SECTION – II

THE PROJECT PLAN

The solid waste management plan/ program for the Paradeep Municipal area is aimed at creating a healthy, pollution free atmosphere and providing sanitary conditions for living to the urban people at Paradeep. Management of solid waste has been a menacing problem for any urban local body. Non-Collection of the same from residential and market areas for days together, dumping them in open space, streets, drains and non-scientific disposal of the same could create terrible unsanitary conditions leading to a host of diseases, environmental pollution and such other human discomforts. It is, therefore, necessary to collect all the generated garbage in a scheduled manner, segregate the same into waste streams like recyclables, organics, inerts, biomedical wastes etc. and treat each stream in a scientific manner so as to minimize their detrimental effects. This project aims at creating infrastructure development at Paradeep for Collection, storage, segregation transportation, processing and disposal of Municipal Solid Wastes in a scientific manner in pursuance to Municipal Solid Wastes (Management & Handling) Rules – 2000.

Paradeep is a Port Town in the district of Jagatsinghpur in coastal region. It is situated on the Coast of the Bay of Bengal. At Paradeep the population of this Municipality is 75,000. It is a growing city. The major industries like IFFCO, PPL, CARBON, I.O.C.L., H.P.C.L. B.P.C.L. are set up here. So besides industrial wastes unleashed by industries, there is garbage on Municipal Solid waste at a rate of approximate 50 tons a day which is likely to increase in coming years due to increasing pace of urbanization and industrialization. If appropriate steps are not taken, there is rather apprehension of Pollution, hazards to human health and comforts. As it is in coastal zone, it is likely to add to pollution of coastal zone.

Basing on the quantity of garbage in this town, this Municipality proposes to take up the Municipal Solid Waste Management in planned way. The project activity will be focused on Collection of Municipal Solid waste, segregation of Solid Waste, storage of solid wastes in systematic manner so as to prevent any unhygienic and insanitary conditions around the storage points, transportation of Municipal Solid waste and disposal and processing of the same at a suiting landfill site. The activities

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will be confined to Paradeep Municipal Area and its periphery and the scope of the project is management of only Municipal Solid Waste.

PROJECT OBJECTIVES AND KEY INDICATORS

Paradeep Port Town, so far as geography and Physical features are concerned, is different from other towns. It is a coastal town surrounded by Sea and creek on three sides. The main objective of the project is to reduce Municipal Solid Waste from the area and process the same in a scientific manner. The collection, transportation, disposal and processing of the Municipal Solid waste is the prime objective of the project. The other objectives are:-

- To strengthen the already existing infrastructure on Solid waste management programme, implemented by this Urban Local Body.
- To provide a pollution free living conditions to Urban dwellers at Paradeep by collection, segregation, transportation and scientific disposal of solid waste and thereby minimizing the environmental and other health hazards due to Municipal Solid Waste.
- Refine and strengthen SWM strategy by conducting need assessment through appropriate agencies in Micro settings and ward levels.
- Ensure proper institutional arrangement viz constitution of WWM cell within Municipality establishment of regular surveilliance susten etc. for proper co-ordination and effective management activities.

KEY INDICATORS

- Well – cleaned streets & drains, market places free of foul smell.
- Clean drains, clean water channels free from de-composing materials
- Pollution free atmosphere in Urban area.
- Improvement of hygienic condition,
- Disposal of solid wastes as per standards stipulated in Solid Waste Handling Rules 2000.
- Fewer incidences of Malaria, plague and other water borne diseases.
- Surface water quality to meet the standard criteria for suitable use.
- Ground water quality to meet the drinking water standard.
- AMBIAN air quality to meet the air quality standard.

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- Involvement of public in all levels of activities.

PROJECT'S GUIDING PRINCIPLE & KEY DESIGN FEATURES

The guiding principles of this project are;

- To minimize the health and environmental hazards caused by waste.
- Collection of 100 % Municipal Waste from the project area.
- Support and involvement of NGOs in the area in the achieving the desired objective.
- Sensitization of public regarding benefits of Solid Waste Treatment in maintaining better hygienic condition.

KEY DESIGN FEATURES

- Strengthening infrastructure, procurement of equipments for collection of Municipal Solid waste.
- Creating of Awareness.
- Developing of Landfill site by fencing or hedging with proper gate.
- Protection of Landfill site by creating boundary around it.
- Construction of approach roads & internal roads at landfill site.

PROJECT AREA DESCRIPTION

Paradeep (21^0 15' 55-44" N 80^6 40' 34-62" E) is a major port in India and is the main outlet & inlet of the sea-borne trade of the eastern port.

Orissa has a rich maritime history. The establishment of Port of Paradeep in 1962 was a tribute to the past maritime glory of Orissa. It also signaled the economic development of the state, giving impetus to trade and commerce. It has become the gateway of Orissa to the International community. Subsequently, Paradeep has become a hub of industrial activities. Industries like, IFFCO, PPL, CARGILL, IOCL, BPCL, HPCL, Carbon etc. have been established here. From administrative view point, Paradeep N.A.C. was constituted vide H & U.D. Department Notification No. 31169, dated 27.9.1979 and actually started functioning with effect from 18.9.1980. Subsequently this N.A.C. was upgraded to Municipality under section 424 of Orissa Municipal Act. 1950 vide H. & U.D. Deptt Notification no. 47302/HUD, dt. 12.12.02. This Municipality comprises of only five Revenue Villages namely

1. Udachandrapur

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2. Chauliapalanda
3. Sandhakuda
4. Bijayachandrapur
5. Bhitaragarh

Again Paradeep Municipality in its meeting dated 22.08.07 vide resolution No. 6(Ka) has resolved that the major industries like IFFCO & I.O.C.L. have been established in the nearby areas of Paradeep and many major and medium Industries are going to be established. Urbanization is also increasing due to industrialization. It is now increasingly felt that area of Paradeep Municipality needs to be expanded to include such upcoming urban areas and to provide basic urban amenities to the people living there. This will solve the problems relating to increasing population and industrialization. Therefore, a proposal to include 15 villages (mentioned below) has been sent to Govt. in H. & U.D. Department vide letter no. 4242 dated 11.10.07 & District Collector, Jagatsinghpur for inclusion.

1. Paradeep Garh
2. Niharuni
3. Niharuni Kandha
4. Chouki Matha
5. Udayabata
6. Nimidiha
7. Kotakula
8. Rangiagarh
9. Nua Sandhakud
10. Musadiha
11. Musadiha Jangle
12. Boitarkuda
13. Kaudia
14. Aganasi
15. Nuagarh

This Municipality is 94 K.M. from Cuttack & 125 K.M. from Bhubaneswar. The details of the urban body are as follows:

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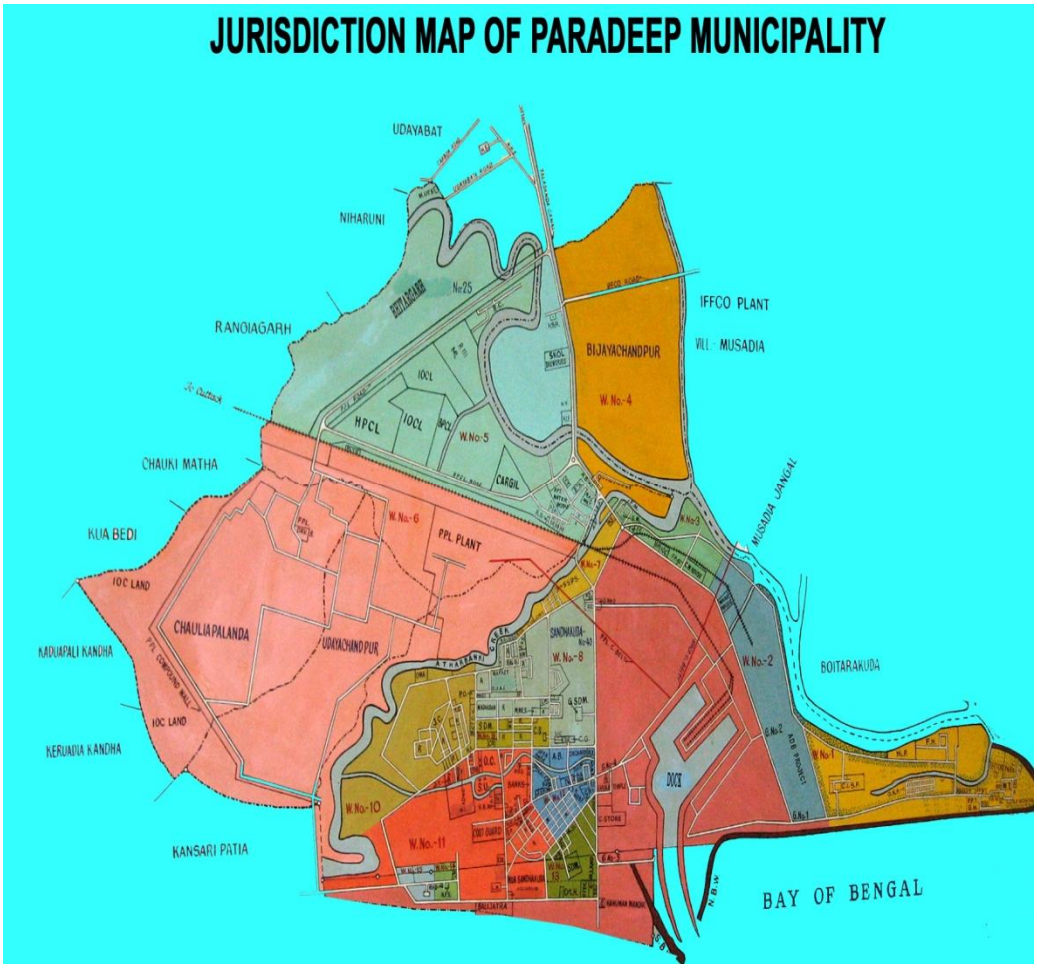

PARADEEP MUNICIPALITY AT A GLANCE

1	Name of the Urban Local Body	Paradeep Municipality It was constituted as an NAC vide H & U.D. Deptt. Notification No. 31169/HUD, Dt.27.9.79. and converted into **Municipality** vide H & U.D. Notification No.47302/ Dt. 12.12.2002
2	Area of the Paradeep Municipality	32.40 Sq. K.M.
3	No. of wards	15
4.	Length of road under Municipality	156.406 K.M.
5.	Population	73,625 Male - 42,380 (58%) Female – 31,245 (42%)

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6.	Literacy	53,598 (73%) Male - 33,401 (78.81%) Female – 20,197 (64.64%)
7	No. of Schools	High School – 7 M.E. School – 5 U.P. School – 12
8.	College	1 no.
9.	Other Govt. Offices	A.D.M. Office, Commercial Tax Office, Employment Exchange, Income Tax, Customs & Central Excise.
10	No. of Major Industries	4
11	No. of Medium/Small Industries	30
12	No. of Banks	17
13	No. of Hospital	3 (PPT, PPL & Govt. Hospital)
14	Homeopathic dispensary	4 nos.
15	No. of Urban Poor Families (BPL)	7492Nos.
16	No. of Slum	25 nos.
17	Population of Slum area	59216
18	Total No. of Holdings	1909
	a) No. of Pvt. Holdings	1852
	b) No. of Govt. buildings	57

Paradeep Municipality encompasses the Paradeep Port Trust area, Paradeep Phosphates industrial area & village area of Bijayachandrapur. Within port area there has been mushroom growth of many slums, like slums at Sandhakud, Bangalipada, Noliasahi, Phandi Colony, Bhimabhoi colony etc. Most of the Municipal Solid Waste generated is coming from the above areas from all drains, roads, medicals, hotels & restaurant, fruits & vegetable markets, fish & meat market, households, offices and shops and above all, the slums. Rapid population growth, Urbanization and Industrial growth have led to severe problems of Solid Waste management. The management of large quantity of solid waste requires proper system of collection, transportation and disposal, besides proper knowledge of what the wastes are made up of, how they need to be collected and disposed off.

