

ACTION PLAN FOR ABATEMENT OF POLLUTION IN INDUSTRIAL AREAS OF PARADEEP



**STATE POLLUTION CONTROL BOARD, ODISHA
BHUBANESWAR
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FOREWORD



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Central Pollution Control Board has developed a Comprehensive Environmental Pollution Index (CEPI) to evaluate the environmental impact on industrial clusters. This is a rational indicator to characterize the environmental quality of a cluster. Industrial clusters having aggregated CEPI score between 60 and 70 is considered as severely polluted cluster. The CEPI score helps in preparing policy for pollution control and taking steps to bring down the pollution level to a tolerable level. In the state of Odisha there are two severely polluted areas, Paradeep and Ib-valley.

Paradeep is a port based severely polluted area. The major industrial activities in this area involves; Phosphatic fertilizer industries, Petroleum Refinery, Calcined Pet Coke (CPC) manufacturing industries, Pellet Plant, Port activities, loading, unloading and other transport related activities. So they have an impact on CEPI score. This action plan aims at abatement of pollution in the cluster taking into account of air, water and ground water / soil environment. It is prepared based on the environmental quality monitoring conducted by State Pollution Control Board, Odisha in recent years.

In this action plan, different action have been recommended for different types of plants addressing the air, water and ground water / soil environment. These include action plans for Phosphatic Fertiliser Plants, Oil Refinery, Port, Fishing Processing Units and Common infrastructure and services. This report is prepared as per the requirement of CPCB and order of Hon'ble NGT in this regard. All the stakeholders can use it for formulating, implementing, monitoring various activities for abatement of pollution in Paradeep. Hope, this document will be useful to all concerned.

A handwritten signature in black ink, appearing to be 'Asit Tripathy', written over a horizontal line.

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List of Abbreviations

1. AAQ – Ambient Air Quality
2. BF – Bag Filter
3. BOD – Biochemical Oxygen Demand
4. CEPI – Comprehensive Environmental Pollution Index
5. CETP – Common Effluent Treatment Plant
6. CMH – Cubic Meter per Hour
7. CO – Carbon Monoxide
8. CPCB – Central Pollution Control Board
9. CPP – Captive Power Plant
10. CPIC – Critically Polluted Industrial Cluster
11. CPC – Calcined Petroleum Coke
12. DAP – Di Ammonium Phosphate
13. DO – Dissolved Oxygen
14. D/s – Down Stream
15. EC – Environmental Clearance
16. EF – Exceedence Factor
17. EMA – Environment Management Area
18. EMP – Environmental Management Plan
19. FC – Faecal Colliform
20. GOI – Govt. of India
21. GPls – Grossly Polluting Industries
22. HDPE – High Density Poly Ethylene
23. HLPA – Hecto Liter per Annum
24. HSD – High Speed Diesel
25. IPP – Independent Power Plant
26. IFFCO – Indian Farmers Fertilizer Cooperative Limited
27. IOCL – Indian Oil Corporation Ltd.
28. KL – Kilo Liter
29. KLD – Kilo Liter per Day
30. LPG – Liquefied Petroleum Gas
31. MLD – Million Liter per Day
32. MPN – Most Probable Number
33. MS – Motor Sprit
34. MSL – Mean Sea Level
35. MTPA – Million Ton per Annum

36. MW – Mega Watt
37. NGT – National Green Tribunal
38. NAAMP – National Ambient Air Monitoring Programme
39. NO_x – Oxides of Nitrogen
40. OWSSB – Odisha Water Supply and Sewerage Board
41. PAP – Phosphoric Acid Plant
42. PIA – Paradeep Industrial Area
43. PM – Particulate Matter
44. PPM – Parts Per Million
45. PPP – Public Private Partnership
46. PPL – Paradeep Phosphate Ltd.
47. PPT – Paradeep Port Trust
48. REMP – Regional Environmental Management Plan
49. RSPM – Respirable Suspended Particulate Matter
50. SAP – Sulphuric Acid Plant
51. SKO – Superior Kerosene Oil
52. SLF – Secured Land Fill
53. SO₂ – Sulphur Dioxide
54. SPCB – State Pollution Control Board
55. SPM – Suspended Particulate Matter
56. Sq Km – Square Kilometer
57. TC – Total Colliform
58. TOC – Total Organic Carbon
59. TPP – Thermal Power Plant
60. TPA –Ton per Annum
61. TOR – Term of Reference
62. TSDF – Treatment Storage Disposal Facility
63. U/s – Up Stream

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Chapter1

Introduction

1.1 Introduction

Environmental pollution in industrial clusters has been a national issue particularly in a period of rapid industrial growth. The environmental problem in a cluster is a complex multi-dimensional problem which is often difficult to measure and manage. In order to address such complex problem Central Pollution Control Board (CPCB) developed a Comprehensive Environmental Pollution Index (CEPI). This index is a rational number to characterize the environmental quality of an industrial cluster following an algorithm of source-receptor-pathway framework. Increasing value of CEPI indicates adverse impact on environment.

