୍ୱସ୍ତ

ସରପଞ୍ଚ
ଗ୍ରାମପଞ୍ଚାୟତ ଲାଠି ।

SARAPANCH
Lathi Gram Panchayat

R-O SPCB MPL



ଗ୍ରାମ ପଞ୍ଚାୟତ କାର୍ଯ୍ୟାଳୟ, ଲାଠି

ତା._____

ପ୍ରାପ୍ତେଷୁ

ଶ୍ରୀଯୁକ୍ତ ସଦସ୍ୟ ସଚିବ

ରାଜ୍ୟ ପ୍ରଦୂଷଣ ନିୟନ୍ତ୍ରଣ ବୋର୍ଡ, ଓଡିଶା ।

ଭୁବନେଶ୍ୱର ।

ବିଷୟ–ବ୍ରହ୍ମପୁର ପୌର ନିଗମ ଦ୍ୱାରା ପ୍ରସ୍ତାବିତ କଠିନ ଆବର୍ଜନା ପରିଚାଳନା ପ୍ରକଳ୍ପ ର ସ୍ଥାନାନ୍ତର ସମ୍ବନ୍ଧେ ।

ମହାଶୟ,

ନିବେଦନର କାରଣ ଏହି କି ଯେ, ଗଞ୍ଜାମ ଜିଲ୍ଲା ଅନ୍ତର୍ଗତ କୁକୁଡାଖଣ୍ଡି ବ୍ଲକ ଅଧିନସ୍ଥ ମହୁଡା ଗ୍ରାମରେ ବ୍ରହ୍ମପୁର ପୌର ନିଗମ ଦ୍ୱାରା କଠିନ ଆବର୍ଜନା ପରିଚାଳନା ପ୍ରକଳ୍ପ ସ୍ଥାପନ ନିମନ୍ତେ ସରକାରଙ୍କ ଦ୍ୱାରା ନିଷ୍ପତ୍ତି ନିଆ ଯାଇ ଅଛି । ଏହା ଆମ୍ଭ ପଞ୍ଚାୟତର ନିକଟବର୍ତ୍ତ ହୋଇଥିବା ହେତୁ ଆମ୍ଭ ଅଞ୍ଚଳର ପରିବେଶ ଦୂଷିତ ହେବ ଓ ପଞ୍ଚାୟତ ବାସି ବିଶୁଦ୍ଧ ପାନିୟ ଜଳ ପାଇବାରେ ବଞ୍ଚିତ ହେବେ ।

ଏଥି ପାଇଁ ପଞ୍ଚାୟତର ନିର୍ବାଚିତ ପ୍ରତିନିଧି ହିସାବରେ ମୁଁ ଏହାର ଦୃଢ ବିରୋଧ କରୁଅଛି ।

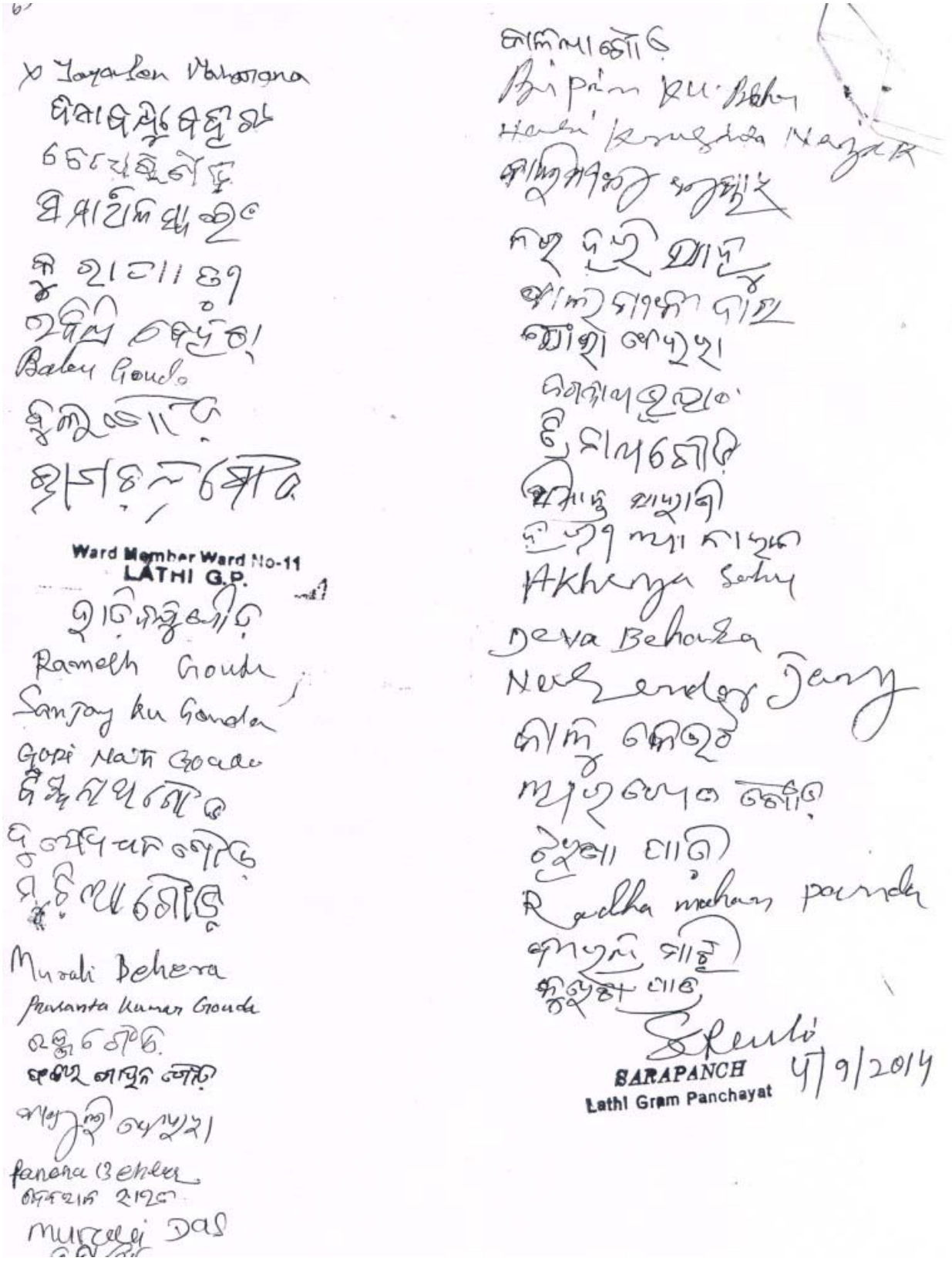
ଉକ୍ତ ପ୍ରକଳ୍ପଟିକୁ ଜନବସତିଠାରୁ ବହୁ ଦୂରକୁ ସ୍ଥାନାନ୍ତର କରାଗଲେ ଆମ୍ଭେ ଆପଣଙ୍କ ପାଖରେ ଚିର ଉପକୃତ ହେବୁ ।

।।ଇତି।।

ଆପଣଙ୍କ ବିଶ୍ୱସ୍ଥ

ସରପଞ୍ଚ

ଗ୍ରାମପଞ୍ଚାୟତ ଲାଠି ।


Ward Member Ward No-11
LATHI G.P.
SARAPANCH
Lathi Gram Panchayat
4/9/2014

ଗ୍ରାମ ପଞ୍ଚାୟତ କାର୍ଯ୍ୟାଳୟ, ମହୁଡା

ତା. 3/9/2014

ପ୍ରାପ୍ତେଷୁ

ଶ୍ରୀଯୁକ୍ତ ସଦସ୍ୟ ସଚିବ
ରାଜ୍ୟ ପ୍ରଦୂଷଣ ନିୟନ୍ତ୍ରଣ ବୋର୍ଡ, ଓଡିଶା ।
ଭୁବନେଶ୍ୱର ।

ବିଷୟ-ମହୁଡା ଗ୍ରାମରେ ବ୍ରହ୍ମପୁର ପୌର ନିଗମ ଦ୍ୱାରା ପ୍ରସ୍ତାବିତ କଠିନ ଆବର୍ଜନା ପରିଚାଳନା ପ୍ରକଳ୍ପ ସ୍ଥାପନର ସ୍ଥାନାନ୍ତର ନିମନ୍ତେ ଆବେଦନ ।

ମହାଶୟ,

ନିବେଦନ କାରଣ ଏହି ଯେ, ଗଞ୍ଜାମ ଜିଲ୍ଲା, କୁକୁଡାଖଣ୍ଡି ବ୍ଲକ ଅଧିନସ୍ଥ ମହୁଡା ଗ୍ରାମ ଠାରେ ବ୍ରହ୍ମପୁର ପୌର ନିଗମ ଦ୍ୱାରା କଠିନ ବର୍ଯ୍ୟବସ୍ଥୁ ପରିଚାଳନା ପ୍ରକଳ୍ପର ନିର୍ମାଣ ନିମନ୍ତେ ସ୍ଥିରିକୃତ କରାଯାଇଅଛି ।

R.O
SPCB
BPT

ଅତ୍ୟନ୍ତ ପରିତାପର ବିଷୟ ଏହି ଯେ, ଗ୍ରାମ ବାସି ମାନେ ପ୍ରାୟ ୬୦ ଏକର ଗୋଚର ଜମିକୁ ମେଡିକାଲ କଲେଜ ସ୍ଥାପନ ନିମନ୍ତେ ସ୍ୱିକୃତି ପ୍ରଦାନ କରିଥିବା ବେଳେ ବ୍ରହ୍ମପୁର ପୌର ନିଗମ ଉକ୍ତ ସ୍ଥାନରେ କଠିନ ବର୍ଯ୍ୟବସ୍ଥୁ ପ୍ରକଳ୍ପ ନିର୍ମାଣ କରିବା ପାଇଁ ସ୍ଥିର କରିଅଛି ।

ଉକ୍ତ ପ୍ରକଳ୍ପ ପାଇଁ ସରକାରୀ ଭାବେ ସ୍ଥିର କରିବା ପୂର୍ବରୁ ଗ୍ରାମ ପଞ୍ଚାୟତ ଏବଂ ସ୍ଥାନୀୟ ବାସିନ୍ଦାଙ୍କ ମଞ୍ଜୁରି/ମତାମତ ନିଆ ଯାଇନାହିଁ । ଉକ୍ତ ପ୍ରକଳ୍ପକୁ ବିରୁଦ୍ଧ କରି ଗଞ୍ଜାମ ଜିଲ୍ଲାପାଳଙ୍କ ଦୃଷ୍ଟି ଆକର୍ଷଣ କରିବା ସତ୍ତ୍ୱେ କୌଣସି ସୁଫଳ ହେଲା ନାହିଁ । ଉକ୍ତ ପ୍ରକଳ୍ପ ହେବା ଫଳରେ ସ୍ଥାନିୟ ଜନସାଧାରଣଙ୍କ ସ୍ୱସ୍ଥ୍ୟଗତ ଜଳ ପରିମଳ ଗୃହପାଳିତ ପଶୁ ଓ ପରିବେଶ ଇତ୍ୟାଦି ସମ୍ପୂର୍ଣ୍ଣ ଭାବେ ନଷ୍ଟ ହୋଇଯିବ ।