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Basing upon the population and standard it is estimated that about 48.00 M.T. of solid waste is being generated per day from various sectors like industry, household, market, commercial establishments & hospital waste etc. There are three nos. of fish markets where quantity of waste generated is estimated to be 6.00MT per day. There are three hospitals with 70 beds, 17520 households, shops, offices and other institutions around 30 nos. The ward wise population of the Municipality is as follows:

POPULATION OF PARADEEP MUNICIPALITY (2001 Census)

Name of the ward	No. of House Holds	Population			Schedule Case			Schedule Tribe		
		Male	Female	Total	Male	Female	Total	Male	Female	Total
Ward No. 1	583	1498	908	2406	133	99	232	126	132	258
Ward No. 2	707	2571	788	3359	256	104	360	10	0	10
Ward No. 3	425	942	714	1656	15	6	21	0	0	0
Ward No. 4	809	1679	1305	2984	198	123	321	7	2	9
Ward No. 5	2921	6452	4949	11401	559	450	1009	489	416	905
Ward No. 6	1434	2932	2339	5271	236	192	428	101	85	186
Ward No. 7	2042	5129	3872	9001	152	127	279	311	251	562
Ward No. 8	2376	6150	4791	10941	482	378	860	240	207	447
Ward No. 9	297	705	595	1300	43	32	75	23	29	52
Ward No. 10	699	1565	1302	2867	79	54	133	57	51	108
Ward No. 11	1648	4121	3060	7181	406	304	710	209	179	388
Ward No. 12	602	1740	1089	2829	82	56	138	29	24	53
Ward No. 13	1112	2869	1990	4859	176	113	289	35	26	61
Ward No. 14	1073	2252	1976	4228	49	50	99	0	0	0
Ward No. 15	792	1775	1567	3342	109	83	192	28	32	60
Total	**17520**	**42380**	**31245**	**73625**	**2975**	**2171**	**5146**	**1665**	**1434**	**3099**

THE WARD WISE ROAD LENGTHS FOR STREET SWEEPING

Ward No.	Road length (in K.M.)	Length to be covered for sweeping and collection of garbage under S.W.M. Programme (in K.M.)
Ward No. 1	9.545	4.35
Ward No. 3	5.465	5.465

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Ward No. 4	7.97	5.25
Ward No. 5	27.61	22.18
Ward No. 6	13.64	2.15
Ward No. 7	7.725	7.725
Ward No. 8	18.681	18.681
Ward No. 9	6.438	6.438
Ward No. 10	9.228	9.228
Ward No. 11	15.338	15.338
Ward No. 12	10.134	10.134
Ward No. 13	5.90	5.90
Ward No. 14	3.484	3.484
Ward No. 15	2.365	2.365

THE WARD WISE GENERATION OF SOLID WASTE

Area	**Quantity of Solid Waste Generated in M.T.**
Ward No. 1	2.00
Ward No. 2	Nil
Ward No. 3	1.48
Ward No. 4	1.67
Ward No. 5	5.35
Ward No. 6	4.30
Ward No. 7	4.50
Ward No. 8	4.75
Ward No. 9	2.00
Ward No. 10	2.80
Ward No. 11	4.58
Ward No. 12	5.80
Ward No. 13	2.30
Ward No. 14	3.20
Ward No. 15	3.09
Total:-	**47.82**

The Solid waste generated from slum area is also in large quantity. The details of information on slums are as follows;

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List of slums with population in Paradeep municipality area;

Sl. No.	Ward No.	Name of the Slum	No. of families	No. of Population	Status of Holding		Remarks
					Unauthorized	Own Plot	
1	2	3	4	5	6	7	8
1	1	Mundapada	223	1081	Unauthorized		
2	1	Neheru Bangla	260	1325	Unauthorized		
3	3	Rajib Nagar	120	550	Rehabilitated by PPT		
4	4	Lock Pada	695	2415	Unauthorized		
5	4	Sukhuakhala	117	580		Private land	
6	5	Ghanagalia Shifted to Bhitargarh	1180	5140	Rehabilitated by PPT	Allotted by PPT (20'X18') Per Plot	Proposed for IHSDP
7	5	Sukhuakhala rice mill	210	1124	Unauthorized		
8	5	Atharbanki near Rly. Colony	105	540	Unauthorized		
9	5	Bauriapalanda	253	1312	Unauthorized		
10	5	Balijhara	659	4192	Rehabilitated by PPT		
11	5	Ambica School Back Side basti	41	208	Unauthorized		
12	6	PPL DAP Colony	254	1275	Rehabilitated by PPL	Allotted by PPL (20'X18') Per Plot	
13	6	Sarala Colony	211	1161	Rehabilitated by PPL	Allotted by PPL (20'X18') Per Plot	
14	6	Loknath Colony	195	936	Rehabilitated by PPL	Allotted by PPL (20'X18') Per Plot	
15	7	Brundaban Colony	2042	9001	Unauthorized 135 families	Allotted by PPT (20'X18') Per Plot 228 families	
16	8	Gopaljew Colony	215	1146	Rehabilitated by PPT		
17	8	CLR Plot	240	1216	Rehabilitated by PPT	Allotted by PPT (20'X18') Per Plot 51 families	
18	10	Bhimabhoi Colony	345	1732	Rehabilitated by PPT	Allotted by PPT	
19	10	Jagannath Colony	245	1219	Unauthorized		
20	10	OMC Colony Back side(Mundapada)	125	624	Unauthorized		
21	11	Nuabazar	1648	7181	Unauthorized		
22	12	Badapadia	602	2829	Unauthorized		
23	13	Nuabazar Noliasahi	1112	4859	Unauthorized		
24	14	Sandhakuda Noliasahi	1073	4228	Unauthorized		
25	15	Sandhakud Bangalisahi	792	3342	Unauthorized		
		TOTAL	**12962**	**59216**			

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PROJECTED DEOMGRAPHIC GROWTHS

Above all, the growing population of the municipality is bound to increase the volume of solid waste. Based on the demographic profile of last thirty years, next twenty years population grows would be as follows.

1981	-	12000
1991	-	51131
2001	-	73,625
2011	-	105497
2021	-	151905

Thus, nearly 1.5 lakh people would be thronging Paradeep by end of 2021 which would add to the magnitude of the problem of Solid Waste Management.

JUSTIFICATION OF THE PROJECT

With increasing urbanization and industrialization, urban India today is a site of rotting garbage. The problems of solid waste disposal and sanitation appear almost intractable. It is estimated that each urban resident generates 350 to 1000 grams of solid waste every day. It is estimated that Indian cities generate 48 million metric tones of solid waste annually. Scattering and littering of solid waste create health hazards and environmental problems. Management of urban solid waste is one of the most neglected areas of urban development in India. The Planning on management of solid waste, i.e. proper systems of collection, transportation and disposal, is of utmost importance. Usually, the Municipal authorities do not have adequate resource and requisite technical knowledge to deal with this problem. Successful waste management requires involvement of the community and private enterprise with the local Government as Nodal agency to execute the project, there is greater hope for solution of the problem.

There is no practice of sorting of waste at Source in a scientific manner. Again there is no public system of primary collection from the source of waste generation. There are no organized methods of solid waste collection. The street sweeping is reported to be irregular and inefficient. The tools used for sweeping and collection of wastes are inefficient and outdated which cause littering of waste and occupational health hazard. In most of the cases, the waste is not treated before disposal. The

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options for the treatment and disposal of household and commercial waste has been largely confined to insanitary landfill. The solid waste is deposited in a dump yard situated within or outside the city haphazardly. These sites emanate foul smell and become breeding grounds for flies, rodents, and pests. Liquid sweeping through the rotting organic waste called lea-chat pollutes underground waste and poses a serious threat to health and environment.

Keeping all these in view the municipal solid waste (Management & handling) rules, 2000 have envisaged provisions to be implemented by the urban local bodies for proper management of Municipal solid waste. A DPR (Detail Project Report) is a required for collection, segregation, transportation, disposal and processing solid waste. The sites of dumping and landfills are required to be well-planned in terms of perspective planning. Public private partnership can improve the sanitary conditions. Private sector can play important role in construction, operation and maintenance of treatment and disposal facility.

PRESENT PRACTICE OF SOLID WASTE MANAGEMENT AT PARADEEP

It is said that out of nothing comes nothing. Since Paradeep Municipality has already completed 25 years of its existence, it has done a lot of things on SWM. The collection, transportation of Solid Waste to the dumping ground is the main thrust areas of the present practice.

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Grass cutting

Basing upon the population and standard it is estimated that about 48 M.T. of solid waste is being generated per day from various sector like industry, household, market, marine & hospital waste etc. Paradeep Municipality attaches highest priority to conservancy, related to public health. It has employed 110 nos. full time and part time sanitary staffs for this purpose to collect solid waste within a covered area of 32.40 Sq. Km. Besides this, 7 nos. of vehicles have been pressed into service i.e. one mini truck, 1 nos. of tipper, three nos. tractor trailer, one no. J.C.B. for lifting of solid waste and carrying to the waste disposal point. Presently, central bins/ dust bins have been placed in residential, market & commercial areas for dumping of wastes from households. Street sweeping is done through sweepers for collection of Solid waste. This is the prevalent practice of Collection of Solid waste. 5 wards have been privatized for collection and transportation of waste.

Garbage collection

Garbage collection

Then, the solid waste is transported to the dumping ground at ward no. 10 in Bangalipada by dint of auto tippers, tractors, mini trucks, and dumpers from Central bins. They are dumped at Landfill site at Bangalipada. At Bangalipada, a proposal was mooted to set up a processing plant for disposal of garbage and MOU was signed with NGO VIKASH. The authorization had been also obtained from state Pollution Control Board. The facility operated in about 2.00 acres of area. Both processing as well as land filling is done in the same site. The wastes were mainly

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composted aerobically and rejects were sorted out. The compost is dried and sieved and packed for sealing. The rejects were used for land filling. But inadequate resources handicapped the project. Now, only dumping is done at Bangalipada. Some of the pictures, as shown in this section, highlight on the practice of solid waste management at Paradeep Municipality.

Garbage collection

Garbage collection vehicles

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Garbage dumping site at Bangalipada

SHORT COMINGS IN PRESENT PRACTICE

The routine and mechanical handling of solid waste suffer from numerous deficiencies such as institutional weakness, lock of strategic planning, shortage of financial and human resources, inefficient managerial practices, improper choice of technology etc. The service levels are far from satisfactory.

- Though wastes are collected through bin at source, most of the people have not abandoned the practice of depositing it in open space, drains, main storm water drains, water channels etc. It poses a serious hazard for health and sanitation.
- There is no system of door to door collection.
- The dust bins are not sufficient.
- No arrangement of primary collection from hotels and restaurants.
- Vegetable, fruit, fist markets do not have adequate storage facility.
- Concrete bins have been placed which are unhygienic and unscientific.
- Slums areas are not providing with adequate service.
- The Municipality does not have adequate men power & machinery for solid waste disposal.
- The land fill site is only two acres which is inadequate.

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PROJECT DESCRIPTION AND SCOPE

The scope of the project is the overall management of Municipal Solid Waste as detailed below.

- Collection of Solid Waste materials from door steps and roads.
- Transportation of Solid Waste to Landfill site by containerized vehicles/ containers carriers.
- Scientific disposal that encompasses windrow composting.
- Improving the life at Urban Slum.
- Implementing the rules and policies of state and central Govt. in this respect.
- Formulating strategies and action plan for management of Urban Solid Waste.