The objective of CEPI is to identify the planning needs for abatement strategies for polluted clusters and eventually bringing down the level of impact to an acceptable level. Industrial clusters having aggregated CEPI score of 70 and above is considered as critically polluted and clusters having a score of 60 to 70 is considered as severely polluted cluster. The CEPI score of Paradeep being 60 and 70 is considered as a Severely Polluted Area (SPA). This action plan for abatement of pollution in the Severely polluted clusters was prepared on the basis of previous studies conducted by the State Pollution Control Board (SPCB), Odisha and data collected during various monitoring programs.

In the year 2018, CPCB undertook a project on “Monitoring, sampling and analysis for ambient air quality, surface water quality and ground water quality in around 100 Polluted Industrial Areas (PIAs)” including that of Paradeep. The CEPI score of Paradeep, on the basis of the 2018 monitoring is found to be 60.61. Although this score is less than 2009 monitoring score, the area still continues to be in a class of a Severely Polluted Area (SPA).

Hon'ble National Green tribunal (NGT) through various cases such as OA no 606/2018 and OA No 1038/2018 addressed the issues of Severely and Critically Polluted Areas and desired that appropriate action must be taken in these areas. In this regard, CPCB performed a gap analysis in the matter of OA no-606/2018, pending before Hon'ble National Green Tribunal (NGT) and has sought for an Action Plan for abatement of environmental pollution in Paradeep, as per Terms of Reference (TOR) suggested by CPCB. The report is prepared on the above background.

1.2 Methodology

The Action Plan is prepared following the CPCB framework for preparation of Action Plan by adopting the following step by step methodology.

1. Background details of the area was collected along with the present industrial status. The boundary limits of the industrial cluster was also determined.
2. Status of present water and air environment and critical environmental pollution issues were identified within the cluster and a model action plan was drawn up for abatement of pollution.
3. Status of present land and ground water environment and critical environmental land and ground water pollution issues were identified within the cluster, and a model action plan was drawn up for abatement of land and ground water pollution within the industrial cluster.
4. Status of present generation of industrial and municipal solid waste and hazardous waste was estimated. For proper management of waste a model action plan was drawn up for management of solid waste within the industrial cluster.

1.3 Description of Study Area

Paradeep is one of the major, port based industrial cluster of the country. The Port was established in the year 1965. This area is located along the sea coast of Bay of Bengal about 120km from the state capital Bhubaneswar and is bounded between 20°31'N to 21°10'N and 84°28'E to 86°28'E (**Figure -1.1**).

Odisha State Pollution Control Board realized the environmental issues of Paradeep area and had prepared a Regional Environmental Management Plan (REMP) in the year 2002-03. For demarcation of boundary of the Polluted Industrial Area (PIA), evaluation of the environmental quality, pollution load and drawing up the action plan, the inputs from the REMP study was extensively used. Inputs from SPCB's own monitoring and survey were also used in this exercise.



Figure-1.1 Location of Paradeep industrial area

Determination of the boundary of the PIA was started with identifying and locating the industries on a composite map. The location of existing polluting industries are marked on the map. The Phosphatic fertilizer industries, Petroleum Refinery, Calcined Pet Coke (CPC) manufacturing industries, Pellet Plant, Port activities, loading, unloading and other transport related activities that have an impact on CEPI score was considered for this purpose.

The boundary is defined by including all the major polluting industries and port which are under operation and closely located (periphery to each other). While determining the boundary, care has been taken to include areas having common environmental problems as per the public opinion expressed in the local newspapers and also expressed during various public hearings that were conducted in the past for different projects in the area. The boundary of PIA area is defined and is shown in blue line in **Figure- 1.2**. The coordinates of the boundary of Paradeep PIA is also shown in the map. The area of the cluster is approximately 121 sq km.



Figure-1.2: Geographical boundary of Paradeep PIA for implementation of action plan

1.4. Demography

The population of the Paradeep is 73,633 as per 2011 census. The demographic profile of Paradeep Industrial Area covering the study is presented in **Table-1.2**.