ଏଥି ନିମନ୍ତେ ଆମ୍ଭେ ପଞ୍ଚାୟତ ବାସିଙ୍କ ପ୍ରତିନିଧି ହିସାବରେ ଲୋକମତକୁ ସମ୍ମାନ ଜଣାଇ ମାନ୍ୟବର ଉଚ୍ଚ ନ୍ୟାୟାଳୟଙ୍କ ଦ୍ୱାରସ୍ଥ ହୋଇଅଛୁ ଓ ଉକ୍ତ ପ୍ରକଳ୍ପର ସ୍ଥାନାନ୍ତର ନିମନ୍ତେ ଆବେଦନ କରିଅଛୁ ।

61

(9)

ଏହା ଅଦାଲତଙ୍କ WP(c) 13283/2014 code-219900 ଦ୍ୱାରା ପଞ୍ଜିକୃତ ହୋଇ ଅଦାଲତଙ୍କ ବିଚାରାଧିନ ଅଛି । ଅଦାଲତଙ୍କ ନିକଟରେ ଦାଖଲ କରାଯାଇଥିବା ଆବେଦନର ନକଲ ଆପଣଙ୍କ ଅବଗତ ନିମନ୍ତେ ସଲଗ୍ନ କରାଯାଇଅଛି ।

ଏଣୁ ବିନିତ ଅନୁରୋଧ ଉକ୍ତ ପ୍ରକଳ୍ପର ମହୁଡା ଠାରେ ସ୍ଥାପନ କରା ନଯାଇ ଅନ୍ୟତ୍ର ସ୍ଥାନାନ୍ତର କଲେ ଆମ୍ଭେ ଅଞ୍ଚଳ ବାସି ଚିର ଉପକୃତ ହେବୁ ।

।।ଇତି।।

ଆପଣଙ୍କ ବିଶ୍ୱସ୍ତ

Sadhana mohanty
Sarapanch
Mohuda Gram Panchayat
ସରପଞ୍ଚ,
ମହୁଡା ଗ୍ରାମ ପଞ୍ଚାୟତ ।

Bansi dhara Bariha
Narayan Mandal
Durga Madhaba Chodhury
[illegible]
Thulu Bishoyi
[illegible]
Loknath Behera
Bhagabana Mandal.
[illegible]
Binayak Nahak
[illegible]
Ram Hari Majhi
Bijuli Das.
[illegible]
L.T.I.

[illegible]
Radha Madhaba Ratha
[illegible]
Atma Narayan Khatua
Sisir Kumar Rana
[illegible]
udaya Behera
[illegible]

60

[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
Rajendra Nahak
Harish Ch Pradhan
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
L.T.I. [illegible]
Lakshman Mandal
L.T.I. [illegible]
Niranjan Pradhan
L.T.I. [illegible]
L.T.I. of [illegible]

Chandan Bishoyi
[illegible]
Bhani Mandal
Rama Ch Bastia
[illegible] Nahak
Purna Ch. Mandal
AJAY Sahu
Bipin Charan Nahak
Sanjay Nahak
[illegible]
[illegible]
[illegible]
[illegible]
Ashok Ku. [illegible]
Simachi Mandal.
[illegible] (ward Member-
Kanhaye Sahu
Achyutananda Khatua
[illegible]
[illegible]
Sudam Nahak
[illegible]
[illegible]
Abhimanyu Sahu
[illegible]

Fax:2562822/2560955
Tel:2564033/2563924
EPABX:2561909/2562847
E-mail:paribesh1@dataone.in
Website:www.ospcboard.org

ରାଜ୍ୟ ପ୍ରଦୂଷଣ ନିୟନ୍ତ୍ରଣ ବୋର୍ଡ, ଓଡ଼ିଶା

ଏ/୧୧୮, ନୀଳକଣ୍ଠନଗର, ନୟାପଲ୍ଲୀ,
ଭୁବନେଶ୍ୱର-୭୫୧୦୧୨

No.12695/IND-II.PH.671 Dtd.02.08.14

ବିଜ୍ଞାପନ

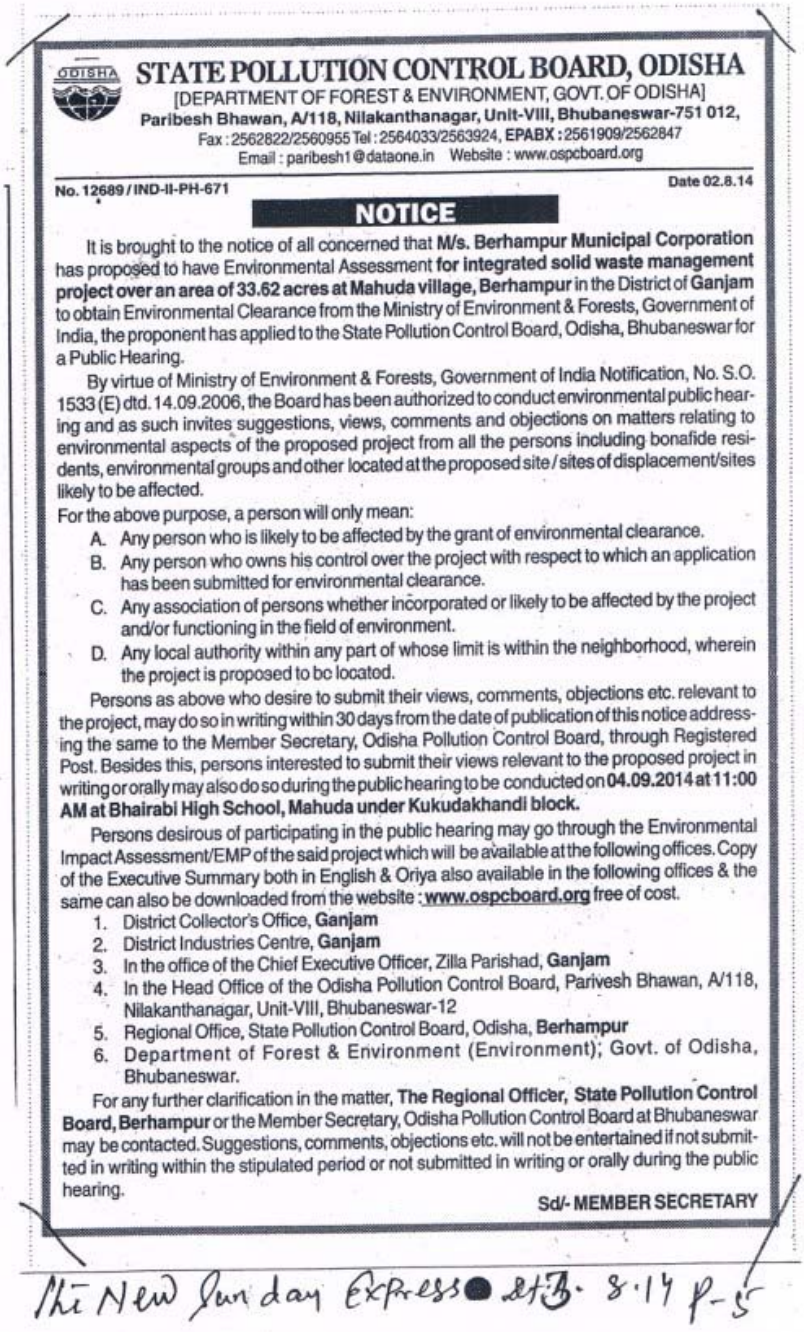
ଏତଦ୍ୱାରା ସମସ୍ତଙ୍କ ଅବଗତି ନିମନ୍ତେ ଜଣାଇ ଦିଆଯାଉଅଛି ଯେ ମେସର୍ସ ବ୍ରହ୍ମପୁର ପୌର ନିଗମ, ଗଞ୍ଜାମ ଜିଲ୍ଲାର **କୁକୁଡ଼ାଖଣ୍ଡି ବ୍ଲକ ଅନ୍ତର୍ଗତ ମହୁଦା ଗ୍ରାମଠାରେ ୩୩.୬୨ ଏକର ପରିମିତ ଅଞ୍ଚଳରେ କଠିନ ଆବର୍ଜନା ପରିଚାଳନା** ଯୋଜନା ନିମନ୍ତେ ଭାରତ ସରକାରଙ୍କ ପରିବେଶ ଓ ଜଙ୍ଗଲ ମନ୍ତ୍ରଣାଳୟ ଦ୍ୱାରା ପରିବେଶୀୟ ମଞ୍ଜୁରୀ ନିମନ୍ତେ ଆବଶ୍ୟକ ପଡୁଥିବା ସର୍ବସାଧାରଣ ଶୁଣାଣି ନିମନ୍ତେ, ଓଡ଼ିଶା ପ୍ରଦୂଷଣ ନିୟନ୍ତ୍ରଣ ବୋର୍ଡକୁ ଆବେଦନ କରିଛନ୍ତି । ଭାରତ ସରକାର, ପରିବେଶ ଓ ଜଙ୍ଗଲ ମନ୍ତ୍ରଣାଳୟର ପରିବେଶୀୟ ମଞ୍ଜୁରୀ ନିମିତ୍ତ ଅଧିସୂଚନା ସଂଖ୍ୟା ଏସ୍.ଓ. ୧୫୩୩ (ଇ), ତା.୧୪.୯.୨୦୦୬ ଅନୁଯାୟୀ ରାଜ୍ୟ ପ୍ରଦୂଷଣ ନିୟନ୍ତ୍ରଣ ବୋର୍ଡ, ଓଡ଼ିଶା, ଭୁବନେଶ୍ୱରଙ୍କୁ ସର୍ବସାଧାରଣ ଶୁଣାଣି କରିବାର କ୍ଷମତା ପ୍ରଦାନ କରିଛନ୍ତି । ଏଥି ନିମିତ୍ତ ବୋର୍ଡ, ସର୍ବସାଧାରଣଙ୍କ ସମେତ ପ୍ରକୃତ ଅଧିବାସୀ, ପରିବେଶୀୟ ସଂସ୍ଥା ଏବଂ ପ୍ରସ୍ତାବିତ ପ୍ରକଳ୍ପ ସ୍ଥାପନ ହେଉଥିବା ସ୍ଥାନରେ ଜନବର୍ଗ, ପ୍ରକଳ୍ପ ଯୋଗୁଁ ଉଚ୍ଛେଦ ହେଉଥିବା ବାସିନ୍ଦା, ପ୍ରକଳ୍ପ ଯୋଗୁଁ ପ୍ରଭାବିତ ହେଉଥିବା ବାସିନ୍ଦାମାନଙ୍କଠାରୁ ପ୍ରକଳ୍ପ ସ୍ଥାପନ ଯୋଗୁଁ ପରିବେଶୀୟ ପ୍ରଭାବ ସମ୍ବନ୍ଧୀୟ ପ୍ରସ୍ତାବ, ମତାମତ, ମନ୍ତବ୍ୟ ଓ ଆପତ୍ତି ପତ୍ର ଆହ୍ୱାନ କରୁଛନ୍ତି । ଏଥି ନିମିତ୍ତ ବ୍ୟକ୍ତିର ଅର୍ଥ କେବଳ ନିମ୍ନମତେ ବୁଝାଯାଉଛି (କ) ପରିବେଶୀୟ ମଞ୍ଜୁରୀ ଦ୍ୱାରା ପ୍ରଭାବିତ ହେଉଥିବା ବା ହେବାକୁ ଥିବା ଯେକୌଣସି ବ୍ୟକ୍ତି (ଖ) ପ୍ରକଳ୍ପ ସମ୍ବନ୍ଧିତ ପରିବେଶୀୟ ମଞ୍ଜୁରୀ ପାଇଁ ଆଗତ ଦରଖାସ୍ତ ପରିପ୍ରେକ୍ଷୀରେ ତହିଁ ଉପରେ କର୍ତ୍ତୃତ୍ୱ ଜାହିର କରିପାରୁଥିବା କୌଣସି ବ୍ୟକ୍ତି ବିଶେଷ (ଗ) ପରିବେଶ କ୍ଷେତ୍ରରେ କାର୍ଯ୍ୟ କରୁଥିବା କିମ୍ବା/ଏବଂ ପ୍ରସ୍ତାବିତ ପ୍ରକଳ୍ପ ଦ୍ୱାରା ପ୍ରଭାବିତ ହେଉଥିବା (ପଞ୍ଜିକୃତ ବା ଅପଞ୍ଜିକୃତ) ଯେକୌଣସି ବ୍ୟକ୍ତି ସମୂହଙ୍କ ସଂଘ (ଘ) ପ୍ରସ୍ତାବିତ ପ୍ରକଳ୍ପର ସ୍ଥାନୀୟ ସୀମାଭୁକ୍ତ ନିକଟବର୍ତ୍ତୀ ଅଞ୍ଚଳରେ ଯେକୌଣସି ସ୍ଥାନୀୟ କର୍ତ୍ତୃପକ୍ଷ । ଉପରୋକ୍ତ ବ୍ୟକ୍ତିମାନେ ସେମାନଙ୍କର ପ୍ରସ୍ତାବ, ମତାମତ, ମନ୍ତବ୍ୟ ଏବଂ ଆପତ୍ତି ଇତ୍ୟାଦିକୁ ସଭ୍ୟ ସଚିବ, ରାଜ୍ୟ ପ୍ରଦୂଷଣ ନିୟନ୍ତ୍ରଣ ବୋର୍ଡ, ଓଡ଼ିଶାଙ୍କୁ ଲିଖିତ ଆକାରରେ ଏହି ବିଜ୍ଞାପନ ପ୍ରକାଶନର ୩୦ ଦିନ ମଧ୍ୟରେ ରେଜେଷ୍ଟ୍ରି ଡାକରେ ଜଣାଇ ପାରିବେ । ଏହାଛଡ଼ା ଉକ୍ତ ପ୍ରସ୍ତାବିତ ପ୍ରକଳ୍ପ ଉପରେ ଲିଖିତ ବା ମୌଖିକ ଭାବେ ମତାମତ ଦେବା ପାଇଁ ଇଚ୍ଛୁକ ବ୍ୟକ୍ତିମାନେ ତା.୦୪.୦୯.୨୦୧୪ରିଖ ଦିବା ୧୧:୦୦ ଘଟିକା ସମୟରେ କୁକୁଡ଼ାଖଣ୍ଡି ବ୍ଲକ ଅନ୍ତର୍ଗତ ମହୁଦା ଗ୍ରାମ, ଭୈରବୀ ଉଚ୍ଚ ବିଦ୍ୟାଳୟଠାରେ ଧାର୍ଯ୍ୟ ସର୍ବସାଧାରଣ ଶୁଣାଣି ସମୟରେ ମଧ୍ୟ ଉପସ୍ଥାପନ କରିପାରିବେ । ପ୍ରସ୍ତାବିତ ପ୍ରକଳ୍ପ ବିଷୟରେ ବିଶଦ ଭାବରେ ଜାଣିବା ପାଇଁ ପରିବେଶୀୟ ପ୍ରଭାବିତ ମୂଲ୍ୟାୟନ ବିବରଣୀ (Environmental Impact Assessment) ଏବଂ ଏହାର ନିର୍ବାହୀ ସାରାଂଶ (Executive Summary) ନିମ୍ନଲିଖିତ ସ୍ଥାନମାନଙ୍କରେ ମିଳିପାରିବ ।