PROJECT COMPONENTS AND COMPONENT DESCRIPTIONS

COMPONENT – A

- The Urban Solid Wastes of this Municipality is generated as a result of different human activities that continue throughout the day. If the Solid wastes are thrown in to the gutter, road, drains or open space it creates health hazards.
- Organizing house to house collection of Municipal Solid waste through trolies.
- Collection of garbages from streets, roads & drains through street sweeping.
- Collected gargabes to be transported to the central bins.
- Hydraulic bins to be placed at slums and squatter areas markets and commercial establishment. Collected wastes from residential and other areas to be transported to community bins by hand driven containerized carts.
- Collection from Central bins. Vehicles and adequate Safai Karmarcharies are be deployed for transportation of Solid Waste from Central bins to dumping ground.
- Awareness to be created among people about waste and its adverse impact on health through awareness campaign. They are to be taught not to throw garbages on streets, open drains, etc and throw them in dustbins.
- They are to be made aware to separate the organic and non-organic waste at the source.
- Wastes not are burnt. Some wards would be privatized for better collection and cleaning for better management of Solid Wastes. There will be storage facilities by placing bins, hydraulic bins with big container.

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- Collected materials will be transported to landfill site where the waste processing facilities to be install.
- To implement the project, the Tahasildar, Kujang has provided eight acres of land at village Kansari Patia at a distance of 5 K.M. from Municipality. The sketch of the land is as follows :

Awareness Campaign

Awareness campaign focused on bringing about behavioural change with respect to handling of solid waste. A sustained campaign is planned to initiate behavioural change and then to sustain the change. The key areas in which the campaign will focus include options for reduction of waste, reuse, recycling and resource recovery from waste. It will also focus on management of waste in an environmentally friendly way at point of generation itself. Another thrust area is segregation of waste and storage at source. The campaign will make use of pamphlets and brochures, wall paintings, audio visual aids and also conduct corner meetings and meetings of residential associations and various stake holders.

Segregated storage of waste at source

The segregated storage of waste at source promoted under the ICZM project will be extended to the entire municipal area of Paradeep city. It is proposed to encourage the households to segregate the waste at their house/ premises. Storage facilities for commercial establishments and industrial units will be arranged by the concerned itself.

Primary collection

Door to door collection and street sweeping will be the main methods of primary collection of MSW. In addition to these Paradeep Municipality will provide facilities for collection of construction and demolition waste, garden waste and bulk waste on payment basis at regular intervals.

Door to door collection

Door to door collection is to be extended to cover the entire city area in a phased manner so that all wards are covered (excluding those who manage waste in

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their own backyard without causing environmental problems) will be attained in 5 years. It is planned to have separate units for door-to-door collection. Each unit including existing units will be provided with a collection vehicle along with bins for collection of garbage.

Street sweeping

Street sweeping will be rationalized and ward wise maps indicating the area to be swept by each sweeper will be prepared. Sanitation workers will be provided with tools and accessories required for proper discharge of their functions. Existing wheel barrows will be replaced with containerized pushcarts.

Transportation

The solid waste coming to the municipal stream is expected to show an increase with the introduction of door-to-door collection and betterment of services. The existing vehicles for transportation of waste will not be sufficient. Additional closed specially built trucks with tipping facility will be made available. Covered vehicles with tipping facilities will be purchased for removal of slit and sand from drains on the same day itself. Tipper Lorries are included for removal of construction and demolition waste. Dumper placers and containers will be procured for collection of waste from markets, bulk waste producers and if needed from slums.

Waste handling vehicles including Excavator cum loader (JCB), Front loaders and tractors with special handling arrangements will be purchased for easy handling of bulk waste from markets, demolition and construction waste and for clearing of vegetations.

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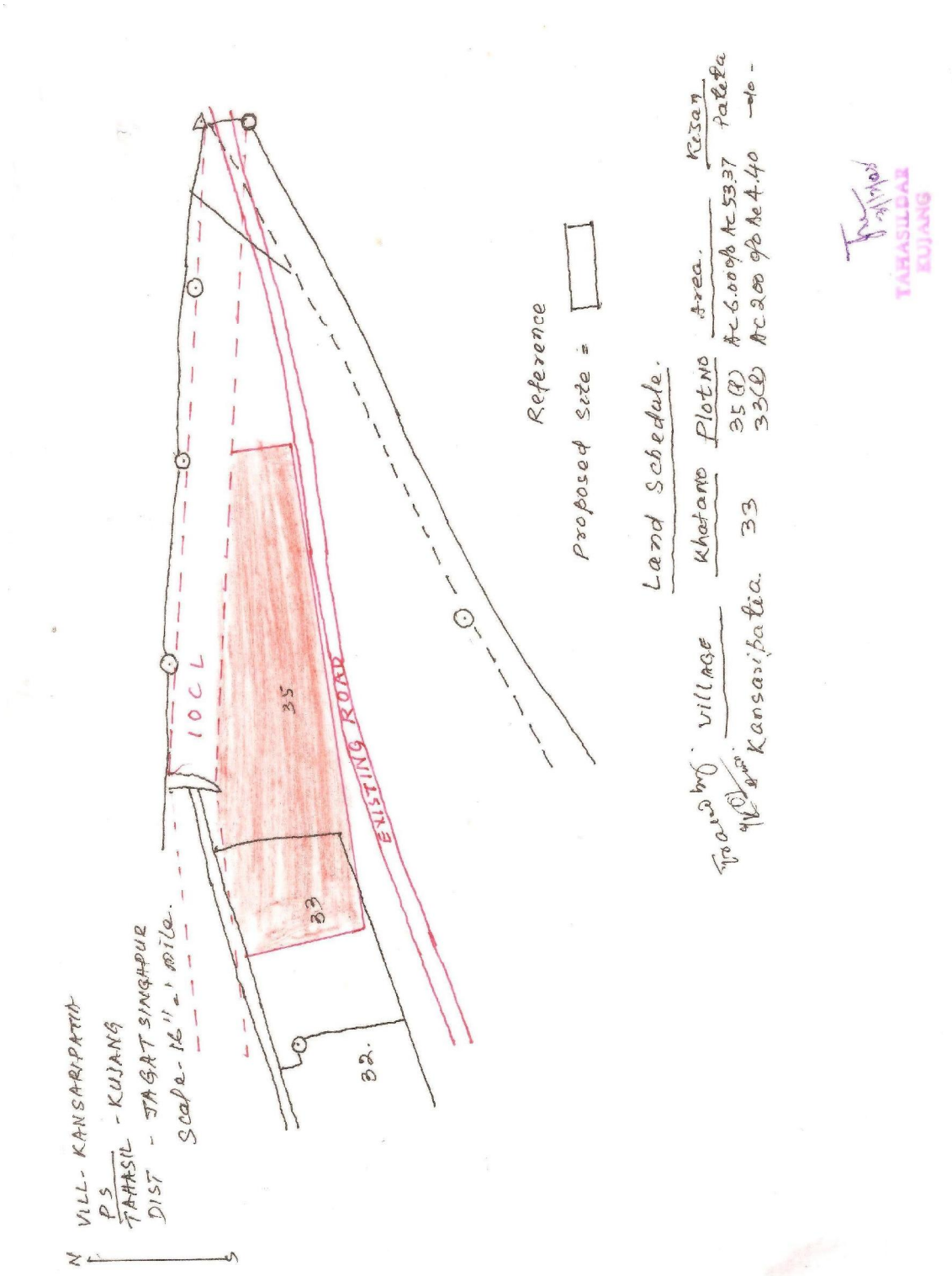
SCHEDULE OF LAND

Village	Khata No.	Plot No.	Area	Kisam
Kansaripatia	33	35 (P)	Ac6.00	Patita
		33(P)	Ac 2.00	Patita



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SCIENTIFIC DISPOSAL (SD) PLAN – COMPOSTING

COMPONENT – B

The next logical step to waste collection, storage and transportation is waste disposal and processing.

The main objective of waste disposal is to minimize the health and environmental hazards caused by waste. At the same time effective waste disposal should aim at considerable reduction of volume of the waste so as to minimize the land requirement for final disposal of the inert and other untreated debris.

The important aspect of this step is transportation of collected waste in a scientific and non-hazardous manner. For disposal of waste several options have been tried in different part of the world depending upon the waste quantity, characteristics, local needs, financial considerations etc. Some of the options currently in practice are

- Uncontrolled dumping or non-engineered disposal.
- Sanitary land fill.
- Composting
- Incineration
- Anaerobic decomposition.
- Pelletization of combustibles to make RDF.
- Pyrolysis

The Relative merits and demerits of these processes are given below:

	Non-engineered disposal	**Sanitary land fill**	**Composting**	**Incineration**	**Pelletization**
Volume reduction	Poor	Poor	Medium	High	High
By product recovery	Nil	Good	Good	Good	Good
Adaptability to waste	All types	All types	Selective	Selective	Selective
Adverse environmental impact	High	High	Poor	High	Poor
Long term maintenance	Required	Required	Not required	Not required	Required
Financial aspects	Inexpensive	Expensive	Expensive	Expensive	Expensive

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Taking into consideration the relative merits and demerits and financial involvement of different waste disposal methods, as a rule of the thumb, composting has been found to be most suitable option.

WINDROW COMPOSTING

For towns generating more that 5 MT of MSW per day windrow composting has been found to be most suitable option. This of course, largely depends on the composition of the generated waste.

This is a process of aerobic composting in which segregated refuse is heaped on a paved open space measuring about 6 sqm called windrow. The height of each heap is maintained within 1.5 meters such that each windrow can compost about 9 cum of waste.

The windrows are turned on the 6^{th} and 11^{th} day from outside to centre so as to destroy inspect larvae and provide aeration to the mass. On the 16^{th} day the windrows are broken and the contents are passed through manually operated rotary sieves of 25mm mesh to remove oversize materials. The screened compost is stored in heaps of 1.5 meters over platforms measuring about 40 Sqm. For stabilization before final packaging and sale.

FACTORS AFFECTING THE COMPOSTING PROCESS

Organisms

Aerobic composting is a dynamic system wherein bacteria, actinomycetes, fungi and other biological forms are actively involved. The relative preponderance of one species over another depends upon the constantly congaing food supply, temperature and substrate conditions. Facilitative and obligate forms of bacteria actinomycetes and fungi are most active in this process. In the initial stages mesophilic forms predominate and thermophilic bacterial and fungi soon take over except in the final stage of composting. Except when the temperature drops, actinomycetes and fungi are confined to 5 to 15 cum outer surface layer. If the turning is not carried out frequently the actinomycetes and fungi in these layers register increased growth imparting it typical grayish white colour. Thermophilic actinomycetes and fungi are known to grow well in the range of 45 to 60^0 C.

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1. The organic wastes are processed by Aerobic composting method.
2. Organic manure is produced from the decomposition of solid wastes by this aerobic method.

The following methods are adopted for conversion of Garbage into organic manure.

- Preparing of windrows of waste.
- Turning and mixing of Waste.
- Sieving of the waste
- Organic manure preparation by using useful micro organisms.

The garbage is kept in windrows. Inoculums is spread over the windrows. Water is spread regularly to ensure humidity. Appropriate humidity and temperature is maintained for growth of thermophillic and meswophylic bacteria. At intervals the garbage is turned to ensure oxidation the bio oxidation process ensures conversion of organic garbage into compost. The compost is sieved and packed for agricultural use.

Measures to be taken at landfill site.