Table 1.2: Socio-Economic Profile of Paradeep (As per 2011 Census)

Sl. No	Items	Jagatsinghpur District	Paradeep
1.	Area in km ²	1668	NA
	Total Population	11,36,971	68,585
	Males	57,7865(50.82%)	37,300
2.	Females	55,9106 (49.18%)	31,285
	Rural	20,991(89.80%)	NA
	Urban	1,15,980 (10.20%)	NA
3.	Sex Ratio (Females per 1,000 males)	968	839
	Total Workers or Business Activity	4,03,649	22,176
4.	Main Workers	71.88%	91.93%
	Marginal Workers	28.12%	8.07%
	Total Literacy Rate	86.59%	85.93%
5.	Male Literacy	92.38%	90.25%
	Female Literacy	80.63%	80.77%

N.A. – Not Available

1.5. Industry classification and distribution

The Paradeep Industrial Area is dominated with RED category of industries. There are 05 numbers of “17- category” of highly polluting industries (RED-A) and 10 number of red category (Red-B) industries. The list of RED category of industries operating within the cluster is presented in **Appendix - A**. Out of these, there are three numbers of Grossly Small Polluting Industries (GPI) that discharge BOD load of more than 100 Kg/day or discharging hazardous substances in the effluent. These GPIs are (i) Paradeep Phosphate Ltd. (ii) IFFCO Ltd. and (iii) IOCL Refinery.

1.6. Environmental Issues in the cluster

Nature and magnitude of environmental issues relevant to an area forms the basis on which action plans are drawn. The key environmental feature of Paradeep Industrial area are the following;

1. River Mahanadi flows along Paradeep Area from Cuttack to Paradeep and falls into the Bay of Bengal. Atharabanki creek which a tributary of River Mahanadi flows from Cuttack to Paradeep. M/s. IFFCO Ltd and M/s. Essar Steel India Ltd are located along the one side of the river with a stretch of about 3 km.
2. Two large phosphatic fertilizer plants are operating in this PIA. The Phosphatic fertilizer plants generate Phospho-gypsum as by-product which is stored in lined gypsum ponds. The wastewater which is highly acidic in nature is contained in guard ponds. An estimated 55 Million tons of Phospho-gypsum which is a low toxic and high volume waste, is lying on 02 nos. of gypsum ponds of two plants. Each pond is of about 200 Acers of land.
3. Paradeep port, which has a capacity of handling 93.60 Million Metric Tons per Annum of cargo is operating very close to Paradeep town. Paradeep port mostly handles import and export of Cargoes to be handled in 18 Berths which includes Iron Ore, Coal, Lime Stone, Coke, Chrome Ore, Fertilizer Raw Materials, Pellet, Gypsum, Oil Cargo, Ferro Chrome, Flux Material, Petroleum Product, etc. excluding SPM handling. Therefore, environment of Paradeep area is likely to be affected due to port activities.
4. During monsoon, the run-offs from various stock piles like coal, minerals, solid waste etc. of Port area flows down the area and gets discharged to river Mahanadi, Atharabanki Creek through its feeder streams.
5. The level of fluoride in the ground water around fertilizer plants has been found to be higher than the prescribed limit of CPCB. During post monsoon period there had also been few instances of burning of natural vegetation like leaf of trees, bushes; presumably due to the effect of fluoride/Ammonia bearing gasses.
6. The industrial activities in this area causes about more than 100 million tons of materials transportation between the nodes in a year. The transportation by road is a cause of nuisance, air pollution and traffic congestion.
7. The sewerage from Paradeep town is discharged to Atharabanki creek without any treatment and causes the deterioration of water quality.
8. Amount of land being converted to gypsum ponds and solid waste disposal facilities is increasing day by day.
9. Two large phosphatic fertilizer plants are now constructing Gypsum ponds at their respective plant premises of area Ac.200 each.
10. Domestic wastewater of Paradeep Port Trust Township and Paradeep Municipality is being directly discharged into Atharabanki and Santra Creek and the water getting polluted.
11. Taladanda Canal, a tributary of River Mahanadi flows from Cuttack to Paradeep and ultimately connects to the Bay of Bengal. Entire people residing proximate to creek depends on water for their livelihood and irrigation. Water quality of Atharabanki creek deterioration has become polluted day by day due to direct discharge of domestic effluent, dumping of household garbage and open defecation of the public.