୧. ଜିଲାପାଳଙ୍କ କାର୍ଯ୍ୟାଳୟ, ଗଞ୍ଜାମ ।
୨. ଜିଲା ଶିଳ୍ପକେନ୍ଦ୍ର, ଗଞ୍ଜାମ ।
୩. ଜିଲା ପରିଷଦ ମୁଖ୍ୟ ନିର୍ବାହୀ ଅଧିକାରୀ, ଗଞ୍ଜାମ ।
୪. ମୁଖ୍ୟ କାର୍ଯ୍ୟାଳୟ, ରାଜ୍ୟ ପ୍ରଦୂଷଣ ନିୟନ୍ତ୍ରଣ ବୋର୍ଡ, ଓଡ଼ିଶା, ପରିବେଶ ଭବନ, ଏ/୧୧୮, ନୀଳକଣ୍ଠ ନଗର, ଭୁବନେଶ୍ୱର-୭୫୧୦୧୨ ।
୫. ଆଞ୍ଚଳିକ କାର୍ଯ୍ୟାଳୟ, ରାଜ୍ୟ ପ୍ରଦୂଷଣ ନିୟନ୍ତ୍ରଣ ବୋର୍ଡ, ଓଡ଼ିଶା, ବ୍ରହ୍ମପୁର ।
୬. ଜଙ୍ଗଲ ଓ ପରିବେଶ (ପରିବେଶ) ବିଭାଗ, ଓଡ଼ିଶା ସରକାର, ଭୁବନେଶ୍ୱର ଏବଂ ରାଜ୍ୟ ପ୍ରଦୂଷଣ ନିୟନ୍ତ୍ରଣ ବୋର୍ଡ, ଓଡ଼ିଶା, ୱେବସାଇଟ୍ www.ospcboard.orgରୁ ପାଇପାରିବେ ।

ଏ ବିଷୟରେ ସବିଶେଷ ବିବରଣୀ ପାଇଁ, ରାଜ୍ୟ ପ୍ରଦୂଷଣ ନିୟନ୍ତ୍ରଣ ବୋର୍ଡ, ଓଡ଼ିଶାର ଆଞ୍ଚଳିକ କାର୍ଯ୍ୟାଳୟ, ବ୍ରହ୍ମପୁରସ୍ଥିତ ଆଞ୍ଚଳିକ ଅଧିକାରୀ କିମ୍ବା ଭୁବନେଶ୍ୱରସ୍ଥିତ ମୁଖ୍ୟ କାର୍ଯ୍ୟାଳୟରେ ସଦସ୍ୟ ସଚିବଙ୍କ ସହ ଯୋଗାଯୋଗ କରାଯାଇପାରେ । କୌଣସି ପ୍ରସ୍ତାବ,ମନ୍ତବ୍ୟ, ମତାମତ ବା ଆପତ୍ତି ଲିଖିତ ଆକାରରେ ଧାର୍ଯ୍ୟ ତାରିଖ ମଧ୍ୟରେ କିମ୍ବା ଲିଖିତ ବା ମୌଖିକ ଆକାରରେ ସର୍ବସାଧାରଣ ଶୁଣାଣିବେଳେ କରାନଗଲେ ତାହା ବିଚାରକୁ ନିଆଯିବ ନାହିଁ ।

ସ୍ୱା/-
ସଦସ୍ୟ ସଚିବ

ସାର୍ଥ ୯୨



STATE POLLUTION CONTROL BOARD, ODISHA

[DEPARTMENT OF FOREST & ENVIRONMENT, GOVT. OF ODISHA]
Paribesh Bhawan, A/118, Nilakanthanagar, Unit-VIII, Bhubaneswar-751 012,
Fax : 2562822/2560955 Tel : 2564033/2563924, **EPABX :** 2561909/2562847
Email : paribesh1@dataone.in Website : www.ospcboard.org

No. 12689 / IND-II-PH-671 **Date 02.8.14**

NOTICE

It is brought to the notice of all concerned that **M/s. Berhampur Municipal Corporation** has proposed to have Environmental Assessment **for integrated solid waste management project over an area of 33.62 acres at Mahuda village, Berhampur** in the District of **Ganjam** to obtain Environmental Clearance from the Ministry of Environment & Forests, Government of India, the proponent has applied to the State Pollution Control Board, Odisha, Bhubaneswar for a Public Hearing.

By virtue of Ministry of Environment & Forests, Government of India Notification, No. S.O. 1533 (E) dtd. 14.09.2006, the Board has been authorized to conduct environmental public hearing and as such invites suggestions, views, comments and objections on matters relating to environmental aspects of the proposed project from all the persons including bonafide residents, environmental groups and other located at the proposed site / sites of displacement/sites likely to be affected.

For the above purpose, a person will only mean:

A. Any person who is likely to be affected by the grant of environmental clearance.
B. Any person who owns his control over the project with respect to which an application has been submitted for environmental clearance.
C. Any association of persons whether incorporated or likely to be affected by the project and/or functioning in the field of environment.
D. Any local authority within any part of whose limit is within the neighborhood, wherein the project is proposed to be located.

Persons as above who desire to submit their views, comments, objections etc. relevant to the project, may do so in writing within 30 days from the date of publication of this notice addressing the same to the Member Secretary, Odisha Pollution Control Board, through Registered Post. Besides this, persons interested to submit their views relevant to the proposed project in writing or orally may also do so during the public hearing to be conducted on **04.09.2014 at 11:00 AM at Bhairabi High School, Mahuda under Kukudakhandi block.**

Persons desirous of participating in the public hearing may go through the Environmental Impact Assessment/EMP of the said project which will be available at the following offices. Copy of the Executive Summary both in English & Oriya also available in the following offices & the same can also be downloaded from the website : **www.ospcboard.org** free of cost.

1. District Collector's Office, **Ganjam**
2. District Industries Centre, **Ganjam**
3. In the office of the Chief Executive Officer, Zilla Parishad, **Ganjam**
4. In the Head Office of the Odisha Pollution Control Board, Parivesh Bhawan, A/118, Nilakanthanagar, Unit-VIII, Bhubaneswar-12
5. Regional Office, State Pollution Control Board, Odisha, **Berhampur**
6. Department of Forest & Environment (Environment), Govt. of Odisha, Bhubaneswar.

For any further clarification in the matter, **The Regional Officer, State Pollution Control Board, Berhampur** or the Member Secretary, Odisha Pollution Control Board at Bhubaneswar may be contacted. Suggestions, comments, objections etc. will not be entertained if not submitted in writing within the stipulated period or not submitted in writing or orally during the public hearing.