- Landfill site to be fenced or hedged and provided with proper gate to monitor incoming vehicles or other modes of transportation.
- The landfill site to be well protected to prevent entry of unauthorised persons and stray animals.
- Approach and other internal roads for free movement of vehicles and other machinery to exist at the landfill site.
- The landfill site to 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.
- Provisions like weigh bridge to measure quantity of waste brought at landfill site, fire protection equipments and other facilities as may be required shall be provided.
- Utilities such as drinking water (preferably bathing facilities for workers) and lighting arrangements for easy landfill operations when carried out in night hours shall be provided.
- Safety provisions including health inspections of workers at landfill site shall be periodically made.

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Specifications for land filling:

- Wastes subjected to land filling shall be compacted in thin layers using landfill compactors to achieve high density of the wastes. In high rainfall areas where heavy compactors cannot be used alternative measures shall be adopted.
- Wastes shall be covered immediately or at the end of each working day with minimum 10 cm of soil, inert debris or construction material till such time waste processing facilities for composting or recycling or energy recovery are set up as per Schedule I.
- Prior to the commencement of monsoon season, an intermediate cover of 40-65 cm thickness of soil shall be placed on the landfill with proper compaction and grading to prevent infiltration during monsoon. Proper drainage berms shall be constructed to divert run-off away from the active cell of the landfill.
- After completion of landfill, a final cover shall be designed to minimize infiltration and erosion. The final cover shall meet the following specifications, namely:--

a. The final cover shall have a barrier soil layer comprising of 60 cms of clay or amended soil with permeability coefficient less that 1 x 10^{-7} cm/ sec.
b. On top of the barrier soil layer there shall be a drainage layer of 15 cm.
c. On top of the drainage layer there shall be a vegetative layer of 45 cm to support natural plant growth and to minimize erosion.

Pollution prevention:

- In order to prevent pollution problems from landfill operations, the following provisions shall be made, namely:-
- Diversion of storm water drains to minimize leachate generation and prevent pollution of surface water and also for avoiding flooding and creation of marshy conditions;

a. Construction of a non-permeable lining system at the base and walls of waste disposal area. For landfill receiving residues of waste processing facilities or mixed waste or waste having contamination of hazardous materials (such as aerosols, bleaches, polishes, batteries, waste oils, paint products and pesticides) minimum liner specifications shall be a composite barrier having 1.5 mm high density polyethylene (HDPE) geo-membrane, or equivalent, overlying 90 cm of

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soil (clay or amended soil) having permeability coefficient not greater than 1 x 10^{-7} cm/ sec. The highest level of water table shall be at least two meter below the base of clay or amended soil barrier layer;

b. Provisions for management of leachates collection and treatment shall be made. The treated leachates shall meet the standards specified in Schedule- IV;

c. Prevention of run-off from landfill area entering any stream, river, lake or pond.

Water Quality Monitoring:

Before establishing any landfill site, baseline data of ground water quality in the area shall be collected and kept in record for future reference. The ground water quality within 50 metres of the periphery of landfill site shall be periodically monitored to ensure that the ground water is not contaminated beyond acceptable limit as decided by the Ground Water Board or the State Board or the Committee. Such monitoring shall be carried out to cover different seasons in a year that is, summer, monsoon and post-monsoon period.

Plantation at Landfill Site:

A vegetative cover shall be provided over the completed site in accordance with the and following specifications, namely:-

a. Selection of locally adopted non-edible perennial plants that are resistant to drought and extreme temperatures shall be allowed to grow;

b. The plants grown are such that their roots do not penetrate more than 30 cms. This condition shall apply till the landfill is stabilized;

c. Selected plants shall have ability to thrive on low-nutrient soil with minimum nutrient addition;

d. Plantation to be made in sufficient density to minimize soil erosion.

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PROJECT FUND FLOW ARRANGEMENT

The funds will be directly placed to the U.L.B i.e. Paradeep Municipality and expenditure will be made as per Orissa Financial Rule, Accounting, Reporting and Auditing. Out of the total project cost, Rs. 1 crores will be met from the own funds of the Municipality that includes the grants of the Central & State Govt. for Solid Waste Management through 12th &13th Finance Commission. & Octroi Compensation grant.

For implementation of this project a separate S.B account shall be opened in a Nationalized/ Pvt. Sector bank to be operated by the Executive Officer, Paradeep Municipality. However, all decision in financial mater shall be taken by a Committee consisting of A.D.M., Paradeep, Addl. Executive Officer, Municipal Engineer & Executive Officer as member secretary of the committee and Chairperson, Paradeep Municipality shall preside over the meeting for guiding the committee. The funds shall be received by the Executive Officer directly without any further intermediary level and shall be deposited in the S.B. Account.

The Purchase committee shall consist of A.D.M., Paradeep, Executive Officer as member secretary, Municipal Engineer and Accountant. The purchase committee shall take decision for procurement for goods and works.

The Bank's procurement guidelines May, 2004 revised OCT- 2006 will be applicable for procurement of all gods and works under the project. The Bank's bidding documents as listed in this document will be used as basis for all procurement of goods and works under the Project.

The mode of procurement that may be followed includes:

- International Competitive Bidding (ICB).
- Limited international Bidding (LIB)
- National Competitive Bidding (NCB)
- National Shopping (NS)
- Direct contracting
- Procurement at the community level.

It is proposed that for Furniture fittings, vehicles, office equipment, machinery upto Rs15.00 Lakhs shall be made through quotation from open market i.e. National Shopping method. It can be also procured for DGSD rate.

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2. It is proposed to purchase goods beyond Rs. 15.00 lakh through National Competitive Bidding.
3. The following will be applicable for all NCB procurement under the project.

- Invitation to bid shall be advertised in at lease one national daily newspaper, at least 21 days prior to the dead line for submission of bid.
- No special preference will be given to any bidder either for price or for any other terms and conditions when competing with state owned enterprises, etc.
- Except with prior concurrence of World Bank there will be no negotiations of price with the bidders even with the lowest evaluated bidder.
- Extension of bid validity will not be allowed without prior concurrence of World Bank (a) For the request for extension of it is longer than week and (b) For all subsequent requests for extension irrespective of the period.
- Re-bidding will not be carried out without prior concurrence of World Bank.
- DGS&D rate contract or State controller of stores contracts will not be a substitute for NCB procedure. But in case of shopping these rates are acceptable.
- Single bidding system will be adopted.

4. All civil works shall be implemented through Tender on turnkey basis. The Tender committee shall consist of E.O., Paradeep Municipality, J.E., M.E., & Accountant. The committee shall have power to approve the tender at Schedule of Rate. Beyond schedule upto 10%, the tender can be approved by the Executive Engineer, (I.L.W.)

5. The procurement of basket, jhadu, spade, phynile, bleaching, gloves etc. shall be made at the community level.

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SECTION – III

PROJECT IMPLEMENTATION ARRANGEMENT

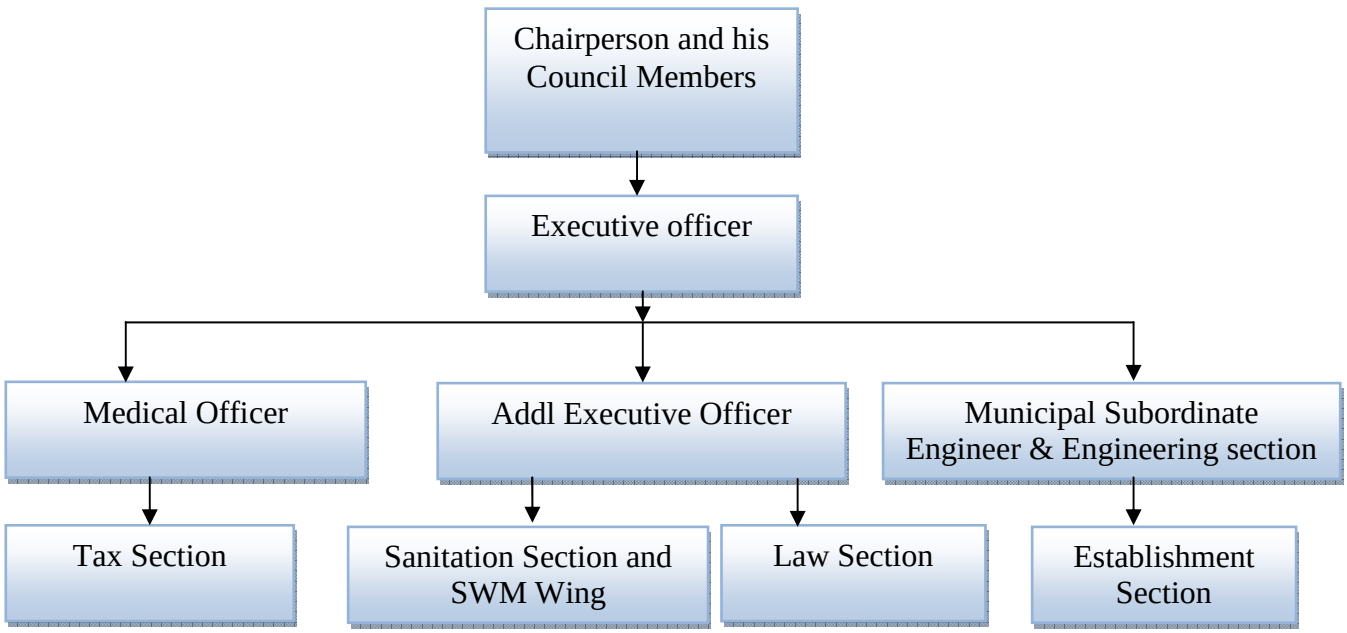
Institutional Arrangement

A1 ***The overall institutional Model***

Paradeep Urban Local Body headed by the Chairperson and Council members is the Sole policy making body under the O.M. Rule implemented by the H & U.D. Department, Government of Orissa. Their Chief objectives are to implement various developmental programmes of State Government. as well as the Central Government. and provide basic urban facilities to the people residing under urban jurisdiction.

The Urban Local Bodies have two tier administrative system. The first tier Comprises of Chairman and council members which is the policy making body, crystallizing the spirit of democratic decentralization, the second tier consists of Executive Officer, official staffs from various fields like Engineers, doctors, Ministerial staffs etc. who implement & execute the policy passed by the Council.

Organizational chart of Urban Local Body



But, since this is a project work which needs speedy execution and since council is a political body it is suggested the following structure for implementation of the project.

Over all guidance: - Director, Municipal Administration, Orissa.