1.7 Salient features: Paradeep SPA

PIA AREA	: 121 km ²
POPULATION	: 68585
MAJOR RIVER	: Mahanadi
MAJOR STREAMS/ CREEKS	: Atharbanki, Santra, Taladanda, Kaudia
MAJOR TOWN	: Paradeep
HIGHWAY	: NH-42, NH-23
RED-A INDUSTRIES	: 05
RED-B INDUSTRIES	: 10
CEPI SCORE	: 60.61

Chapter 2

Water Environment

2.1 Present status

Mahanadi is the major river flowing through Paradeep Area. It drains into the Bay of Bengal near Neheru Banglow Guest House. Apart from river Mahanadi, Taladanda Canal and Kaudia River flows through the area and joins the confluence point near Neheru Banglow Guest House. Santra Creek and Kaudia River also pass close to Paradeep area and drain into the Bay of Bengal. Besides these river systems, Atharabanki Creek and Santra Creeks also surround the Paradeep area. There is a close interaction between these river and creek system. The river system of Paradeep area with the Bay of Bengal is shown in **Figure- 2.1**. The water quality of river Mahanadi, Taladanda Canal, Atharabanki Creek, and sea water near Paradeep is being monitored by the Board under National Water Monitoring Program. The water of Mahanadi is monitored at two locations viz; upstream and downstream of Paradeep. The water quality of Taladanda Canal, Atharabanki Creek and Sea water are being monitored at one location each. The water quality data of river systems in Paradeep area for the year 2018 are summarized in section 2.1.1.



Figure-2.1 River systems in Paradeep area

These river systems receive effluent / seepage from industries, fishing activities, Paradeep Port, Port Township and Paradeep Municipality. All the effluent and wastewater are ultimately drained into the Bay of Bengal.

2.1.1 Present levels of pollutants in water bodies

The water quality of Mahanadi river system is being monitored by the Board under National Water Monitoring Program at 55 locations of entire stretch. Out of 55 locations 02 locations come under Paradeep Severely Polluted Area. The water quality data of river Mahanadi near Paradeep area, Taladanda Canal, Atharabanki Creek with respect to four criteria parameter like pH, Dissolved Oxygen, Biochemical Oxygen Demand (BOD), and Total Coliform (TC) for the year 2018 is summarized at **Table-2.1** to **Table2.4**.

Table-2.1 Water monitoring data for Mahanadi River at Paradeep

Sl. No	Location	No. of Obs.	Annual average value (Range of values)				Frequency of violation (Percent of violation) from designated criteria value		Designated Class	Existing Class
			Parameters				BOD (mg/l)	TC (MPN/ 100 ml)		
			pH	DO (mg/l)	BOD (mg/l)	TC (MPN/100 ml)				
1	Paradeep U/s	12	7.8 (6.9-8.0)	7.4 (6.2-8.6)	1.0 (0.4-1.5)	973 (<1.8-3500)	0	0	C	C
2	Paradeep D/s	12	7.6 (7.0-8.1)	7.4 (6.8-8.2)	1.0 (0.3-1.8)	146 (<1.8-490)	0	0	C	C
Class 'C' water quality Criteria (IS-2296-1982)			6.5-8.5	4 and above	3 or less	5000 or less			Drinking water source with conventional treatment followed by disinfection	

NB : The criteria of non-compliance with respect to TC has been calculated on the following basis:

TC values with more than 5% of samples show above 20,000 MPN/100 ml and more than 20% of the samples show above 5000 MPN/ 100 ml. (Ref: IS 2296-1982 foot note)

Apart from four criteria parameters, SPCB monitors water quality data with respect to physical parameters, organic pollution indicators, mineralogical constituents, nutrient, and heavy metals. The water quality data for Mahanadi at Paradeep, Taladanda Canal at Atharabanki, Atharabanki Creek and Sea water near Paradeep for the year 2018 are presented in Table 2.2 through Table 2.8.