Sd/- MEMBER SECRETARY

The New Sunday Express ● 27.8.14 P-5

SL. No	**Nature of issues raised by public**	**Issues**	**Action**	**Time schedule**	**Cost /Remarks**
1.	**Peripheral Development** (Sri Binen Pattanaik, Corporator BMC No. 12, Sri Sukanta Patra)	• Overall development of the area, school, education, road, health facilities etc.	• The company will invest **35,00,000 (**for health, Education and Awareness campaigns**)**	5 years	3500,000
2.	**Employment** (Smt. Rajeswari Sahoo, Sri Jiban Dalai)	• Job Opportunity	• Direct and indirect employment will be provided to the local people on the basis of their qualification & experience as per job availability.	10 years	
3.	**Environmental Issues** (Sri Udaynath Pradhan, Mohuda; Sri Paresh Chandra Sahoo, Sri Jiban Dalai, Smt. Radhamadhab Mohanty) **Health and Hygiene** (Smt. Sadhana Mohanty, Smt.Tulusa Sasmal, Smt. Radhamadhab Mohanty	• Harmful effect on the Climate • Water and Air pollution • Storm water	• There will be no discharge of waste water from the project hence any chance of water pollution does not arise. • There is no river or water body in the nearby area which can get affected due to water pollution. • The wastes after processing will generate inert wastes which will be disposed off in the scientific landfill system i.e. in the polythene lined pit followed by soil cover. After attenuation of the life period of the landfill system, plantation will made over the landfill system unlike the present earth disposal practice at Chandania Pahad • This project will have garland storm water drain & the storm	3 years	150 lakhs for waste water treatment and management

		Management • Odor Nuisance • Harmful Effect on Cattle grazing/ Agricultural Land • Harmful Health Effect on the inhabitant, Flora fauna of the area near by	water will be stored in a rain water harvesting pond so that the stored water will be reused in the process for different uses. • All wastes will be kept in a covered place & biocides will be sprayed on the wastes in a covered silo in order to restrict the odour to spread out side. • Deodorizing agent will sprayed in a time interval • Plantation will be around the site which will create a buffer zone • There will be no dust generation or other type of pollutants which will be carried by air to damage the near by grazing fields, hence there is remote chance of damaging the nearby agricultural /cattle grazing field by the project • The transportation of the MSW will be carried out in closed & covered vehicles to ensure no spillage on the roads. As the disposal of the solid wastes will be done in closed silos and in a scientific manner there will be no adverse impact on health of inhabitant & flora fauna in the surrounding area.	3 years	70 lakhs will be incurred for Air pollution abatement of the project

CHAPTER-8
ENVIRONMENTAL MONITORING PROGRAM

Introduction

Monitoring of the Municipal Solid Waste operations i.e. the physical environment and the public health in the vicinity of the Integrated Municipal Solid Waste Management Facility is an integral part to design, construction and operation of the facility. The proposed monitoring program for the this project has three interrelated objectives.

- To monitor implementation and management of the various aspects required for impact mitigation.
- To check how effective are the measures for mitigation and control of pollution.
- In case of non compliance,what could be further measures for rectification.

Scope of Environmental Monitoring Program

The main objective of environmental monitoring program is aimed such that there is not much of time lack between commencements of damage to environment and mitigation measures to various environmental parameters that are being affected. The Environmental Monitoring Program involves the following.

- Planning a survey and sampling program for systematic data/information collection
- Conducting survey and sampling program
- Analysis of samples and data/information collected, and interpretation of data and information
- Preparation of reports for submitting to management and statutory authorities

Environmental monitoring is carried throughout project operation to detect changes in the key environmental quality parameters, which can be attributed to the project.
The results of the monitoring program used to evaluate the following:

a. Extent and severity of the environmental impacts against the predicted impacts;

b. Performance of the environmental protection measures or compliance with pertinent rules and regulations

c. Trends in impacts and Overall effectiveness of the project EMP

(a) Air Environment

For the proposed project, the air emissions are from windrow process, DG sets and vehicular movement. DG set is proposed as standby for use during power failure for emergency needs using diesel as fuel and hence are not expected to contribute emissions to the environment on regular basis. Ambient air quality in and around the project site (nearby villages) will be monitored for important parameters

(b)Noise Environment

Monitoring of the noise levels and exposures is essential to assess the Environmental Management Plan implemented to reduce noise levels. Audiometric tests will be conducted periodically for the employees working close to the noise sources. Noise levels will be monitored within the project site on regular intervals.

(c) Water Environment

Leachate, domestic sewage, water from peizometers, nearby bore wells, nearby surface waters will be analyzed regularly for the parameters given below. They are as follows:

(1)pH & EC ;(2) Suspended Solids ;(3) Dissolved Solids ;(4) Oil and Grease ;(5) Chloride ; (6)Sulphide ;(7) COD ; (8)BOD ;(9) Nitrates and (10) Phosphates

(d)Analytical Procedure for manure

The sample of Manure is subjected to an array of analytical procedures which includes the following parameters.

Physical Analysis

The physical analysis can be used to instantly detect the degradation rate/the quality of the manure. The following are the physical tests carried out at the laboratory for Manure.

1. Colour
2. EC
3. pH
4. Moisture
5. Odour
6. Maturity test
7. Particle size
8. Bulk Density

The following QC/QA sheets shall be used for the composting facility

Name of the project_____

Checklist at weigh Bridge

Contractor Contact No.		
Vehicle No:_____ Empty weight of vehicle:_____Tonnes Loaded weight of vehicle:_____Tonnes Net Weight:_____Tonnes		
	Signature	Date
Driver		
Weigh bridge Operator		

Name of the project_____

Checklist at Waste receiving Platform

Contractor Contact No.		
Composition of waste:1.organic waste_____% 2.Inorganic waste_____% Moisture Content:_____%		
	Signature	Date
Lab in charge		
Plant in charge		

Name of the project_____

Checklist at Windrow Platform

Contractor Contact No.		
Before placement:1.Moisture content_____% 2.C/N ratio_____% During process: 1. Moisture content_____% 2.C/N ratio:_____% 3.Temperature:_____◦c		
	Signature	Date
Lab in charge		
Plant in charge		

Name of the project_____

Checklist at Refinement section

Contractor Contact No.		
1. Moisture content:_____% 2. C/N ratio:_____% 3. pH:_____% 4. Nitrogen:_____% 5. Phosphorus:_____% 6. Potassium:_____%		
	Signature	Date
Lab in charge		
Plant in charge		

(e) Land Environment

The soil in the neighboring areas will be analyzed for the relevant parameters. The average canopy height of the greenbelt, number and types of plant species will be monitored. Air and noise pollution attenuation achieved by the greenbelt will also be evaluated. It would be ensured that trained and qualified staff supervises the monitoring of ambient air, stack gases, effluents, noise etc. to see that prescribed standards laid down are obtained. The post project monitoring schedule/plan is given in Table 7.1 below.

Table 7.1: Post Project Monitoring Schedule

Environmental Component	Locations	Frequency	Parameters
Ambient Air Quality	**Nearby habitations, upwind, downwind, crosswind**	**Monthly once**	**PM_{10}, $PM_{2.5}$, SO_2, NO_x, CH_4, CO, Ammonia odour**
Stack emission	**DG Set**	**Monthly once**	**PM_{10}, $PM_{2.5}$, SO_2 & NO_x**
Noise	**Within site(DG set, compost yard, SLF area) and nearest habitation**	**Monthly once**	**Noise levels**
Ground water/Surface water	**Piezometers around the landfill, ground water & surface water from nearby villages**	**Monthly once**	**IS 10500:1991 drinking water parameters**
Leachate	**Windrow,**	**Monthly once**	**SS,TDS,pH,BOD,COD,As,**

	compost plant, Secured landfill		**CN, Cl**
Waste water	**STP**	**Monthly once**	
Landfill gas	**Landfill area**	**Monthly once**	**Methane & CO_2**
Plantation	**Greenbelt**	**Half yearly**	**Survival of plants and replacement of immature plants**
Compost	**Final product**	**Monthly once**	**As, Cd, Cr, Cu, Pb, Hg, Ni, Zn, C/N ratio, pH**

Table-7.2: Cost Estimates for Environmental Monitoring

S.N	**Parameter**	**No. of Samples per annum**	**Cost per Sample (INR)**	**Total Annual Cost (IN**
Mohuda Village				
Constructiopn phase				
1	Ambient air quality	**104*3= 312**	**3500**	**1092000**
2	Noise quality	**12*6=72**	**500**	**36,000**
3	Surface Water quality	**-**	**-**	**-**
4	Groundwater quality	**2*12**	**3500**	**84,000**
5	Soil quality	**1**	**10000**	**10,000**
				12,22,000
Operation phase				
1	Ambient air quality	**104*3= 312**	**3500**	**10,92,000**
2	Noise quality	**12*6=72**	**500**	**36,000**
3	Surface Water quality	**-**	**-**	**-**
4	Groundwater quality	**2*12=24**	**3500**	**84,000**
5	Soil quality	**1**	**10000**	**10,000**
6	Leachate Quality	**12*4*2= 96**	**3500**	**33,6000**
	Total cost			**27,80,000**
Chandania Pahad				
Post closure Monitoring				
1	Ambient air quality	**104*3= 312**	**3500**	**10,92,000**
2	Noise quality	**12*6=72**	**500**	**36,000**

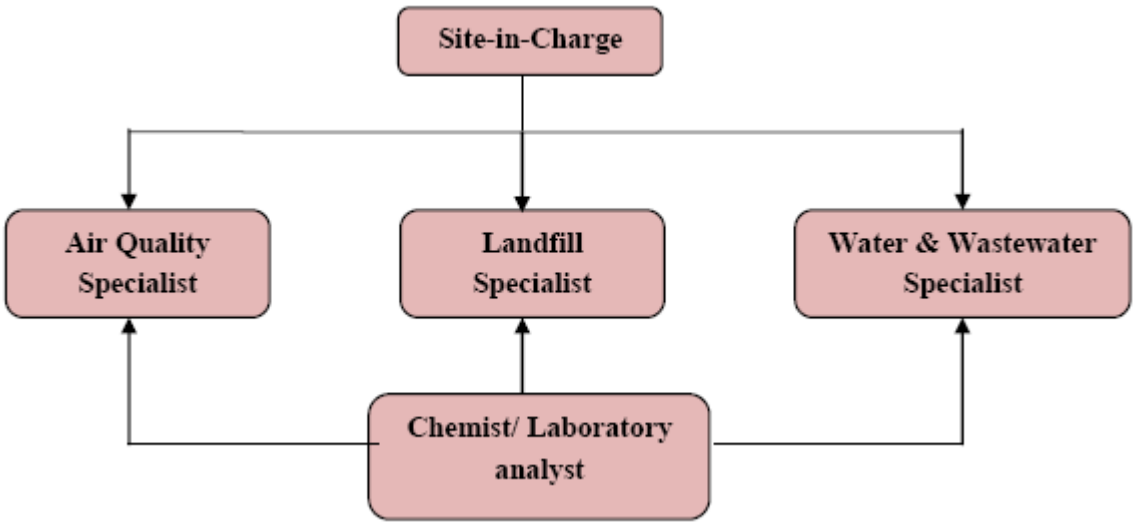
3	Surface Water quality	**-**	**-**	**-**
4	Groundwater quality	**2*12=24**	**3500**	**84,000**
5	Soil quality	**1**	**10000**	**10,000**
6	Leachate Quality	**12*4*2= 96**	**3500**	**33,6000**
	Total cost			**15,58,000**

Public Health Monitoring

The value of Public Health studies in seeking to establish whether or not a site or facility has caused significant adverse health effects is well known. In this situation the results form a public health study may not fulfill the primary objective of such a program, which is to detect health changes before the manifestation of adverse health effects. However, three-stage health-monitoring program is proposed.

- Monitor the health of workers within the project site to identify adverse health effects, and
- Periodically obtain feedback from local doctors regarding any potential indicators of adverse health effects due to environmental cause in the communities surrounding, and particularly down-stream of the landfill.
- By organizing health camps on a regular basis.

The company will invest **15,58,000** (around 0.3 % of total project cost Phase-I and phase II) as capital investment towards implementation of Environmental monitoring for the site Mohuda **and chandania pahad**



In order to ensure the optimal performance of the landfill site, checking the environmental pollution and complying with the regulatory requirements is essential. The following environmental parameters shall be monitored on a regular basis.