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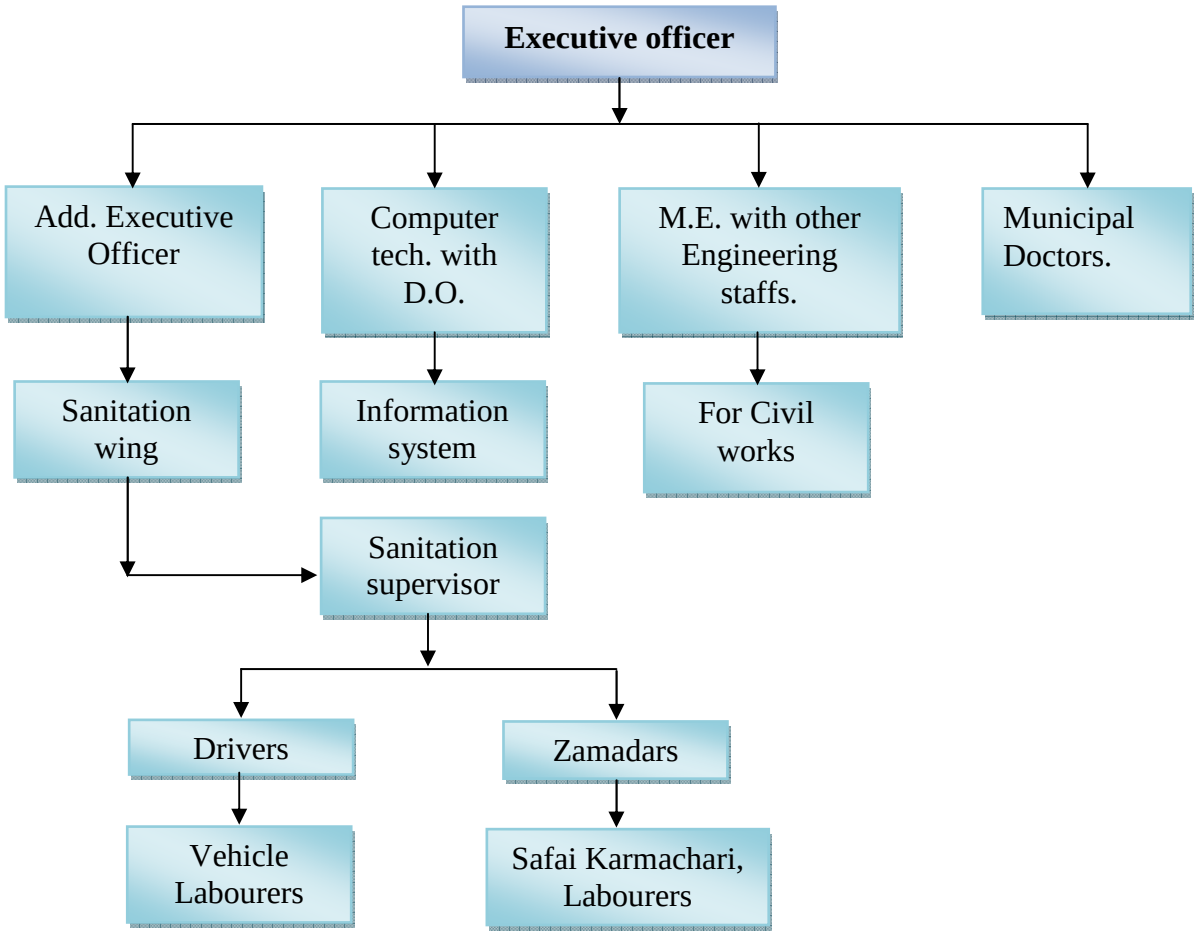
Advisor at the implementation level : - A.D.M. Paradeep.

Implementing Agency : - Paradeep Municipality.

The structure of administration will be as follows



A2 Implementing Agencies – Roles and Responsibilities

The Municipal Authority shall within the territorial area of the Municipality, be responsible for the implementation of the provisions of this project and for any infrastructure development; for collection, storage, segregation, transportation, processing and disposal of Municipal Solid Wastes. The Municipal Authority have to get an authorization for setting up waste processing and disposal facility including landfills from the State Board or Committee as described in the Municipal Solid waste handling Rule. The Municipal Authority has the role and responsibility which are as follows:

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- To be more vigilant about non littering of Municipal Solid wastes in the lanes, by lanes of its jurisdiction.
- Organising house to house collection of Solid wastes in the Scientific and smooth manner.
- Devising collection of wastes from slums and squatter areas of localities which includes hotels, restaurants, office complex etc.
- Wastes from Slaughter houses, meat and fish markets to be collected and managed to make use of such wastes.
- The Municipal Authority shall have to notify waste collection schedule and make awareness through participation of N.G.Os.
- The Municipal Authority shall undertake phased programme to ensure community participation in Waste segregation.
- The Municipal Authority has the responsibility for a systematic transportation of Solid waste in following manner.

a) The vehicle used for the purpose are to be covered in such a way so that it should not be visible to public nor exposed to open environment preventing their scattering.

- The Municipal Authority shall have to adopt scientific disposal method which will not adversely affect human beings, nature etc.

A3 Staffing pattern

SL.No.	Name of the Post	Sanctioned strength	Staff in position
1	Executive Officer	1	1
2	Addl Executive Officer	1	1
3	Municipal Engineer	1	1
4	Junior Engineer	1	1
5	Asst. Law Officer	1	1
6	Homeo Doctor	3	3
7	Homeopathic Assistant	1	1
8	Work Sarkar	2	2

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9	Driver	3	3
10	Tractor Helper	2	2
11	Fogging Machine operator	1	1
12	Sanitary Supervisor	1	1
13	Zamadar	3	3
14	Sweeper	35	20 + 65
15	Jhadudar	25	25
16	Watchman	1	1
17	Peon	3	3
18	Computer Operator	-	1

B FINANCILA MANAGEMENT ARRANGEMENT

B1 Financial Management frame work

Executive Officer of the U.L.B. is the head of dealing financial matter. He is assisted by one Accountant, and Cashier. The Orissa Govt. Finance Rule is observed in all financial transaction. For this project, the Sanitation Committee consisting of Executive Officer, Addl. Executive Officer, Municipal Engineer, Junior Engineer. In matter of bill and vouchers etc. one Asst. who will remain in charge of Sanitation section for this project shall maintain the records and put up the papers. Then the Accountant shall examine and check the vouchers and bills. In civil matters the contractor will submit his work done bill. It will be duly measured and check measured by the J.E. & M.E. Then it will be check by the Accountant.

Disbursement shall be made by the E.O. directly in the office. The extra staff will be engaged on out sourcing basis and payment will be made directly by the E.O. on Acquaintance. Payment to supplier, consultant & contractor shall be made through A/C payee cheque on submission of bills and vouchers, after maintaing due formalities. The cashier shall maintain a separate cash book for project. The Asst. in charge of the project will submit the report and return.

Accounts shall be maintained as per the principle of accrual basis.

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B2 Fund Flow and Disbursement arrangement

The U.L.B has own source of receipt as per O.M. Rule. It receives its Octroi Compensation from Govt. of Orissa in H & U.D. to meet its own expenses like Salaries of Staffs, Expenditure towards sanitation, Developmental works and programmes. All receipt is being deposited in Banks and payments are made in shape of A/C payee Cheque observing all financial formalities.

The source of U.L.B's financial resource include grant in aid from the State Govt., M.P. LAD, MLA LAD and specified projects from Central Govt. and from the holding Taxes etc.

The funds required from the World Bank will be kept in a separate interest bearing schedule bank account to be opened as per the instruction of State Govt. in H & U.D. Deptt. The books of account will be maintained separately.

B3 Accounting policies and procedures

The U.L.B follows O.M. Rule in principle and Orissa Government Finance Rule. Now as per the direction of Govt., double entry system of Cash Book, Bank reconciliation system, receipt of expenditure account, Balance sheet will be followed.

B4 Staffing and Capacity Building

Since the existing staffs, i.e. Safai Karmachari, Sanitation wing, engineering staff are those who have gained experience in the matter, further reinforcement will strengthen capacity building.

B-5 Internal Control Mechanism

Every year accounts of U.L.B are being audited by the Local Fund Audit, and General Audit. A third party evaluation team will be involved for evaluation of the expenditure and achievement.

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B-6 User Cost Sharing Principles

The cost sharing is made through contribution from the SWM funds of municipality, received from holding taxes, property taxes, etc. Besides, the Municipality receives nearly 20 lakhs under Solid Waste Management Programme.

C. PROCUREMENT METHOD.

The procurement procedure broadly consists of the following steps.

1. Assessment of requirement.
2. Deciding procurement strategy including Technical specifications.
3. Mode of procurement.
4. Preparation of Tender documents.
5. Advertisement of Tender.
6. Issue of Tender Documents
7. Opening of Tender.
8 Evaluation of the Tender.
9. Notification of Delivery to consignee.
10. Receipt of consignment
11. Acceptance and storage of the consignment.
12. Resolution of disputes, if any.

C-3 Procurement Thresholds

Within Rs. 5000/-	Direct Procurement	No Bids required
Rs. 5000/- to Rs. 50,000/-	Local Quotation	Three Quotes must be solicited by letter, fax, e-mail.
Above Rs. 50,000/-	Open Tender	Formal competitive Bidding
Upto 1500000/-	National shopping	Three Quotes must be solicited by letter, fax and email
Above Rs. 1500,000/-	NCB	Formal competitive Bidding

C-4 Overall procurement Plan

While resorting to procurement, specific budget provision should be available for meeting the expenditure in the financial year in which it is to be incurred. Preparation of a procurement plan is an essential requirement.

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- Procurement plan covering civil works equipment, goods, consultancy service and resource support will be prepared on a firm basis for first year of the programme and on a tentative basis for the subsequent years.
- Procurement plan shall be prepared for 1st year for proper monitoring and execution.
- Method of purchase shall be based on the value of the contract, urgency of the demand, type of goods/ services and availability of different sources of supply etc.
- Limit of value per contract applicable to the particular procurement procedure shall be strictly adhered to.
- It shall be ensured that the procurement is based strictly on actual need.

C-5 Annual procurement Plan

After addressing the procurement the follow-up actions will be taken

a) Calling for tender/ quotations and processing of tender papers by the purchase department.
b) Evaluation of the tender/ quotations and preparation of comprehensive fact sheet.
c) Submission of the tender by the competent authority for sanction.
d) Placement of orders.
e) Arrival of procured items and installation in case of machinery/ equipment and stock entry.

Financial powers of the competent authority are as follows:

Authority	**Financial Power**
Executive Officer	Up to Rs. 1,00,000.00
Purchase Committee	Above Rs.1,00,000.00

In case of sanction of estimates, for civil works, the technical provision to be followed as per OPWD code, Municipal Act & Municipal Rules.

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SECTION IV

MONITORING & EVALUATION

Monitoring and evaluation is key component of the project.

- For monitoring, Project officer, Addl. Executive Officer, Municipal Engineer, Junior Engineer shall look into the matter.
- A technical team consisting of ILW, Municipal Engineer, Junior Engineer will evaluation the Civil construction work.
- Director, Municipal Administration, Project Director, DUDA and Addl District Magistrate, Paradeep will evaluate the implementation and monitoring of the scheme.
- The consultant will monitor implementation of the processing.
- The supervisor & zamader will supervise the work of safai karmachari
- Environment cell will evaluate the environmental impact.
- Annual reports will prepared on the progress of the work as per direction of PMU.

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ENVIRONMENTAL AND SOCIAL ASSESSMENT OF ICZM PROJECT

1.0 INTRODUCTION

1.1 Project description

Integrated Coastal Zone Management Programme (ICZMP) has been formulated by the Ministry of Environment and Forests, Government of India. The project attempts to harmonize conservation and development with specific thrust on the welfare of local and indigenous communities, the traditional custodian of the coastal resources.

- The objective of the ICZM Project is "protection and sustainable development of coastal stretches and the marine environment through sustainable coastal zone management practices based on sound scientific principles taking into account the vulnerability of the coast to natural hazards, sustainable livelihood security for local communities and conservation of ecologically and culturally significant coastal resources".

Paradeep-Dhamra coastal stretch, which covers about 80 Km. of the total 480 km. coastal stretch of the state Orissa, is of prime concern on the basis of their existing and potential expansion. Paradeep is one of the deep-sea ports along the east coast of India. These areas are going to witness rapid infrastructure development and establishment of mega projects including some more ports as well as special economic zones.

Basing on the economic importance and pollution potential of the area, the Paradeep Municipality proposes to carry out "solid waste disposal and processing" for the urban area of port city Paradeep with following objectives.

- To strengthen the existing solid waste management programme of the ULB to provide pollution free living condition to the urban dweller.
- To augmentation of systematic collection, segregation at the source,

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transportation, scientific disposal and processing of solid waste to minimize the environmental and other health hazard.