Table: 2.2 Water monitoring data for Mahanadi River at Paradeep for other parameters during 2018

Sl. No.	Sampling Location	Physical parameters	Organic pollution Indicators	Bacteriological parameter	Mineral constituents				
		Annual average values (Range of values)							
		TSS (mg/l)	COD (mg/l)	Free NH ₃ -N (0-0.009)	FC (MPN/100ml)	EC (µS/cm)	TDS (106-22060)	Cl (9.64-11994.0)	F (0.24-0.72)
1.	Paradeep U/s	105 (14-182)	10.7 (3.2-21.0)	0.003 (0-0.009)	356 (<1.8-1300)	10929 (161-31070)	7819 (106-22060)	4114 (9.64-11994.0)	0.47 (0.24-0.72)
2.	Paradeep D/s	242 (48-904)	20.5 (8.5-45.3)	0.005 (0-0.018)	47 (<1.8-230)	24314 (203-51284)	19687 (122-43260)	10660.1 (19.28-23488.2)	0.77 (0.21-2.60)
❖	Class 'C'	-	-	-	-		1500	600	1.5
❖	Class 'E'					2250	2100	600	-

Table: 2.3 Water Quality of Taladanda Canal with respect to Criteria parameters during 2018

Sl. No	Sampling Location	No. of Obs	Annual average values (Range of values)					Frequency of violation (Percent of violation) from designated criteria value			Existing Class	Parameters responsible for downgrading the water quality	Possible Reason
			Parameters					BOD	TC	FC			
			pH	DO (mg/l)	BOD (mg/l)	TC (MPN/ 100 ml)	FC (MPN/ 100 ml)						
Taladanda canal													
1.	Atharabanki	12	7.8 (7.2-8.2)	6.5 (1.4-8.2)	1.7 (0.8-5.7)	18843 (330-92000)	9502 (110-54000)	1 (8)	6 [*] (50) 9 ^{ss} (75)	6 (50)	Does not conform to Class B & C	BOD, TC, FC	Human activities
***Class 'C'			6.5-8.5	4 and above	3 or less	5000 or less		Drinking water source with conventional treatment followed by disinfection					

Sl. No	Sampling Location	No. of Obs	Annual average values (Range of values)					Frequency of violation (Percent of violation) from designated criteria value			Existing Class	Parameters responsible for downgrading the water quality	Possible Reason
			Parameters					BOD	TC	FC			
			pH	DO (mg/l)	BOD (mg/l)	TC (MPN/100 ml)	FC (MPN/100 ml)						
***Class 'B'			6.5-8.5	5 and above	3 or less	500 or less				Outdoor bathing			

*** Tolerance limits for Inland Surface water bodies (IS-2296-1982)^s for Class C and ^{ss} for Class B

NB: The criteria of non-compliance with respect to TC has been calculated on the following basis:

(Ref: IS 2296-1982 foot note)

For Class B : TC values with above 5% of samples show above 2000 MPN/100 ml and more than 20% of the samples show more than 500 MPN/ 100 ml.

For Class C : TC values with above 5% of samples show above 20,000 MPN/100 ml and more than 20% of the samples show more than 5000 MPN/ 100 ml.

Table: 2.4 Water Quality of Taladanda Canal at Atharabanki with respect to heavy metals during 2018

Sl. No.	Sampling Location	Nutrients		Heavy metals				
		Annual average values (Range of values)						
		NO ₃ ⁻ (mg/l)	Cr(VI) ^{##}	Fe ^{##}	Zn ^{##}	Hg ^{##}	Pb ^{##}	
1.	Atharabanki	3.283 (0.833-12.595)		0.015	2.157	0.026	<0.00006	0.009
***Class 'C'		50		0.05	50	15.0	-	0.10
***Class 'E'		-		-	-	-	-	-

Table: 2.5 Water Quality of Atharabanki Creek during 2018 (January-December)

Sl. No	Sampling Location	No. of Obs.	Annual average value (Range of values)				Frequency of violation (Percent of violation) from designated criteria value			Existing Class	Parameters responsible for downgrading the water quality	Possible Reason
			Parameters				DO	BOD	FC			
			pH	DO (mg/l)	BOD (mg/l)	FC (MPN/100 ml)						
1.	Atharabanki Creek	12	7.2 (6.9-7.7)	5.3 (2.6-8.2)	3.3 (0.8-7.9)	2709 (<1.8-16000)	3 (25)	4 (33)	12 (100)	Does not confirm to Class-SW-II	DO, BOD, FC	Human activities
Water quality criteria for Class SW-II Waters (MOEF Notification G.S.R. No. 742(E) Dt. 25.09.2000)			6.5-8.5	4.0 or more	3.0 or less	100 or less				For Bathing, Contact Water Sports and Commercial Fishing		