- Quality of Leachate after treatment
- Surface Water Quality
- Ground Water Quality

- Quantity and Quality of Gas Generated
- Ambient Air Quality

The above parameters shall be monitored as per the standards stipulated in MSW Rules 2000. The number of samples and location specifications for monitoring are presented in **Table 7.3.**

Table-7.3: Sampling Specifications for Environmental Monitoring

Description	Sampling Specifications
Quality of Leachate after Treatment	One grab Sampling at out let of the treatment plant every month
Surface Water Quality	One grab sample at upstream side and one grab sample at downstream side for water body near the landfill site monthly
Ground Waste Quality	One sample at up-gradient side and three samples at down-gradient side of the landfill site every month
Quantity and Quality of Gas Generated	24 hours continuous stack monitoring at selected vent on every month
Ambient Air Quality	48 hours continuous ambient air quality monitoring at one location in upwind and three locations in downwind directions every month

The leachate quality after treatment should meet the standards recommended by MoEF in Municipal Soil Waste (Management and Handling) Rules, 2000 and presented in **Table 7. 4.**

Table- 7.4: Disposal Standards for Treated Leachate

Sr. No.	Parameter	Standard (Mode of Disposal)		
		Inland Surface Water	Public Sewer	Land Disposal
1.	Suspended solids, mg/1, Max	100	600	200
2.	Dissolved solids (inorganic) mg/1	2100	2100	2100
3.	pH	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
4.	Ammonical nitrogen (as N), mg/1	50	50	-
5.	Total Kjeldahl nitorgen as N,mg/1	100	-	-
6.	BOD in mg/1 (3 days @ 27◦C)	30	350	100
7.	Chemical oxygen demand, mg/1	250	-	-
8.	Arsenic (as As), mg/1 max	0.2	0.2	0.2
9.	Mercury (as Hg) mg/1, max	0.01	0.01	-

10.	Lead (as Pb), mg/1, max	0.1	1.0	-
11.	Cadmium (as Cd) mg/1 max	2.0	1.0	-
12.	Total chromium as Cr, mg/1	2.0	2.0	-
13.	Copper as Cu, mg/1	3.0	3.0	-
14.	Zinc A as Zn, mg/1	5.0	15	-
15.	Nickel as Ni, mg/1	3.0	3.0	-
16.	Cyanide as CN, mg/1	0.2	2.0	0.2
17.	Chloride as CI, mg/1	1000	1000	600
18.	Fluoride as F, mg/1	2.0	1.5	-
19.	Phenolic compounds (C_6H_5OH), mg/1	1.0	5.0	-

Source: MSW (Management and Handling) Rules, 2000. The groundwater quality within 50 m of the periphery of landfill site shall be periodically monitored to ensure that the groundwater is not contaminated beyond acceptable limits as decided by the Ground Water Board or the State Board or the Committee. Usage of ground water in and around the landfill site for any purpose (including drinking and irrigation) is to be considered after ensuring its quality. The monitoring results water quality shall meet the drinking water quality standards as presented in **Table 7.5.**

Table- 7.5: Standards for Surface and Ground Water Quality Monitoring

S.N.	Parameter	IS 10500: 1991 Desirable Limit
1	Arsenic, mg/l	0.05
2	Cadmium (as Cd) mg/l	0.01
3	Chromium, mg/l	0.05
4	Copper as Cu, mg/l	0.05
5	Cyanide as CN, mg/l	0.05
6	Lead (as Pb), mg/l,	0.05
7	Mercury (as Hg) mg/l	0.001
8	Nickel as Ni, mg/l	-
9	Nitrate as NO, mg/l	45
10	pH	6.5 – 8.5
11	Iron, mg/l	0.3
12	Total Hardness (as CaCO3), mg/l	300
13	Chloride as CI, mg/l	250
14	Dissolved solids, mg/l	500
15	Phenolic compounds (as C_6H_5OH), mg/l	0.001
16	Zinc A as Zn, mg/l	5
17	Sulpahte (as SO_4), mg/l	200

Source *MSW (Management and Handling) Rules, 2000* ambient air quality at the landfill site and at the vicinity shall be monitored to meet the prescribed standards as presented in **Table 7.6.**

Table- 7.6: Ambient Air Quality Standards

S. No	Parameters	Acceptable Levels
1.	Sulfur dioxide	120 g/m ^{3} (24 hours)
2.	Suspended particulate matter	500 g/m ^{3} (24 hours)
3.	Methane	25 % of the lower explosive limit(650 mg/m^3)
4.	Ammonia (24 hour average)	0.4 mg/m^3 (400 g/m ^{3})
5.	Carbon Monoxide	1 hour average: 2 mg/m^3 8 hour average: 1 mg/m^3

The post closure monitoring will be carried out for a period of 20 years from the starting day of operation of the proposed processing and disposal facility at Mohuda.

Landfil site is not likely to have any major risk for which separate disaster management plan is required. However, since the area where facility is being proposed, falls in cyclone affected area, site needs to have a local disaster management plan that could be integrated with government disaster management plan if need be there. Following are the component of this disaster management plan.

Disaster Management Plan

'Disaster management can be defined as the organization and management of resources and responsibilities for dealing with all humanitarian aspects of emergencies, in particular preparedness, response and recovery in order to lessen the impact of disasters. Following are key points of Disaster Management.

- Disaster prevention
- Disaster preparedness
- Disaster relief
- Disaster recovery

The development of an effective disaster management plan ensures that the potential causes of disaster and efforts to prevent and respond to such disasters can be planned in advance. At a landfill site, an emergency can take place at any time due to extreme weather events (such as earthquake or floods) or by major accident in the site (fires or explosions), despite the installation of various safety devices. Unlike natural disasters, accidents such as fire and explosions can be prevented by proper plan and in case of accident the effect can be minimized by proper emergency response method. Though the risk of fire or explosion is considered minimal due to the inert nature of the waste dumped in the landfill, this disaster management plan will be implemented in case of an unforeseen scenario of major fire, explosion or cyclone

KEY ELEMENTS

The important elements of Disaster Management Plan are described below.

(a)Pre-disaster stage

Any emergency starts as a small incident that may become a major accident if not controlled on time. Hence, all the elements of a disaster management plan must be developed and operational at any point of time to be able to control and respond to emergency situations.

The initial steps in the disaster management plan are provision of fire fighting systems and rescue teams.

Fire fighting system required to meet disaster from major fire or explosion

The fire fighting system will comprise of the following:

- Fire extinguishing systems which will consist of fire pumps, water distribution pipelines, Hydrants, fire hoses and the portable extinguishers.

- Fire alarm system in areas places which are unmanned or will not have any fixed fire extinguishing system. The fire alarm and detection system shall be designed, installed, maintained and tested according to relevant standards.
- All the rooms in the office shall be equipped with fixed smoke detectors.
- The water for firefighting shall be stored in the fire water tank (water reservoir).

Emergency response team

An emergency response team under the direct supervision of landfill site in-charge is planned. The team will consist of Security personnel, Safety and Services (Maintenance) and Welfare officer. This team will be responsible for prevention as well as for dealing with any expernal agency related to disaster management agency. The activity of the team will be as given below:

- To plan and augment area wise safety and other related facilities, if required, so as to match with the needs
- To periodically organize mock exercise with respect to disaster plan to check the awareness and preparedness of the concerned agencies/personnel to meet the emergency
- To prepare a general course of action and responsibility chart to be adopted for any disaster/emergency and identification of specific steps that needs to be taken unique to each type of disaster/emergency.
- To organize rescue operations during and after the emergency/disaster.
- To review the progress status on various activities relating to the compliance of Safety Rules, and communicate to all concerned for compliance.

(b)Disaster Stage

As soon as a fire/disaster/emergency takes place inside the premises of landfill, action to be taken by various persons/officials will be as follows:

1. The person noticing a disaster/emergency situation will:

- Raise the alarm by shouting
- Give message to Safety department on telephone/personally giving full and clear message of accident
- If the emergency/disaster is small enough for tackling by person alone, immediate attempts to control it by using nearby control equipment

2. The person arriving next on scene will:

- Inform respective control room on telephone
- Attempt to control the disaster with due care of personal danger
- Make sure that exit routes are free and road for approach for rescue vehicles is clear and unobstructed

4. Other persons in the disaster area:

- All required persons would not leave the place of disaster and continue their functions and operate essential equipment and emergency systems till ordered to evacuate

- Considering the building/section and the immediate surroundings
- All other non-essential persons would be evacuated safely and would be collected in safe place of assembly under an executive and should act in accordance with his instructions

5. Sectional In-charge of the disaster area:
   - On hearing the alarm or on receipt of message regarding accident in his area, he will immediately proceed to the scene of the accident in his area
   - He will ensure that Safety Department is informed about the accident and if required, should inform Main/Control Gate Security for sounding hooter
   - He should ensure that all important documents, precious material are salvaged / removed to safe place with the help of his section staff
   - He should decide in consultation with other senior officers present and arrange to switch off power/gas/air or any other equipment or system if so warranted to control the situation
   - He will give top priority to the calls of accident and immediately inform the location of the disaster to the Chief Executive Officer, Safety Department, Main Gate/Safety Officer, Welfare Officer
   - He will take all necessary steps required in the emergency situation regarding operational control of the landfill site
   - He wills guide/assist rescue staff in combating the disaster/emergency situation
   - He will mobilize all spare trained personnel to help in tackling the jobs such as fire, rescue, moving of casualties & salvage operations.

6. All persons of the area not affected by the disaster:
   - On hearing the alarm sounded or Siren, work in the building and landfill site, will not be stopped, unless specifically told by In-charge of the section
   - All persons of the section are available at their respective work place for any assistance that may be called for till all clear is sounded
   - They will extend their fullest co-operation to meet the situation if called for by affected section

Emergency response team:

- On arrival at the scene of the accident, In-charge of rescue team will enquire about the details of accident, quickly size up the situation. Rescue team will immediately operate fixed fire fighting systems or initiate other appropriate action according to situation
- He will also take action for calling the additional fire brigades from town administration, if required, and co-ordinate with them
- He will make sure that the necessary water, foam compound, dry powder, carbon dioxide gas, or any other fire fighting agents equipment required according to situation are readily available at the fire spot
- He will take appropriate action simultaneously to protect the unaffected areas
- He will direct the fire fighting rescue operations till all clear is given

Security Main Gate:

- Security guard of Main Gate on receipt of message of emergency/fire will immediately sound the alarm on Siren in Wavering sound for 5 minutes
- He will not permit any one to leave/enter Main gate except essential persons of the landfill after thorough check and verification
- He will arrange to keep the main gate road clear for outside assistance
- On receipt of ALL CLEAR message from concerned officials of landfill site conducting Emergency/Fire fighting operations, he will sound ALL CLEAR siren by continuous blast of one minute.

Security in-charge:

- He will immediately rush to the place of incident and arrange for Security Cordoning
- He will see that no unwanted personnel approach the place of incident
- He will also take charge of security of landfill site.s property
- He will inform police in case of serious accident when causalities are involved in consultation with In-charge (Landfill Site)
- If causalities are involved he will make arrangement to shift them to town hospital by ambulance or any other available vehicle.

Safety Officer:

- Safety Officer and his personnel will make available all safety gadgets and personnel protective equipment etc according to the situation at the scene of incident.
- He will see that all persons entering the place of occurrence are wearing protective equipment
- He will ensure that fire fighting personnel and other persons while fighting emergency/fire is in safe place/position
- He will make complete note of the incident inform about the incident to the concerned authorities as per statutory provision in consultation with Engineer-in -charge of landfill site
- He will make arrangement for evacuation of staff if necessary in consultation with In-charge Engineer (Landfill Site).

CHAPTER-10
CORPORATE SOCIAL RESPONSIBILITY

CSR activity

The projet itself is a CSR oriented & and sponsored by Government.

Under CSR the company shall spent specific amount on yearly basis; which will fulfill public demand and bring about the overall improvement of the locality and shall be spent for overall development of the locality and local people.