- Refine and strengthen SWM strategy by conducting need assessment in micro settings and ward levels
- To ensure proper institutional arrangement of regular surveillance for proper coordination and effective management

The major activities to be carried out by the Paradeep Municipality to achieve the objectives are as follows:

- Procurement of equipments for collection and transport of Municipal solid waste by adopting "Container System of Transport"
- Engagement of skilled, semiskilled manpower for collection, segregation and storage of different types of solid waste items from the source
- Infrastructural development of landfill site along with fencing/ boundary, protective plantation etc.
- Infrastructural development of organic waste processing plant along with approach read and internal roads.
- Planned awareness activities for the urban dwellers to adopt to segregation at the source and direct collection processes for organizations such as hotels, restaurants, community halls, hospitals, slaughterhouses and also construction wastes etc.

1.2 Baseline data

Paradeep ($21^0$15'55.44" N, $86^0$40'34.62"E) is one of the major ports of India and is the main out-let and in-let of the sea-borne trade of the eastern part of the country spread over States such as Orissa, Madhya Pradesh, Uttar Pradesh, Jharkhand, Chattisgarh and Bihar. The natural resources and industrial products of this wide spread hinterland are immense and the value of the mineral trade of the country passing through the Port of Paradeep is considerably higher than many other Major Ports of India. Besides, Paradeep Port, POSCO has proposed a captive port at

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Jatadhari Muhan in Jagatsinghpur district.

At present, four major industries such as Paradeep Phosphates Ltd., Phosphatic Fertiliser plant of IFFCO, Paradeep Carbon Ltd., Cargill India (P) Ltd. are operating at Paradeep. Five other mega industries e.g. POSCO (I) Pvt. Ltd, Hygrade Pellets Ltd, Essar Steel Ltd., Indian Oil Corporation Ltd., Deepak Fertilizer and Chemicals are in pipeline. Development of Petroleum, Chemicals & Petrochemical Investment Region, Multi product Special Economic Zone (SEZ) and Paradeep Industrial Park are under the proposed schemes. Apejee Surrender Shipyard has been proposed to set up in Paradeep area. The increase in industrial activity at Paradeep area in past decades and its immense potential to grow further necessitates for its management for sustainable development.

Port activities at Paradeep while promoting the economic pursuits also result in environmental impacts. Navigation, dry-docking, ship breaking, loading and unloading operations are among the various port and harbour related activities, which cause environmental impacts.

1.2.1 Physical settings

The proposed project site is located at the kansaripatia village of Paradeep Municipality area in Jagatsinghpur district of Orissa. The area allotted is about 8 Ac. Bearing Khata No. 33 plot No. 33 (p) & 35 (p) and kisam is patita. It lies toward the land ward side of the road leading to IOCL, which is lying parallel to the coast. It is located about a kilometre away from the HT line of the coast. Sand dunes and Kasuarina plantations present towards the seaward side of the plot. The project area is a flat land with no plants in the vicinity; but occasionally some bushes here and there at the adjacent areas. The topographic features of the project area also include a network of agricultural fields, some converted to prawn culture fields and a creek near by. There is no human settlement nearby.

1.2.2 Biological settings

The project area is a flat land with no plants in the vicinity; but

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occasionally some bushes here and there at the adjacent areas. Alluvial and fluvio-tidal settlements cover the area. The soil cover in the area is mostly formed in recent times. It has got moderate levels of nutrients. No vegetation coverage found in the proposed project site. Hence, no felling of plant is required during the implementation of the project.

There are no protected areas of national ecological significance like Reserved Forests, National Park, Wild Life Sanctuary, Biosphere Reserves and Ramsar site in the Area. The vegetation cover does not include any plant but some herbs and shrubs are found in the vicinity of the plot. There is no unique faunal community in the proposed project site. However, the species observed in the vicinity of the project area are given below.

Common name	**Zoological name**
Toad	Bufo melanostictus
Indian green lizard	Calotex versicolor
Cat	Felis catus
Crow	Carvous corax
Baya	Ploceus Philippinus
Bulbul	Pycnonotus sp.
Frog	Rana tigrina
House lizard	Hemidactylus sp.
Dog	Canis familiaris
Sparrow	Passer domesticus
Parrot	Prittacula sp.
Myna	Acridothenes tristis

Sporadic nesting of the Olive Ridley Turtles is observed in the Paradeep seacoast.

1.2.3 Socioeconomic Settings

As per 2001 census, Paradeep had a total population of 73,625. Males constitute 58% and females 42% of the total population. The

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decadal growth is around 53%. There are 15 wards in the municipality covering an area of 32.40 km. Male literacy rate is 78.81%, while female literacy rate is 64.64%. There are 7492 Urban poor families (BPL). There are 25 slum settlements in the municipality area, whose population is 59216. The length of the road under municipality area at present is about 156.406 km. The total no. of holdings in this urban area is 1909. At present the quantity of SW generated is estimated to be 47.82 MT.

Percentage of total main workers is more than that of non-workers due to the existence of large industries like PPL, IFFCO, Paradeep Carbon, and port. This percentage is expected to increase significantly after the commissioning of industries like IOCL, POSCO and Deepak fertilizers etc. The population of the area will be further increased as the Municipality authority has proposed to include 15 more nearby villages in the municipality area.

1.3 Policy, legal, and administrative framework

The purpose of Environmental Assessment (EA) is to assist in the decision making process and to ensure that the project is environmentally sound and sustainable and necessary management plans are included wherever necessary to minimize/ mitigate the environmentally adverse impacts. It is the responsibility of the project implementing agency i.e. the Paradeep Municipality (H & U.D. Dept. Govt. of Orissa) to ensure that the project activities are in consistent with the existing regulatory/ legal framework, whether national, state, municipal or local.

The environmental regulations, which have significance on the implementation of the Project, are highlighted below.

The Environment (Protection) Act, 1986

This act is an umbrella legislation that focuses on the protection of the environment, which includes water, air and lands the interrelationship among them.

The act provides power to the authority declared under the Act to take

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necessary measures for the purpose of protecting and improving the quality of environment life. It lays down standards for the quality of the environment, emissions or discharges of environmental pollutants from different sources. Environmental Impact Assessment Notification, 2006 forms a part of the regulation under this legislation.

Relevance to the project:

(1) During construction phase, the contractors need to meet the requirements/ standards prescribed in the various Rules and regulations for protection of environment.

(2) During operation phase, there may be need to undertake an environmental impact assessment and obtain clearance under the EIA notification. This is also necessary for abatement of pollution in ambient air, water and land. Specifically, surface water and ground water screening at regular intervals is necessary to check contamination.

Water (Prevention & Control of Pollution) Act, 1974

This Act has been enacted to implement measures devised for effective prevention and control of water pollution. It empowers the State Pollution Control Board to take necessary regulatory measures for disposal of sewage and trade effluents and information dissemination for maintaining or restoring wholesomeness of the water Bodies, prosecuting offenders and issuing licenses for construction and operation of certain facilities.

Air (Prevention & Control of Pollution) Act, 1981

This Act has been enacted to implement measures devised for effective prevention and control of air pollution. It empowers the State Pollution Control Board to take necessary regulatory measures for discharge of emissions and information dissemination for maintaining or ambient air quality, prosecuting offenders and issuing licenses for construction and operation of certain facilities.

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The Hazardous Waste (Management, Handling & Transboundary movement) Rules, 2008

This Act requires the owners to identify their wastes and manage them as per the prescribed guidelines. The assessment criteria under the Act are based on process involved and concentration.

The Coastal Regulation Zone (CRZ) Notification, 1991 (amended, 2002)

The Coastal Regulation Zone (CRZ) Notification, 1991 Issued under the Environment (Protection) Act, 1986, coastal stretches have been defined as Coastal Regulation Zone and restrictions have been imposed on industries, operations and processes within the CRZ. For regulating development activities, the coastal stretches within 500 metres of High Tide Line on the landward side are classified into four categories, namely:

- CRZ-I: (i) Areas that are ecologically sensitive and important, such as national parks/ marine parks, sanctuaries, reserve forests, wildlife habitats, mangroves, corals/ coral reefs, areas close to breeding and spawning grounds of fish and other marine life, areas of outstanding natural beauty/ historically/ heritage areas, areas rich in genetic diversity, areas likely to be inundated due to rise in sea level consequent upon global warming and such other areas, and (ii) Area between Low Tide Line and the high Tide Line.
- CRZ-II: The areas that have already been developed upto or close to the shoreline. For this purpose, "developed area" is referred to as that area within the municipal limits or in other legally designated urban areas which are already substantially built up and which have been provided with drainage and approach roads and other infrastructural facilities, such as water supply and sewerage mains.
- CRZ-III: Areas that are relatively undisturbed and those, which do not belong to either CRZ-I or CRZ-II. These will include coastal zone in the rural areas (developed and undeveloped) and also areas within Municipal limits or in other legally designated urban areas, which are not substantially built up.

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- CRZ-IV: Coastal stretches in the Andaman & Nicobar, Lakshadweep and small islands, except those designated as CRZ-I, CRZ-II or CRZ-III.

The development or construction activities in different categories of CRZ area shall be regulated by the concerned authorities at the State/ Union Territory level, in accordance with norms stipulated in the CRZ regulation and in the state/ UT coastal zone management plan.

Relevance to the project.

- No new construction is permitted in CRZ-I areas that are ecologically sensitive.
- In CRZ-II areas, new buildings are permitted only on the landward side of the existing (or approved) road or authorized structures.
- In CRZ-III areas, no new construction shall permit within 200m from the High Tide Line.
- In CRZ-III areas, construction or reconstruction of dwelling units between 200m and 500m is permitted only if it pertains to traditional/ customary rights.
- Construction of public rain shelters, community toilets, bridges, roads and jetties are permitted in CRZ-I areas that are not ecologically sensitive and fall between the high and low tide line. But clearance is required from the State/ UT Coastal Zone Management Authority.

Orissa Ground Water (Regulation and Control of Development and Management) Bill, 2006 (Draft)

This bill is to protect groundwater resources, to provide safeguards against hazards of its over-exploitation and to ensure its planned development and management in the state of Orissa and for matters connected therewith or incidental thereto. The bill shall empower government through the Orissa Groundwater Authority to develop, control, regulate and administer the groundwater in the state by ensuring its optimal and efficient utilisation. This also provides for conjunctive use of surface and groundwater. This bill provides for registration of new users of

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wells and also prohibition of sinking wells in notified areas without permit. It shall empower the authority to penalise the activities not in accordance with the act regarded as offences.

Relevance to the project.

Orissa Groundwater Authority shall regulate the abstraction of groundwater. Line department/ contractor should obtain clearances/ permissions, if required, from this Authority prior to any abstraction of groundwater.

The Municipal Solid Wastes (Management And Handling) Rules, 2000

The exercise of the powers conferred by the Environment (Protection) Act, 1986, the Central Govt. hereby makes the following rules to regulate the management and handling of the municipal solid wastes. The Urban bodies will follow the Schedule- I, for implementation of the practice, Schedule- II, for Management of Municipal Solid Wastes, Schedule- III, for Specifications for Landfill sites as well as water quality criteria and Schedule- IV, for standards for composting, treated leachates and incinerations (if any).

Relevance to the project.

1) Under this rule, Form- 1 will be used to obtain authorisation from the competent authority for operation of solid wastes collection, segregation, landfill process for inert wastes and various practices for processing of organic wastes and recycling to useful products.
2) Form-II will be used for Annual Report to submit to the Municipal Authority after the operation starts.
3) Schedules-I, II, III and IV of the Rule are to be followed for implementation process schedule, principles and practices for management of municipal solid wastes, specification for landfill sites and water quality monitoring and Referral standards for waste processing products respectively, which will be followed during both construction and operation phases of the project.