Table-2.6 Water Quality of Atharabanki Creek during 2018 for other parameters

Sl. No.	Sampling Location	Physical parameters	Organic pollution Indicators	Bacteriological parameter	Mineral constituents				
		Annual average values (Range of values)							
		TSS	COD	Free NH ₃ -N	TC	EC	TDS	Cl	F
	(mg/l)	(mg/l)	(MPN/100 ml)	(□S/cm)	(mg/l)				
1.	Atharabanki Creek	161 (17-370)	29.6 (7.9-54.6)	0.001 (0-0.007)	3844 (20-16000)	16199 (1500-28760)	12317 (952-21290)	6508.9 (385.6-11994.0)	3.47 (0.28-8.00)

ND + Not Detected ## Data for the period April, 2018

Table-2.7 Water Quality of Atharabanki Creek during 2018 for other parameters (heavy metals)

Sl. No.	Sampling Location	Nutrients	Heavy metals				
		Annual average values (Range of values)					
		NO ₃ ⁻	Cr(VI) ##	Fe##	Zn##	Hg##	Pb##
	(mg/l)	(mg/l)					
1.	Atharabanki Creek	8.082 (1.120-18.076)	0.005	1.244	0.015	0.00006	0.009

ND + Not Detected ## Data for the period April, 2018

Table-2.8 Water Quality of sea at Paradeep with respect to Criteria parameters during 2018

Sl. No	Sampling Location	No. of Obs.	Annual average value (Range of values)					Frequency of violation (Percent of violation) from designated criteria value	Existing Class
			Parameters						
			pH	DO (mg/l)	BOD (mg/l)	Turbidity, NTU	FC (MPN/100 ml)		
1.	Paradeep	12	7.9 (7.4-8.1)	7.0 (6.1-8.6)	1.0 (0.2-2.6)	9.9 (2.1-41.0)	43 (<1.8-490)	1 (8)	SW-II
Water quality criteria for Class SW-II Waters			6.5-8.5	4.0 or more	3.0 or less	30 or less	100 or less*		

- Ref – (MOEF Notification G.S.R. No. 742(E) Dt. 25.09.2000). * The average value not exceeding 200/100 ml in 20 percent of samples in the year and in 3 consecutive samples in monsoon months.

From the data, it is apparent that Taladanda canal and Atharbanki Creek at Paradeep is primarily affected due to sewage disposal. However, exceedance of level of fluoride is observed in Atharbanki creek may be attributable to industrial activities or may be because of brackishness of creek water.

The water quality, results were compared with the desirable parameters as per CPCB, 2002, "Water quality criteria and goals" Monitoring of Indian national aquatic Resources series: MINARS/17/2001-2002. For surface water, summer season was considered as critical period and for ground water quality post monsoon was considered as critical. Similarly, the critical parameters were chosen by linking the environmental issues and relevance of the parameter. The CPCB, during the evaluation of CEPI for Paradeep identified Selenium, Total Dissolved Solids and Total Hardness as the critical water quality parameter for Paradeep.

2.2 Sources of Water Pollution

Major sources of water pollution in Paradeep are industrial, domestic, agricultural runoff and others. However, reliable data on agricultural runoff is not available. Therefore, estimated quantity of effluent generated by major industries and domestic sources are summarized in **Table 2.9** and **Table 2.10** respectively.

2.2.1 Industrial sources

The effluent generation detail from major industries operating in Paradeep area is shown in **Table-2.9**. The table also reflects the effluent treatment and discharge detail of the industries.

2.2.2 Domestic sources

Paradeep Municipality, PPT Township, IFFCO Township, PPL Township, IOCL Townships etc. are the major sources of domestic effluent. These domestic effluent are discharged into the water body of River Mahanadi and Atharabanki Creek. Most of the industrial townships have installed STPs and Paradeep Municipality is yet to install Sewage Treatment Plants. Industries like PPL, IFFCO, IOCL, Essar Steel India Ltd. and Paradeep Port have installed STP. The detail of the STPs is shown in the **Table 2.10**.

Table-2.9: Effluent generation in major industries

Sl No	Name of the industry	Product	Capacity	Effluent in KLD	ETP Capacity (m ³ /Hr)	Recycle/ reuse/ treatment	Quantity of Effluent discharged to river/ sea
1.	IOCL Refinery Division	Petro Products	15 MTPA	26525	1580	-	Deep Sea Discharge through 3 Km outfall from low tide line
2.	IFFCO Ltd.	Phosphatic Fertilizer	1.92 MTPA	4075	200	Reuse in Ball Mill of PAP & Lime Preparation	River Mahanadi
3.	PPL	Phosphatic Fertilizer	1.5 MTPA	881	200	Reuse in Ball Mill of PAP	-
4.	Essar Steel India Ltd.	Iron Pellets Ore	6 MTPA	5000	550	Reuse in pellet plant & supplied to Essar Power Odisha Ltd	River Mahanadi
5.	SAB Miler India Ltd.	Beer	2 Lakh HLPAs	285	16.7	Reuse in Dust & Suppression gardening purpose	Nearby water bodies