Some of the community developments plans can be considered by the project developer as part of corporate social responsibility. These are explained below:

1. **Health care initiatives:**
   Project developer may tie-up with hospitals in Berhampur city to conduct free health checkups periodically at Project site. Rag pickers employed at Project site and villagers in the vicinity, who are otherwise averse to visit the city for paid diagnosis will be greatly benefitted.
   Health camps for diagnosis of cardiovascular diseases, eye sight & cataract etc. can be conducted and health awareness workshops can be conducted. Similarly, in case of spread of some epidemic, necessary medicines can be distributed and local community can be educated to take preventive measures.

2. **Educational Initiatives:**
   Project Developer can collaborate with various NGOs working in the region to impart education to the children of the labourers and local community. Other initiatives like distribution of used books collected during Door to Door collection and arrangement of moving schools can also be considered.

3. **Awareness campaigns:**
   Citizens in Indian cities lack basic awareness about handling waste in households. By means of circulating educational literature and conducting road shows/ street plays, citizens of Berhampur can be taught to deal with dry and wet solid waste and to reduce, recycle and reuse the waste by segregating it at source.They can also be educated about ill-effects of littering the public spaces, streets and drainages. Similar campaigns can be run in fruit and vegetable markets to encourage the vendors to use garbage bins to dispose of the leftovers.

   The company will invest **35,00,000** (around 1 % of total project cost Phase-I) as capital investment for CSR activities.

Table-10.1 : Estimated cost for CSR activities

Activities	Activities	Budget for 5 Years
Health care initiatives	**Free health checkup camps** - Free diagnosis - Free Medicine distribution	**500000.00**
Educational Initiatives	Adoption of children for imparting education to the children's of the economical backward class	**500000.00**
	Distribution of Books and arrangement of moving schools	**500000.00**
	Adoption of near by villages for Municipal Waste collection.	**1500000.00**
Awareness campaigns	Circulating educational literature and conducting road shows/ street plays	**300000.00**
	Awareness camps for sanitation & cleanliness at both house & Public Places.	**200000.00**
TOTAL		**35,00,000.00**

CHAPTER-11
PROJECT BENEFIT

Berhampur is one of the oldest towns which located in the southern part of odisha. This town is one among business capital of southern coastal odisha and scattered in the area of 37 sq.km. Like most urban cities, this city too is marred with lack of treatment or processing facility for treating municipal solid waste generated in the city. Door to door collection in the city is being practiced only in 19 ward out of 31 wards with and residents of remaining wards throw the waste in open in the road side or in the open drain which causes chocking of the drains. And also the storage facility in the city is inefficient. Transportation of the waste is done in uncovered vehicle, due to the heavy wind waste is scattered on the way to the disposal. Finally the solid waste is disposed at Chandania Pahad without any segregation and treatment of the municipal solid waste. At this site the waste is being dumped in a very crude manner without any liner which has lead to contamination of soil, ground water, surface water and burning practice has also caused serious air pollution problem.

This is social service project being funded by donor agency and government in order to provide a hygienic living condition to the people residing in and around Berhampur city. The project will be constructed and managed by professional group having adequate experience in this field.

The proposed project is likely to benefit the people living in Berhampur and in the surrounding areas through different steps which will lead to overall improvement of the environment are:

Improvement In collection Efficiency:

Project intends to improve the overall collection efficiency by outsourcing the door to door collection of waste for all the wards to 2-3 private agency or NGOs. And Special care will be taken for waste from vegetable market, commercial places, hotels & restaurant and construction places.

Improvement in Storage and transportation of Municipal waste:

Well designed waste bin will be placed in uniformly in all the wards. Modern Hydraulic automobile vehicle will be deployed for transportation such as auto tipper, TATA Ace etc.

Decomissioning of the existing site at Chandania Pahad

The existing disposal site will be decommissioned by the construction of a engineered landfill cell for disposal of accumulated waste and waste generated till the development of the proposed new sanitary landfill i.e. during the transition period. This landfill will be designed with liner, cover system to prevent ground and surface water contamination. Leachate collection and conveyance system and storm water management system has been proposed for the cell. Post closure monitoring is proposed for 15 years as per MSW Rules, 2000.

New Site for disposal Of solid waste at Mohuda

This site is suitable landfill site as there is no habitation near the site.

Landfill will be well designed to have following facility

Liner system will prevent contamination of ground water and soil due to leachate
Leachate collection and treatment facility for leachate management

Material recovery:

a) Recyclable waste segregated will be sent to plastic recycler
b) Compost produced will be provided to for agricultural use

The project will also benefit the people living in the neighboring villages by giving preference to them in relation to direct & indirect employment associated with the various project activities. Site preparation & construction phase will involve a certain number of laborers and there is a possibility that local people can be engaged for this purpose. The operational phase will involve a number of skilled and unskilled workers. There is a possibility that local people will be engaged for this purpose to the extent possible and hence improve the existing employment scenario of the region.

CHAPTER -12
CONSULTANT PROFILE

(A Techno-Enviro Consultant)

NABET Accreditated consultant & SPCB, Odisha Empanelled Category – "A" Consultant.

M/s Global Experts is a professionally managed quality conscious organization, which provides environmental solutions to various industrial organizations with sustainable growth and environmental friendly ecosystem. It is a competent technical organization providing environmental solutions with latest technical know how, legal advice, liasioning with various authorities and community at large. More than 60 industries have engaged Global Experts as their consultant to obtain environmental & statutory clearances from various statutory bodies and Government Agencies. Presently more than 10 nos. of Integrated Steel Plants (Signed MoU with Govt. of Orissa) have engaged Global Experts for carrying out their EIA/ EMP Studies and other allied environmental clearances. The Global Experts is the first consultant in Orissa to prepare REIA/ EMP Study report for 1.5 MTPA Integrated Steel Project in Orissa. Recently Global Experts is been engaged in environmental clearance from MoEF, New Delhi, VISA Steel Ltd., ACC Bargarh Cement Works, Dungri Limestone Quarry, SPS Steel and Power Ltd., Maithan Ispat Ltd., various mines of Adhunik Metaliks Ltd. M/s Global Experts is the first consulting firm in Eastern and North-Eastern region of India to undertake the EIA/EMP Study along with Liasioning for MoEF clearance for Vedanta International University Project. Global Experts has a distinct track record in the field of liasioning with local public in order to carry out Public Hearing jobs for different Steel Plants to their utmost satisfaction. Our Internal resources and technical acumen blended with highest degree of Public Relationship has been our strength in providing a total solution for Environmental aspects of Mines and Industries.

The technical team of Global Experts has wide experience in design, engineering, erection & commissioning of various pollution control devices, carrying out statutory Audits, drawing of water pipe line, Water and Air Quality modeling, Mine Plans, designing of Intake Well and other technical assignment for various industries.

Global Experts is also deeply involved in Hazardous Waste Audits, and Water Harvesting Projects etc.

We are associated with Administrative Staff College of India (ASCI) for the hazardous waste inventorisation of all industries in Orissa for their initial preparation.

OUR MISSION:

Our aim is to provide sustainable development for the growth of Industries, a one stop service provider for all types of Industries / Mines related projects, particularly relating to environmental issue.

SERVICES:-

Environmental:

- ✯ Environment Impact Assessment
- ✯ Environmental Management Plan
- ✯ Pollution Prevention & Control (Design, Installation & Maintenance of ETPs, Air Pollution Control Equipment).
- ✯ Preparation of Comprehensive EMP mitigation measures, advising on air pollution control, wastewater treatment.
- ✯ Solid Waste Management (Vermin-technology & Bio-Technology) Industrial Waste, Urban Waste
- ✯ Environmental Monitoring & Survey.
- ✯ Greenery Management (Plantation, Maintenance, Nursery raising & Sailing of seedling)
- ✯ Watershed Management
- ✯ Liasioning with OSPCB, CPCB & MoEF
- ✯ Environment Auditing, Energy Auditing, Assessing the performance of environmental systems, environmental liabilities.
- ✯ Bio-medical Waste Management
- ✯ Third Party Hazardous Waste Audit
- ✯ Environmental Monitoring (Air, Water, Soil)
- ✯ Laboratory Testing of different samples in Laboratory

Techno-Functional:

- ✯ Site Selection & Procurement of land.
- ✯ Design, Erection & Commissioning of industrial units, water treatment plant, Effluent Treatment Plant, Sewage Treatment Plant etc.
- ✯ Preparation of Mining Plan, Environmental Clearance, Forest Diversion Proposal Rehabilitation & Reclamation.
- ✯ Liasioning with statutory authorities.
- ✯ Mechanical Fabrication.
- ✯ Engineering Designing
- ✯ Turnkey Projects
- ✯ Preparation of DPR for Integrated Steel Plants
- ✯ Preparation of DPR for MSW Management practices
- ✯ Preparation of Feasibility Report for Water Pipeline & Intake-well Design, Supervision & Commissioning
- ✯ Design, Erection & Commissioning of Dust Suppression Equipments like Sprinkler System, Dry Fog System & Scrubber etc.
- ✯ Dust Extraction System like Cyclone & Bag filter.

Legal Liasioning:

We Advice on various legal matters related to industries / mines, and represent on behalf of clients in interacting with various authorities. We always keep up with the latest Notifications, Circulars of the authoritative bodies for appropriate advice to our clients. We have 87% client retention been maintained over last 7 years, which speaks of our credibility and level of customer service.

ESTEEMED CLIENTS OF M/S GLOBAL EXPERTS

A. STEEL INDUSTRIES

VISA Steel Limited

1.5 MTPY Integrated Steel Plant, **MoU** Project at Duburi, Jajpur, Orissa. REIA/ EMP Job, 1st Phase clearance of NOC & Consent to Operate. Water pipeline and Intake well project, Green Belt Development, Rain Water Harvesting projects.

Maheswary Ispat Limited

0.25 MTPY Integrated Steel Project coming up in Athgarh area under Cuttack dist. of Orissa. REIA/ EMP Studies, 1st Phase clearance from SPCB, Orissa. Consent to Operate for the Phase – I and several technical alternation job. Water pipeline assessment job is also carried out by Global Experts.

SPS Steels & Power Ltd.

0.5 MTPY Integrated Steel Plant, **MoU** Project at Jharsuguda, Orissa. REIA/ EMP Report, 1st Phase clearance of NOC & Consent to Operate.

Maharastra Seamless Limited:

0.3 MTPY Integrated Steel Plant, **MoU** Project at Duburi, Jajpur, Orissa. REIA/ EMP Report and getting NOC from SPCB, Orissa and MoEF, New Delhi.

Maithan Ispat Limited

0.2 MTPY Integrated Steel Plant, **MoU** Project at Duburi, Jajpur, Orissa. REIA/ EMP Report, 1st Phase clearance of NOC & Consent to Operate from SPCB, Orissa and MoEF, New Delhi.

Agrim Steel Industries Limited

0.3 MTPY Integrated Steel Plant, **MoU** Project at Jharsuguda, Orissa. Preparation of DPR, REIA/ EMP Report, 1st Phase clearance of NOC & Consent to Operate.

Jindal Stainless Limited

i) 1.6 MTPY Integrated Steel Plant & ii) 4 X 125 MW CPP at Duburi, Jajpur, Orissa. Preparing Executive Summary of EIA/ EMP, Conducting Public Hearing and obtaining NOC from SPCB, Orissa & MoEF, New Delhi.

Bhusan Steel & Strips Ltd.