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2.0 ENVIRONMENTAL AND SOCIAL IMPACTS

Project Layout and Development Concept

The proposed project includes:

a) A Scientific 100% Solid waste collection, segregation at the source, transport and storage at the Solid Waste Management Plant Site.

b) Treatment of inert, non-degradable solid waste by developing scientific landfill site phase-wise.

c) Development of degradable solid waste treatment plant by adopting windrows composting and recycling of these wastes into fertilizers.

d) Consideration of Environmental Management Plan (EMP) to minimise/ mitigating environmental adverse impacts to protect ambient air, water, lands, surface water, underground water, flora and fauna and above all the workers engaged in the project activity.

To meet the projected objectives and spatial considerations, the Municipal Solid Waste Treatment Pilot Plant is planned at about 5 km away from the municipal human habitation, barren and flat land at least 1 km away from the HTL from the coast. It also keen to certain following temporal/ environmental and legal considerations:

- Adherence to the building requirements such as safety, internal roads for service and maintenance, parking, water source, transformer for electrical supply, soak pit, disposal pits for solid waste and hazardous waste.
- Necessary permission will be taken from the OSPCB, Dept. Forest & Environment for CRZ Clearance etc. prior to initiation of the project activity.
- Water requirement during the construction phase will be met both through tankers and tube wells. During operation phase, permanent water supply provision will be made.
- The power requirement during construction phase will be met either through DG sets or supply through the nearest substation. During operation phase, the construction of electric substation and installation of

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transformers shall be as per the provision specified by the concerned authorities.

Environmental and Social Impacts

This section lists the potential environmental impacts, both positive and negative, during the construction as well as operational phase of the project. The environmental impacts identified in following pages are only preliminary in nature. Any further impact that may arise in due course of time will be assessed for its significance and necessary mitigative measures will be included in the Environmental management Plan. Overall the project is expected to yield significant environmental benefits in terms of pollution abatement and improvement in public health, agricultural yield, fish yield.

Checklist for Environmental and Social Assessment of the project is given in Table-1.

Table-1 Environmental and Social Assessment Checklist

Features likely to be affected	Positive impact		Negative Impact		No Impact	Mitigation measures required or not
	Yes	Likely	Yes	Likely		
Forestry/ Vegetation					✔	
Birds			✔			✔
Fisheries					✔	
Other wildlife/animals					✔	
Air quality			✔			✔
Noise environment			✔			✔
Water quality				✔		✔
Water availability					✔	
Soil quality					✔	
Landuse and topography					✔	
Drainage patterns					✔	
Sedimentation/erosion					✔	
Agriculture					✔	
Food production					✔	
Climate					✔	
Groundwater table				✔		✔
Industrialization					✔	
Housing (involuntary					✔	

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resettlement)						
Employment/training		✔				
Income and livelihood		✔				
Other socio-economic activities					✔	
Health and safety		✔				
Communications					✔	
Historical/cultural monuments					✔	
Scenic views and vistas					✔	
Tourism					✔	

Impact identification matrix for the construction phase as well as the operation phase of the proposed project is given in Table-2.

Table-2 Impact Identification Matrix

	Air	Noise	Surface Water	Ground water	Climate	Land & soil	Ecology	Health	Socio Economic
Land Acquisition	Developed land will be acquired. Hence no impact.								
Construction Phase									
Transportation of construction materials	✔	✔				✔		✔	✔
Construction	✔	✔	✔	✔		✔		✔	✔
Operational Phase									
Generation of Liquid waste			✔	✔		✔		✔	
Generation of Solid waste						✔		✔	
Emission of foul smelling	✔							✔	
Operation of DG Set	✔	✔						✔	

Impact prediction matrix for various activities involved in the construction phase and operation phase and the impact characteristics are given in Table-3.

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Table-3 Impact Prediction Matrix

Activity	Environmental Attributes	Cause	Impact Characteristics			
			Nature	**Duration**	**Reversibility**	**Significance**
Construction Phase						
Transportation of construction materials	Air	Transportation of construction materials in trucks & Exhaust emission from vehicles	Direct Negative	Short term	Reversible	Low
	Noise	Noise generation from vehicles	Direct Negative	Short term	Reversible	Low
	Land & soil	Dumping of materials & excavated earth	Direct Negative	Short term	Reversible	Low
	Health	Inhalation	Direct Negative	Short term	Reversible	Low
	Socioeconomic	Employment	Direct **Positive**	Short term	Irreversible	Medium
	Risk	Risk of accidents during transit	Direct Negative	Long term	Irreversible	Low, if safety measures are taken to prevent accidents
Construction activity	Air	Operation of construction machinery	Direct Negative	Short term	Reversible	Low
	Noise	Noise generation from vehicles and machinery	Direct Negative	Short term	Reversible	Low
	Health	Inhalation	Direct Negative	Short term	Reversible	Low
	Socioeconomic	Employment	Direct Positive	Short term	Irreversible	Medium

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Activity	Environmental Attributes	Cause	Impact Characteristics			
			Nature	**Duration**	**Reversibility**	**Significance**
	Risk	Risk of accidents during transit	Direct Negative	Long term	Irreversible	Low, if safety measures are taken to prevent accidents
Operational Phase						
Landfill for non-degradable and windrow processing for degradable wastes	Water Quality	Generation of waste waters/ lechates	Direct Negative both for surface and ground water	Short term	Reversible	Low, as proper drainage and non-permeable lining at the bottom will installed
	Air Quality	Organic/ non-degradable Waste processing, Operation of DG sets	Direct Negative	Short term	Reversible	Low, as scrubbers will be installed to control the emission of pollutants.
	Noise levels	Noise generation from instruments and operation of vehicles	Direct Negative	Short term	Reversible	Low, with installation of acoustic enclosures, periodic maintenance of vehicles,
	Soil Quality	Generation of SPM from Solid waste during landfill and organic waste processing.	Direct Negative	Short term	Reversible	Low, with proper collection and safe disposal practice

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	Socioeconomic	Employment generation	Direct Positive	Long term	Irreversible	High, new opportunities for income generation
	Overall Quality of Life	Impose of stringent standards	Direct Positive	Long term	Irreversible	High

Legal Framework

The legislative tools for coastal environmental management are outlined in the Coastal Regulation Zone Notification, 1991, Environment (Protection) Act, 1986, Water (PCP) Act, 1974 and Air (PCP) Act, 1981, and Coastal Management Zone Notification, 2008 (Draft). Despite the obvious strengths of these regulations, there still exists a gap in the institutional coordination, which needs to be addressed.

Institutional Framework

The Project Coordinator (PC)/ Nodal Officer (NO) will have overall responsibility for implementation of the Project in coordination with the Project Management Unit. PC will be assisted by adequate and qualified technical and managerial staffs and will be provided with necessary equipment/ instruments and other infrastructural facilities and vehicles. PC will be responsible for preparing consolidated environmental monitoring reports as part of the regular Project monitoring,

3.0 PUBLIC CONSULTATION

The above impact studies reveal that the implementation of the project is not expected to lead any severe adverse social concerns. As the activities will be involved in a flat barren government land, which is well connected to the city through the connecting IOCL, there will be no loss of public land and therefore no rehabilitation programme is necessary. As the proposed site is substantially away from the human habitation, it is not expected to bring antipathy towards the proposed project. During construction phase, the activities are only small civil

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works, which will have minor, localizes impacts and these can be readily managed. Necessary environment management programmes have been included in the project to mitigate/ minimise the adverse impacts of operation phase.

The local inhabitants of the Paradeep Municipality have been consulted for their opinion on the establishment of the Solid Waste Management (Landfill) and processing plant at Kansaripatia village. People from all sectors of society were present in this consultation programme. They were briefed about the intrinsic concept and objectives of ICZM Project as well as positive and adverse impact of the proposed Project. The people present during the consultation expressed their support to the project. A detail is enclosed in Annexure-I. (attach the public consultation meeting minutes)

4.0 ANALYSIS OF ALTERNATIVES

To safeguard the coastal environment in the urban area in harmony with the increase of population, industrial segments, slums and business complexes etc. it is necessary to remove the solid wastes from the dwelling places and to contain them (inert) by landfill and/ or processing (Organic) in order to maintain a pollution free and hygienic environment. To fulfill these objectives, out of the available alternatives, landfill is considered as the most appropriate process to contain large bulk of non-degradable solid wastes usually generated from the urban areas. However, recycling of some cost effective specific solid waste items may be considered later on. Out of the alternatives available for the processing of the organic wastes, windrow composting is considered to be more appropriate for huge turnover (more than 5 MT of MSW) and composition of the generated wastes and humid climate of Paradeep port city.

5.0 ENVIRONMENTAL MANAGEMENT PLAN

5.1 Mitigation

The primary objective of this proposed environmental management plan and monitoring programme is to control environmental impacts to levels within acceptable standards, and to minimize possible impact on the

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community and the workforce of foreseeable risks during the construction and subsequent operation phases of the project. Such environmental mitigation measures shall be used in conjunction with good management practices and good engineering design, construction and operation practices.

Mitigation Measures:

Table - 4

Activity	Impacts	Mitigative measures to be taken
Initiation of Construction activity	Legal non-compliance	All clearance/ approvals required for Environmental aspects during construction phases shall be ensured and made available before initiation of the work.
(a) Construction Phase The following section contains instructions to the Contractors, which should be adhered to while carrying out the construction activity. This section will be appended into the relevant bid document.		
Site development	Tree felling	• Any tree felling should be minimized. • Compensatory plantation through landscaping • As the proposed site is a barren land, tree felling not required.
Construction	• Top soil erosion	• In slopes and suitable places along the roadside, bush grass should be planted and retaining walls, water-intercepting ditches will be built to prevent soil erosion. • Deploy silt fences to avoid/ reduce soil erosion and run-off. • Temporary and permanent drainage systems will be designed to minimize soil erosion.
	• Air pollution due to Dust during Construction and transportation	• Locally available materials should be used as much as possible so as to avoid long distance transportation, especially that of sand and stone. • Vehicles delivering loose and fine materials like sand and fine aggregates shall be covered to reduce spills on roads. • All dusty materials shall be sprayed

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		with water prior to any loading, unloading or transfer operation so as to maintain the dusty materials wet. • Stockpiles of aggregate or spoil shall be covered and water applied. • The height from which excavated materials are dropped shall be controlled to a minimum practical height to limit fugitive dust generation from unloading. • All vehicles, equipment and machinery used for construction shall be regularly maintained to ensure that the pollution emission levels conform to the SPCB norms. • Mixing equipment should be well sealed, and vibrating equipment should be equipped with dust removal device. Residence should be 500 meters from downwind direction of (asphalt) mixing sites. • The random ambient air quality monitoring shall be done to ensure that the significant impacts are being mitigated adequately at regular intervals.
	• Noise pollution	• Noise emission level from all construction equipment shall strictly conform to the MoEF/ CPCB noise standards. • On-site power gensets shall be covered with an acoustic enclosure and fitted with muffler and shall conform to the noise emission standards. • Ambient noise level monitoring shall be conducted at suitable locations at periodic intervals during construction phase to conform to the stipulated standards both during day and nighttime.
	• Creation of mosquito breeding site	• Design and maintenance of earthworks should be done to avoid creation of significant habitat areas for mosquito larvae. • Spray larvicide in silt traps to prevent the mosquito breeding.
	• Water logging	• Careful attention to be given on design and maintenance of earthworks and