Table 2.10- STP Capacity of different Townships with disposal status

Sl No	Township	STP Capacity (KLD)	Receiving water body	STP Status
1.	IOCL Refinery Division, Paradeep	1000	Reused for gardening purpose	Operational
2.	IFFCO Ltd, Paradeep	1200	Reused for gardening purpose	Operational
3.	PPL, Paradeep	3600	Reused for gardening purpose	Operational
4.	Essar Steel India Ltd, Paradeep	15	Reused for gardening purpose/ dust suppression	Operational
5.	Paradeep Port Trust	1x2.5 MLD and 2x2 MLD	-	1x2.5 MLD and 1x2.0 MLD Operational and 1x2 MLD Under Construction

2.3 Action Plan for compliance and control of water pollution

Based on the background information, monitoring reports, an action plan for Paradeep area has been prepared. In this action plan, sector specific abatement strategies for control of water pollution were drawn up. Improvement in environmental management practice, technological up-gradation in process, pollution control, development of adequate infrastructure remained the thematic area. All the action plans were aligned to the environmental issues of the area and aim at addressing them Sector-wise for control of water pollution. The action plan and possible target period to achieve it, is presented in the **Table- 2.11** to **Table-2.15**.

Table-2.11 Action Plan for control of water pollution in Fertilizer Plants

Sl. No	Action plan	Target Period	Issues being addressed
1.	Conduct comprehensive waste water audit for phosphatic fertilizer industries including run-off management	Short	Water Conservation
2.	Establishment of New Gypsum pond of IFFCO with HDPE lining with a life of 15 Years	Short	Water contamination of nearby areas
3.	Establishment of New Gypsum pond of PPL with HDPE lining with a life of 15 Years	Short	Water contamination of nearby areas
4.	Provision of water Recycling system in PAP Plants.	Medium	Reduction in effluent volume
5.	Provision of Surge Pond with impervious lining all along the gypsum pond with provision of Garland Dyke for PPL and IFFCO	Medium	Water contamination of nearby areas

Table-2.12: Action Plan for control of water pollution in Oil Refinery

Sl.No	Action plan	Target Period	Issues being addressed
1.	Conduct comprehensive waste water audit including run-off management	Short	Water Conservation
2.	Complete utilization of treated water from ETP for different heads so as to minimize fresh intake water	Medium	Water Conservation
3.	Installation of desalination plant to reduce fresh water consumption	Long	Water scarcity

Table-2.13: Action Plan for control of water pollution in Port

Sl.No	Action plan	Target Period	Issues being addressed
1	Provision of adequate number of Settling Pits for all drainage networks and utilization of settled water for dust suppression and plantation.	Short	Water Pollution
2	Provision of a Sewage Treatment Plant for the port township	Short	Water Pollution
3	Provision of Centralized Automobile Servicing Center with an ETP facility. The treated effluent shall be reused in vehicle washing.	Medium	Water Pollution
4	Maintaining minimum stock of minerals like coal, iron ore, coke, etc. (optimize detention time) to reduce fugitive emission from these minerals and stack height of storage of these minerals	Medium	Air Pollution and Surface runoff

Table-2.14: Action Plan for control of water pollution in Fishery Industry

Sl.No	Action plan	Target Period	Issues being addressed
1.	Provision of ETP for treatment of washings from fish landing centers	Short	Water Pollution

Table-2.15: Action Plan for control of water pollution through Common Infrastructure services

Sl. No.	Action plan	Target Period	Issues being addressed
1	Construction of a sewage treatment plant for Paradeep Municipality.	Short	Organic pollution of river
2	Selenium, Lead, Cadmium and Fluoride concentrations in Ground water is to be monitored.	Short	Data availability
3	Establishment of on-line monitoring station for water quality monitoring of River Mahanadi and online data transmission facility with SPCB and CPCB	Medium	Real time Data estimation and transmission
4	Construction of water impoundment and rain water harvesting structures	Long	Water conservation
5	Preparation of prefeasibility report and development of facility for central pooling of surplus treated effluent of PPL, IFFCO, ESSAR, IOCL and using the same for common cause i.e. road dust suppression, firefighting, industrial use etc.	Long	Water conservation

Chapter 3

Air Environment

3.1 Present Status

Ambient Air Quality Monitoring is being carried out by State Pollution Control Board, Odisha at three locations in Paradeep area within the polluted area. The Annual average of ambient air quality monitoring data for the period 2014-2018 with respect to **Respirable Suspended Particulate Matter (PM₁₀ and PM_{2.5}), Sulphur Dioxide (SO₂) & Oxides of Nitrogen (NO₂)** are given in Table.3.1 to Table-3.3. The monitoring data includes average, maximum, minimum values and violation percentage.