1.5 MTPY Integrated Steel Plant at Meramandali, Dhenkanal, Orissa. Preparation of Executive Summary of EIA/ EMP Report, Conducting Public Hearing and obtaining NOC from SPCB, Orissa & MoEF, New Delhi.

Shyam DRI Power Ltd.

0.25 MTPY Integrated Steel Plant at Sambalpur. Preparation of Detail Project Report, obtaining NOC of 1st Phase, presentation at SPCB, EIA / EMP Study will be carried out after MoU.

SCAW Industries Pvt. Ltd.

0.25 MTPY Integrated Steel Plant at Dhenkanal, Orissa. Presentation at SPCB, Orissa, Obtaining NOC for their first phase project of 309.2 Cr. Preparation of Feasibility Study for drawing of Pipeline from River Brahmani to their Site.

Neepaz Metallicks Limited

0.25 MTPY Integrated Steel Plant at Kuarmunda, Sundargarh, Orissa. Obtaining NOC and Consent to Operate for their 4x100 TPD Sponge Iron Plant. Preparation of Feasibility Study for drawing of Pipeline from River Koel to their Site, Designing of Intake Well.

Vedanta Alumina Limited

Alumina refinery plant at Lanjigarh, Dist.- Kalahandi, Orissa. Obtaining NOC and Consent to operate for their refinery plant, Power Plant & Bauxite Mines

Beekay Steels & Power Ltd.

350 TPD Single Kiln Sponge Iron Unit at Barbil, Dist.- Keonjhar, Orissa. Preparation Project Report obtained NOC & Consent to Operate from SPCB, Orissa and EIA/EMP to be carried out soon after signing of **MoU** with Govt. of Orissa, Liasioning with IPICOL and Govt. of Orissa for signing of MOU for Integrated Steel Plant.

Aryan Ispat & Power Pvt. Ltd.

1.0 MTPY Integrated Steel Plant at Sambalpur, Orissa. Obtaining NOC for the 1st Phase, REIA/ EMP Report, water line survey, erection & commissioning work.

AML Steel & Power Ltd.

1.0 MTPY Integrated Steel Plant at Duburi, Jajpur, Orissa. Liasioning with Statutory Authorities like IDCO, IPICOL etc., Land Purchase, Environmental Works like EIA/EMP will be taken up in due course of time.

Maa Samaleswary Industries Pvt. Ltd.

200 TPD Sponge Iron Unit at Rengali, Sambalpur. Obtaining NOC from SPCB, Orissa.

Kohinoor Steel Pvt. Ltd.

Integrated Steel Plant at vill: Kuchidihi, Chandil (Jharkhand). Designing, Erection & Commissioning of Intake Well for continuous water supply of 400 Cu.m./h to the plant from River Subarnarekha.

Shiv Metalicks Pvt. Ltd.

50 TPD Single Kiln Sponge Iron Units at Manguli, Choudwar, Cuttack, Orissa. Consent to Operate for the single Kiln, NOC for additional 50 TPD Kiln & Captive Power Plant & Blast Furnace.

Swastik Ispat Pvt. Ltd.

2 X 40 TPD Sponge Iron Unit at Kuarmunda, PO-Birmitrapur, Sundargarh, Orissa. Consent to Establish for additional 2 X 100 TPD Sponge Iron Plant & 04 MW Captive Power Plant.

Dharampal Premchand Ltd.

0.2 MTPA Cold Rolling Mill and Galvanizing Unit, at Tripura Indiustril Development Growth Center, Agartala. Preparation of EIA/EMP/DMP and Environmental clearance from MoEF, New Delhi.

Rashmi Metalliks Ltd.

0.2 MTPA Integrated Steel Plant at Gokulpur, Kharagpur, WB. Preparation of Project Plan, Feasibility Study, EIA/EMP/DMP and Environmental clearance from MoEF, New Delhi.

Rashmi Cements Ltd.

Preparation of REIA/ EMP Report, and Environmental clearance for Rasmi Cement Ltd was carried out for its cement-Sponge Iron plant at Jhargram, WB

Limtex Steels Ltd.

4 x 100 TPD Sponge iron Unit at Asansole, West Bengal
Preparation of Project Plan, Feasibility Study, EIA/EMP/DMP and Environmental clearance from MoEF, New Delhi.

Bengal Energy Ltd

Mini Integrated Steel Plant at Dauka, Narayangarh, West Midinipur near in West Bengal for 0.6 MTPA Coke Oven, 35 MW Power Plant and 2 x 16.5 MVA Ferro Alloy Plant
Preparation of Feasibility Study, EIA/EMP/DMP and Environmental clearance from MoEF, New Delhi.

Super Smelters Ltd.

Medium sized integrated Steel Plant located at Jamuria, West Bengal for .2 MTPA Coke Oven, 55 MW Power Plant, 3 x 9 MVA Ferro Alloys Plant, 2 X 100 TPD DRI & 2 X 300 TPD DRI for 590,000 TPA Sponge Iron production.
Preparation of TEFR, EIA/EMP, and necessary clearances from MoEF, New Delhi.

B. MINING & ALLIED INDUSTRIES

AXL Exploration Pvt. Ltd.

Manganese Ore Mines at Sundargarh, Orissa. Assisted in operating Consent to Operate Job, Preparation of REIA/ EMP Report, Technical Presentation at SPCB, Bhubaneswar.

Raikela Iron Ore Mines

Iron Ore Mines of M/s Geetarani Mohanty Pvt. Ltd. at Sundargarh, Orissa. Preparation of Rapid EIA/ EMP Report, Conducting the Public Hearing, and clearances from MoEF, New Delhi

T. P. Minerals Pvt. Ltd., Temapodar

Graphite Mines at Temapodar, Muniguda, Rayagada, Orissa. Preparation of EIA/EMP Report, Conducting Public Hearing and obtaining NOC from SPCB, Orissa & MoEF, New Delhi.

T. P. Minerals Pvt. Ltd., Khalopadar

Graphite Mines at Khalopadar, Muniguda, Rayagada, Orissa. Preparation of EIA/EMP Report, Conducting Public Hearing and obtaining NOC from SPCB, Orissa & MoEF, New Delhi.

Manikeswari Gems Pvt. Ltd., Bandoguda

Iolite Mines at Bandoguda, Junagarh, Kalahandi, Orissa. Preparation of EIA/EMP Report, Conducting Public Hearing and obtaining NOC from SPCB, Orissa & MoEF, New Delhi.

Manikeswari Gems Pvt. Ltd., Kutingpadar

Iolite Mines at Kutingpadar, Junagarh, Kalahandi, Orissa. Preparation of EIA/ EMP Report, Obtaining NOC from SPCB, Orissa & MoEF, New Delhi.

Dungri Limestone Query (a unit of ACC/ BCL)

Limestone Quarry at Dungri, Bargarh, Orissa. Preparation of REIA/ EMP Report, conducting Public Hearing Job and clearances from SPCB, Orissa & MoEF, New Delhi for the expansion of Existing Limestone Mines

Kalinga Coal & Mining Pvt. Ltd.

2.0 MTPA Open Cast Coal Mines at Raijharan (Utkal - D Block), Angul, Orissa. preparation of Executive Summary of EIA/ EMP Report, conducting Public Hearing & obtaining NOC from SPCB, Orissa & MoEF, New Delhi.

Bikash Chandra Dev Iron & Manganese Mines

2.0 TPA Iron & Manganese Ore Mines (244 Acres) at Inganijharan, PO-Joda, Keonjhar, Orissa. Preparation of REIA/ EMP Report, Consent to Operate of Mines, NOC for 150 TPH Iron Ore Crusher.

Teherei-Sonua Iron & Manganese Ore Mines

Iron & Manganese Ore Mines at Vill : Teherei & Sonua, PO-Koida, Sundargarh, Orissa. Preparation of Rapid REIA/ EMP Report, Conducting the Public Hearing, and clearances from MoEF, New Delhi.

Nuagan Manganese Mines

Manganese Mines at village Nuagaon, PO- Koida, Dist.- Sundargarh, Orissa. Preparation of REIA/ EMP Report, Obtaining Environmental Clearances from SPCB, Orissa.

VISA Steel Limited

Chrome Ore beneficiation Plant at Golagaon, Jajpur, Orissa. Obtaining Environmental Clearances from SPCB, Orissa.

Ritika Alloys Pvt. Ltd.

100 TPH Iron Ore Crushing & Screening Unit at Barbil, Orissa. NOC Job for 2x350 TPD Sponge Iron Plant for the first Phase & Consent to Operate.

Nayagarh Minerals

40 TPH Iron Ore Crushing & Screening Unit at Barbil, Orissa. Preparation of Project Report, obtaining NOC & Liasioning with statutory authorities.

Shyam Sel Limited

75 TPH Iron Ore Crushing & Screening Unit at Barbil, Orissa. Preparation of Project Report, obtaining NOC, consent to Operate & Liasioning with statutory authorities.

Krishna Ores Pvt. Ltd.

30 TPH Iron Ore Crushing & Screening Unit at Sundargarh, Orissa. Preparation of Project, obtaining NOC, Liasioning with statutory authorities.

Gajanan Metallicks

0.16 MTPY Iron Ore Crusher at Sundargarh, Orissa. Obtaining NOC From SPCB, Orissa, liasioning with statutory authorities.

Naaraayani Sons Pvt. Ltd.

Iron Ore Mines at Ulliburu, Keonjhar, Orissa. Obtaining Consent to Operate, Preparing Techno-economical Feasibility Report, EIA/ EMP Report.

Kanodia Iron Works Pvt. Ltd.

100 TPH Iron Ore Crusher at Keonjhar, Orissa. Obtaining NOC & Consent to Operate from SPCB.

Gopi Krishna Minerals & Metals Pvt. Ltd.

100 TPH Iron Ore Crushing & Screening Unit at Bonai, Sundargarh, Orissa. Preparation of Detailed Project Report, Consent to Establish from SPCB, Orissa.

Krishna Kanheiya Metals Pvt. Ltd.

100 TPH Iron Ore Crushing & Screening Unit at Bonai, Sundargarh, Orissa. Preparation of Detailed Project Report, Consent to Establish from SPCB, Orissa.

Subham Enterprisers

A Stone Crusher at Bhadrak, Orissa. Obtaining NOC from SPCB, Orissa.

Bajarangbali Alloys Pvt. Ltd.

2.0 Lacs ton per annum (Ingot & Re-rolling Mill Dvn.) at Manguli Sqr., NH-5, Cuttack, Orissa. obtaining Consent to Establish & Consent to Operate job from SPCB, Orissa

HINDALCO Industries Limited

0.6 mtpy Bauxite Mines at Aligan area, Dist.- Koraput, Orissa. Obtaining NOC & Consent to Operate from SPCB, Orissa,

ADHUNIK METALLIKs Ltd., Kulum Mines at Keonjhar District of Orissa

Preparation of EIA/EMP with MoEF applications for Iron Ore Mines at Kulum, Deojhar of Keonjhar District, Orissa covering 109.3 ha of M.L.A.

GEETARANI MOHANTY MINES, RAIKALA

Necessary Reporting and Liasioning for Environmental Clearance from MoEF and SPCB, Orissa for Iron Ore mines at Raikela and Nuagaon of Sundergarh District of Orissa.

C. COAL/ COKE BASED INDUSTRIES

Sterlite Energy Limited

(4×600) 2400 MW CPP plant at Sarbahal Road, Jharsuguda.Carrying out NOC from SPCB, Orissa and Environmental clearance from MoEF New Delhi.

Neelachal Carbometaliks Pvt. Ltd.