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		drainage systems during construction due to the fact that Paradeep lies at the flat coastal plain and water logging is very common • Special consideration to the water logging near the proposed site will be given with consideration to rainy season and during cyclones.
	• Surface Water pollution	• Use water resources without conflict. • Solid/ liquid/ construction wastes should not be disposed in surface water bodies. • Surface water quality monitoring shall be conducted at suitable locations at periodic intervals during construction phase to conform to the stipulated standards for Inland surface water bodies.
	• Ground water pollution	• Requirement of water for the whole construction period will be met from tanker supply and ground water. • Necessary precautions will be taken to minimize the wastage of water in the construction process. • Ground water quality monitoring shall be conducted at periodic intervals during construction phase to conform to the stipulated standards for drinking water quality. Depth of water level should also be monitored at frequent intervals.
	• Land pollution	• The project will take prior permission from the competent authority for disposal of construction waste on landfill site in suitable area. It will be ensured that no construction spoils of any unsuitable material are disposed off on roadside or any other place in the project area. • Construction debris will be collected and suitably used on site as per construction waste management plan.
Labour camps	• Soil contamination • Pollution of drinking	• All relevant provisions of the factories Act, 1948 and the Building and the other Construction Workers (regulation of Employment and Conditions of Service) Act, 1996 shall be followed for

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	water sources • Surface water contamination due to washing, bathing and waste disposal • Tree felling for fire wood and tents • Unhygienic work environment • Air pollution form burning of tyres and plastic materials	construction and maintenance of labour camps. • Labour camps will be constructed within the project area • The Contractor shall also guarantee for the following. ➢ Availability of uncontaminated water for drinking, cooking and daily uses. ➢ Supply of potable water at easily accessible places. ➢ The sewage system for the camp will be designed, built and operated in such a way that no health hazard as well as no pollution to the air, ground water or adjacent surface water bodies should occur. ➢ Latrines and urinals shall be maintained in a clean sanitary condition at all times with adequate water supply. ➢ Regular collection and proper disposal of Municipal solid wastes according to the Municipal Solid Waste (Management and handling) Rules, 2000. ➢ Toxic materials like tyres and plastic materials should not be burnt by the labours for any purpose. ➢ Trees will not be cut for firewood or tent.
Working Condition	• Impact on workers health • Impact on Public safety	• The Contractor shall comply with all the precautions as required for ensuring the safety of the workmen as per the International labour Organisation (ILO) Convention No. 62 as far as those are applicable to this contract. • All machines to be used in the construction will conform to the relevant Indian Standards (IS) Codes, will be free from patent defect, will be kept in good working condition, will be regularly inspected and maintained. • Where loose soil is met with, shoring and strutting shall be provided to prevent the collapse of soil. • The project will comply with all

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		regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, and safe means of entry and exit. • The Contractor shall arrange for ➢ A readily available first aid kit including adequate supply of sterilized dressing materials and appliances. Suitable transport to take injured or sick person to the nearest hospital will be immediately provided. ➢ Personal protective equipment such as safety goggles, helmets, safety belts, earplugs, mask etc. to workers and staff. • The project will take adequate precautions to prevent danger from electrical equipments. • No material will be so stacked or placed as to cause danger or inconvenience to any person or the public. All necessary fencing and lights will be provided to protect the public. • Work spots will be maintained clean, and provided with optimum lighting. • Fire fighting arrangement: ➢ Demarcation of area susceptible to fires should be provided along with cautionary signage ➢ Portable fire extinguishers/ sand baskets shall be provided at easily accessible locations in the event of fire. ➢ The workers should be educated on the usage of the equipments in the need of emergency. • The contractor shall not engage any person below the age of 14 years for any work and no woman will be employed on the work of painting with products containing lead in any form.

(b) Operation Phase

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The following section contains activities to be undertaken by the respective persons entrusted with the operation and maintenance of the project activity to ensure long-term sustainability.		
Maintenance	• Management of Municipal Solid Waste	• Collection, segregation, storage and transport of Municipal wastes shall be managed and handled in accordance with compliance criteria and procedure laid down in Schedule- II. • The waste disposal processing facility shall meet the specifications and Standards as specified in Schedule- III • The processing of municipal solid wastes shall meet the specifications and Standards as specified in Schedule- III. • Biomedical wastes shall be disposed of in accordance with the Bio-medical wastes (Management and Handling) Rules 1998.
	• Drainage or Flooding	• Careful design of the waste treatment plant to withstand to the flooding during rainy season and during cyclones. • Provision for diversion of storm water drains to minimize leachate generation and prevent pollution of surface water • Provision of storm water drains to avoid flooding and creation of marshy condition near by • Regular inspection and periodic maintenance for cleaning of drains to remove any debris or plant growth that may interrupt the flow. • Provision of run-off from landfill area not entering any stream, river, lake and pond.
	• Landfill process	• The landfill site to be protected to prevent entry of unauthorized persons and stray animals • As the site is near the coast, strong protective wall against storm must be built along with protective plantation cover for protection and to avoid soil erosion. • The wastes should be compacted in thin layers to achieve density of

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		wastes. • Wastes shall be covered immediately/ at the end of each working day. • Prior to the monsoon, appropriate layer of soil covering is to be done after proper compaction and grading to prevent infiltration during monsoon. • After the completion of the landfill, final cover shall be designed with appropriate specification. • Provision of management of lechates collection and treatment shall be made to meet the standard specification. • The landfill site is planned, designed with proper documentation of a phased construction plan as well as closure. • Provision for management of lechates collection and treatment shall be made to meet the standards specified in Schedule-IV.
Waste disposal	• Soil contamination • Water contamination	• Construction of a non-permeable lining system at the base and wall of the waste disposal site/ landfill receiving sites shall be of appropriate liner specification which shall work as composite barrier to check water/ waste water sippage. • Oil and fuel contaminated waste shall be buried in properly identified waste disposal areas. • Soak pits and septic tanks should be covered and effectively sealed off. • Construction debris shall be disposed separately and properly. • Follow safety measures while disposing wastes.
Environment	Air Quality	• Use of ultra low sulphur diesel in the DG sets. • Green belt development with specific species will reduce SPM levels. • Then be scrubbed through an alkaline medium before being allowed to discharge to atmosphere. • Gas control system shall be installed at the landfill site to minimize odour

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		generation. • Concentration of methane gas at landfill site shall not exceed 25% of lower explosive limit (LEL)
	Noise	• All noise generating sources in the complex will be equipped with appropriate noise control measures. Noise levels will be consistent with prescribed standards for Industrial areas. • Ambient noise levels will be periodically monitored to determine compliance with the norms. • Noise levels will also be monitored at point sources for occupational noise exposure and ensuring health risk.
	Waste water	• To properly manage the liquid wastes the necessary treatment should be designed • While discharging treated lechates into inland surface waters, quantity of leachates being discharged and quantity of diluted water available in receiving water body shall be given due consideration
	Ground Water	• Baseline data of the ground water around the solid waste landfill/ processing site shall be collected for future reference. • The ground water quality within 50 meters of the periphery of the landfill site shall be periodically monitored to ensure the ground water is not contaminated by it beyond the acceptable limit as decided by SPCB • Such monitoring shall be carried out in different seasons, particularly summer, monsoon and post-monsoon period. • Hazardous wastes will be stored in a lined pit constructed as per the Rule.
	Traffic Pattern and Accident Reporting	• Vehicle movement will be regulated inside the site with adequate roads and parking lots. • Any accident during solid waste collection, segregation, transportation, storage, processing,

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		treatment and disposal shall report the accident in Form V to the Secretary-in charge of the H. and U. D. Dept.
	Landscaping and Green Belt Development around Landfill site	• Landscape and green area in approx. 20% of total plot area will be developed. • The species to be grown on the site will be fast growing native species having broad leaf base so that a permanent green belt is created in a short period. • The effective plantation will also stabilize the soil and reduce any nuisance during windstorm. • The species of locally adopted non-edible perennial plants those are resistant to drought, extreme temperature and high wind velocity. • The plant grown is such that their roots do not penetrate more than 30 cm. and this should be maintained till the landfill is stabilized. • These species shall have the ability to thrive on low-nutrient soil with minimum nutrient addition. • Plantation is to be made in sufficient density to minimize soil erosion.

5.2 Monitoring

The monitoring program will be a continuing program of data gathering, collection of representative samples for specific purposes, which includes, surface and ground water quality, ambient air quality, composition of compost, treated leachates etc.; and analysis to ensure the effectiveness of the mitigation measures for potentially adverse environmental impacts arising from construction and operation of Project facilities, and to suggest for any additional mitigation measures in case of significant deterioration of environmental quality. It is proposed to monitor essential parameters for ambient air quality, ambient noise quality, ground water quality, and waste water quality

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both during the construction and operation phases of the project.

Monitoring Schedule:

Implementing agency will take steps for a baseline study, which will be under taken at the proposed project site before the initiation of the project for the reference (control). It will be done by involving experts from SPMU, OSPCB and from other institution and organisations (if necessary).

Monthly monitoring will be done by the implementing agency and technical support will be provided by SPMU.

For Quarterly Environmental Monitoring, the Monitoring team will be formed by including officials from the implementing agency, OSPCB, SPMU environmental expert, and if necessary experts may be hired from outside.

A detailed post-project Environmental Evaluation Study will be undertaken to assess the overall environmental impact of the project on the locality.

All such reports will be communicated to SPMU for review and mitigation suggestions if any.

Ambient Air Quality

The frequency of ambient air quality monitoring shall be once every month by thee implementing agency at least three locations within 500-meter radius of the proposed site. The parameters to be monitored are Reparable Particulate Matter (RPM), Suspended Particulate Matter (SPM), Sulphur Dioxide (SO_2), and Nitrogen Oxide (NOx).

During operation phase, ambient air quality level within the plot area as well as 200 m. periphery will be monitored for once in three months. More air quality parameters may be considered depending upon the condition of the site.

Ambient Noise Quality

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Noise emissions from vehicular movement, operation of various construction equipments shall be monitored once every month during construction phase. The frequency of monitoring for day and night time noise level shall be once in every month at all important locations within 500 meter radius of the proposed site

During operation phase, ambient noise level within the plot area will be monitored for once in three months.

Wastewater Quality

During project operation phase, storm water analysis will be done every month.

During operation phase, it is proposed to analyze the quality of storm water, wastewater (including leachates) from the plant and nearby creek, aquaculture ponds will be analyzed once every three months for the following parameters: pH, BOD, COD, oil and grease, total suspended solids, total dissolved solids, Nitrate, Phosphate, Sulphate, Chloride and Metals. If required, more water quality parameters including heavy metals may be considered for analysis.

Ground Water Quality

During Construction Phase, Ground water (if any) used for the construction and human consumption shall be monitored for the desired parameters as per BIS standards once in every month.

During Operation Phase, the ground water will be tested once in every three month to ascertain any contamination due to solid wastes processing plant operation taking representative samples within 50m periphery of the landfill site.

5.3 Capacity Development and Training

The Nodal Officer of the project will be responsible for the implementation of environmental Monitoring Plan. The annual monitoring report will be submitted to SPMU and Dept. of H. & U. D, government of Orissa.

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As the municipality has no specialized staff for environmental monitoring, necessary support will be sought from the SPCB. However, some of the Municipality staff will be trained from the SPCB. The staffs engaged for collection, segregation transport, landfill and waste processing also need to be trained to adjust to adapt to modern scientific tools and processes. For the effective planning, design and implementation of the landfill and various waste processing practices and construction of plants, other cities of the state have not any spectacular achievement and in fact all are at their initiation phase. Therefore, Paradeep Municipality is in need of training and exposure visits for its implementing officials and engagement of efficient consultants during construction and operation of waste processing plant for the proposed project.

However, at every step of the project implementation, active support from SPMU is in need for success of such a pilot project in an extreme coast terrain for the first time in Orissa.

5.4 Implementation Schedule and Cost Estimates

The Environmental Management Plan and Monitoring Plan shall be synchronized with the construction and operational phases of the project.

The total cost estimate for implementation of the Environmental Monitoring Plan & Environmental Management Plan (EMP) shall be INR Rs. 46.00 Lakhs. The cost break-up is as follows.

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