60,000 TPY LAM Coke Oven Unit at Chandikhol, Jajpur, Orissa. Obtaining NOC & Consent to Operate from SPCB, Orissa.

M. V. International Limited

1.0 Lacs TPY LAM Coke Oven Unit at Chandikhol, Jajpur, Orissa. Obtaining NOC & Consent to Operate from SPCB, Orissa.

Tycoons' Industries Pvt. Ltd.

Non-recovery Beehive hard Coke mechanized Oven Unit at Darpanigarh, Jajpur, Orissa. Liasioning with statutory authorities, Land Purchase, Preparation of Project Report, obtaining NOC and Consent to Operate.

Aryan Energy Pvt. Ltd.

2.0 MTPA Coal Washery. Liasioning with statutory authorities, Land Purchase, obtaining NOC and Consent to Operate.

Global Coal & Mining Pvt. Ltd.

1.5 MTPY Coal Washery at Talcher, Orissa. Consent to Operate & NOC for Expansion of the Project.

Global Coal & Mining Pvt. Ltd.

2.5 MTPY Coal Washery at Jharsuguda, Orissa. Obtaining NOC from SPCB, Orissa.

S. V. POWER PVT. Ltd.

2.5 MTPY Coal Washery at Korba, Chhatisgarh. Preparation of Detail Project Report.

D. CEMENT INDUSTRIES

Bargarh Cement Works (ACC Cement)

2.0 MTPY Cement Plant. Preparation of REIA/ EMP Report, obtaining NOC from SPCB, Orissa & MoEF, New Delhi.

SCANIA Steel & Cement Ltd.

1.0 MTPA Cement Plant, and 0.1 MTPA Integrated Steel Plant at Rajgangpur, Sundergarh, Orissa. Preparation of Project Plan, Feasibility Study, EIA/EMP/DMP and Environmental clearance from MoEF, New Delhi.

Green Valley Industries Pvt. Ltd.

2000 TPD cement clinker & 20 mw coal based CPP Plant at Nongsning, Jaintia hills, Meghalaya. Preparation of Project Plan, EIA/EMP/DMP and obtaining Environmental clearance from MoEF, New Delhi.

E. CONSTRUCTION & ALLIED PROJECTS

Vedanta University, Puri, Orissa

Preparation of REIA/EMP report, obtaining Environmental Clearance from MoEF N. Delhi.

Lonavale Super City, Pune

Preparation of REIA/EMP report, and obtaining EC from MoEF, New Delhi

F. MISCELLANEOUS

SKOLL Breweries, Paradeep (SAB Miller Group)

Existing Brewery Unit at Paradeep, Orissa. Operation & Maintenance of Effluent Treatment Plant on day to day basis.

Thirubala Chemicals Pvt. Ltd.

Chemical Unit at Khurda, Orissa. Obtaining NOC from SPCB, Orissa.

Kalinga Oil & Refineries

Existing Rice Mill at Cuttack, Orissa. Assisted in operating Consent to Operate Job.

VISA Steel Limited

Water Harvesting Project in steel plant at Duburi.

K.L. Resources Pvt. Ltd.

EIA / EMP Study for 1,20,000 TPA chrome ore beneficiation plant at Chandikhol, Jajpur Road, Orissa.

G. THIRD PARTY HAZARDOUS WASTE AUDIT

Hazardous Waste Inventorisation for the State of Orissa.

We are associated with Administrative Staff College of India (ASCI) for the hazardous waste inventorisation of all industries in Orissa for their initial preparation.

Hindustan Petroleum Corporation Ltd.

LPG Bottling Plant at Jatni, Khurda, Orissa. Third Party Hazardous Waste Audit Report submitted to SPCB.

Paradeep Phosphates Limited

2,400 TPD Di-Ammonia Phosphate Plant at Paradeep, Orissa. Third Party Hazardous Waste Audit Report to be submitted SPCB.

Jindal Stainless Limited

1.5 Million TPA Integrated Steel Plant at Kalinga Nagar Industrial Complex, Duburi, Jajpur, Orissa. Third Party Hazardous Waste Audit Report to be submitted SPCB.

SKOL Breweries Limited

East Coast Breweries Limited, a unit of SKOL Breweries Limited at Paradeep, Orissa. Third Party Hazardous Waste Audit Report to be submitted SPCB.

Maheshwary Ispat Limited

0.3 Million TPA Integrated Steel Plant at Vill: Rampei, PO- Khuntuni, Dist- Cuttack Orissa. Third Party Hazardous Waste Audit Report to be submitted SPCB.

Hazardous Waste Inventorisation for the State of Jharkhand

We are at final stage of negotiation for carrying out Hazardous Waste Inventorisation for the entire industry for the State of Jharkhand. Our offer has been accepted by Jharkhand, SPCB and are awaiting for the LOI.

H. THIRD PARTY MONITORING AND TESTING OF ENVIRONMENTAL SAMPLES

Nilachal Ispat Nigam Limited

Integrated Steel Plant at Duburi, Orissa. Analysis of CRI & CSR of Coke and Cyanide & Chromium content of BOD Plant on regular basis.

Mideast Integrated Steel Pvt. Ltd. (MESCO)

Integrated Steel Project at Duburi, Jajpur, Orissa. Analysis of various parameters of ingredient and finished product.

SPS Steel & Power Ltd.

Regular monitoring of Ambient Air Quality, Stack Monitoring & Water Analysis etc as per OSPCB Guidelines.

Bargarh Cement Limited (a subsidiary of ACC Group)

2.0 MTPY Cement Plant at Bargar, Orissa. Regular monitoring of Ambient Air Quality, Stack Monitoring & Water Analysis etc as per OSPCB Guidelines.

Vedanta Allumina (Sterlite Group) at Langigarh, Orissa

2.0 MTPA Alluminium Refinary Plant, Langigarh, Orissa. Regular monitoring of Ambient Air Quality, Stack Monitoring & Water and Waste water Analysis etc as per OSPCB Guidelines.

Maithan Ispat Ltd., Jajpur

0.25 MTPA Integrated Steel Plant, at Kalinga Nagar, Jajapur, Orissa. Regular monitoring of Ambient Air Quality, Stack Monitoring & Water and Waste water Analysis etc as per OSPCB Guidelines

Jindal Stainless Ltd.

1.6 MTPA Stainless Steel Plant, and 4 X 125 MW Power Plant at, Kalinga Nagar, Jajpur, Orissa. Regular monitoring of Ambient Air Quality, Stack Monitoring & Water and Waste water Analysis etc as per OSPCB Guidelines

VISA Steel Ltd.

1.5 MTPA Integrated Steel Plant at Kalinga Nagar, Jajapur, Orissa. Regular monitoring of Ambient Air Quality, Stack Monitoring & Water and Waste water Analysis etc as per OSPCB Guidelines

Maheshwary Ispat Pvt. Ltd.

0.25 MTPA Integrated Steel Plant at Khuntuni, Cuttack, Orissa. Regular monitoring of Ambient Air Quality, Stack Monitoring & Water and Waste water Analysis etc as per OSPCB Guidelines

I. PUBLIC HEARING

Jindal Stainless Limited

i) 1.6 MTPY Integrated Steel Plant & **ii)** 4 X 125 MW CPP at Duburi, Jajpur, Orissa. Preparation of Executive Summary of REIA/ EMP Report, Conducting Public Hearings and obtaining NOC from SPCB, Orissa & MoEF, New Delhi.

Bhusan Steel & Strips Ltd.

1.5 MTPY Integrated Steel Plant at Meramandali, Dhenkanal, Orissa. Preparing Executive Summary of REIA/ EMP, Conducting Public Hearing and obtaining NOC from SPCB, Orissa & MoEF, New Delhi.

T. P. Minerals Pvt. Ltd., Temapodar

Graphite Mines at Temapodar, Muniguda, Rayagada, Orissa. Preparation of Executive Summary of REIA/ EMP Report, Conducting Public Hearing and obtaining NOC from SPCB, Orissa & MoEF, New Delhi.

T. P. Minerals Pvt. Ltd., Khalopadar

Graphite Mines at Khalopadar, Muniguda, Rayagada, Orissa. Preparation of Executive Summary of REIA/EMP Report, Conducting Public Hearing and obtaining NOC from SPCB, Orissa & MoEF, New Delhi.

Manikeswari Gems Pvt. Ltd., Bandoguda

Iolite Mines at Bandoguda, Junagarh, Kalahandi, Orissa. Preparation of Executive Summary of REIA/EMP Report, Conducting Public Hearing and obtaining NOC from SPCB, Orissa & MoEF, New Delhi.

Raikela Iron Ore Mines

Iron Ore Mines at Vill: Raikela, PO- Koida, Dist- Sundargarh, Orissa. Preparation of Executive Summary of REIA/EMP Report, Conducting Public Hearing and obtaining NOC from SPCB, Orissa & MoEF, New Delhi.

J. DESIGN, SUPPLY, ERECTION & COMMISSIONING

(POLLUTION CONTROL EQUIPMENT)

OMFED, Cattle Feed Plant

Existing Cattle Feed Plant at Radhadamodarpur, Cuttack, Orissa. Erection & Commissioning of Dust Aspiration System consisting of Bag filters & Cyclone Separators

Naresh Kumar & Co. Pvt. Ltd.

100 TPH Chrome Crushing Unit at TATA Mines, Sukinda, Orissa. Erection & Commissioning of Dust Aspiration System of Cyclone Separator

Nilachal Carbometalicks Pvt. Ltd.

60,000 TPY LAM Coke Oven Unit at Jajpur, Orissa. Erection & Commissioning of Dust Aspiration system consisting of 2 nos. of Bag filters and Venturi Scrubber.

BRG Steel (P) Ltd, Meramundali, Dhenkanal

0.2 Million Ton Integrated Steel Plant at Meramundali, Dhekanal, Orissa. Survey & Commissioning of water pipeline Job.

Bhaskar Steel Pvt. Ltd., Rajamunda, Sundargarh, Orissa

Survey & Commissioning of water pipeline Job.

Ritika Alloys Pvt. Ltd.

Iron Ore Crusher at Koida, Sundargarh, Orissa. Installation of Bag Filter & Cyclone Collector.

EIA COORDINATORS & FUNCTIONAL AREA EXPERTS INVOLVED IN THIS PROJECT

NAME OF THE PROJECT MSW BERHAMPUR.

EIA COORDINATORS

Name	Role
Mr. Anand Srivastava	EIA Coordinator

FUNCTIONAL AREA EXPERTS

Functional Area	Name of Experts	Role
Air Pollution Monitoring, Prevention & Control (AP)	M.S.Panda	Functional Area Expert
Water Pollution Monitoring, Prevention & Control (WP)	R.k.Nayak	Functional Area Expert
Solid & Hazardous Waste Management (SHW)	A. Srivastava	Functional Area Expert
Ecology & Biodiversity (EB)	Sasmita Das	Functional Area Expert
Socio- Economic Aspects (SE)	B.Behera	Functional Area Expert
Meteorology, Air Quality Modeling & prediction (AQ)	C. R. Panda	Functional Area Expert
Land Use (LU)	A. Srivastava	Functional Area Expert
Hydrology, Ground Water & Water Conservation (HG)	A. Srivastava	Functional Area Expert
Geology (GEO)	P. S. Acharya	Functional Area Expert
Soil (SC)	S. B. Pani	Functional Area Expert (Proposed)
Risk & Hazards Management (RH)	S. Mohanty	Functional Area Expert
Noise &Vibration (NV)	M.S.Panda (Noise) B.K.Panda (Vibration)	Functional Area Expert (Proposed)