Table- 3.1 Ambient Air Quality Data of PPL Guest Hose for the period 2014-18

Year	Daily average and (Range) and Percent violation from 24 hourly standard					
	PM ₁₀ (µg/m ³)		PM _{2.5} (µg/m ³)		SO ₂ (µg/m ³)	NO ₂ (µg/m ³)
	Average (Range)	Percent violation	Average (Range)	Percent violation		
2014	84 (33-237)	(30%)	-	-	9.8 (6.1-15.6)	11.4 (9.9-13.7)
2015	87 (40-306)	(30.5%)	31 (17-122)	(1.2%)	11.7 (6.7-36.9)	12.0 (10.3-24.4)
2016	97 (49-193)	(37.3 %)	34 (16-69)	(8.75%)	22.7 (12.7-34.3)	12.9 (10.9-17.0)
2017	104 (36-76)	(37.37%)	40 (13-91)	(13.13 %)	18.8 (11.5-31.7)	14 (8.7-21.7)
2018	114 (38-295)	(46.9 %)	36 (16-119)	(14.8 %)	18.7 (11.9-32.8)	11.4 (7.7-17.3)
24 Hourly, Standard	100	-	60	-	80	80

Table- 3.2 Ambient Air Quality Data on the roof of STP of IFFCO for the period 2014-18

Year	Daily average and Range					
	PM ₁₀ (µg/m ³)		PM _{2.5} (µg/m ³)		SO ₂ (µg/m ³)	NO ₂ (µg/m ³)
	Range	Percent violation	Range	Percent violation		
2014	93 (29-211)	(41.2%)	-	-	9.9 (5.8-17.3)	11.3 (9.9-13.4)
2015	100 (40-289)	(50.5%)	32 (16-61)	(1.2%)	11.9 (6.5-26.2)	11.6 (10.0-24.0)
2016	117 (64-250)	(56.8%)	41 (19-86)	(17%)	21.9 (11.1-32.1)	12.7 (10.6-19.5)
2017	112 (40-238)	(53.53%)	37 (17-84)	(13.13%)	19.3 (12.1-31.1)	13.8 (10.3-19.8)
2018	132 (43-248)	(70.3 %)	62 (33-102)	(43.3%)	17.5 (12.2-26.3)	11.4 (8.8-19.3)
24 Hourly, Standard	100	-	60	-	80	80

Table- 3.3 Ambient Air Quality Data on the roof of Paradeep port trust building for the period 2014-18

Year	Daily average and Range					
	PM ₁₀ (µg/m ³)	Percent violation	PM _{2.5} (µg/m ³)	Percent violation	SO ₂ (µg/m ³)	NO ₂ (µg/m ³)
	Range		Range			
2014	95 (31-208)	(34%)	-		8.9 (5.2-14.7)	12.9 (10.6-16.9)
2015	96 (43-386)	(33.3%)	40 (22-155)	(4.3%)	11.5 (6.9-29.7)	13.2 (10.5-27.7)
2016	114 (53-248)	(45%)	42 (18-120)	(21.3%)	22.5 (13.0-43.1)	13.9 (10.9-21.8)
2017	102 (32-279)	(37.37%)	41 (23-95)	(12.12%)	19.1 (12.1-33.2)	14.2 (10.8-24.7)
2018	113 (36-317)	(49.5 %)	47 (16-161)	(26.8 %)	19.2 (13.8-37.8)	11.5 (9.1-20.6)
24 Hourly, Standard	100	-	60	-	80	80

The critical parameters were chosen by linking the environmental issues and relevance of the parameter. During the year 2018 CPCB carried out an environmental monitoring across 100 PIAs by engaging a third party consultant. Based on the monitoring carried out by CPCB, the critical parameters are PM₁₀, PM_{2.5} and CO. From the results of air quality monitoring, it is observed that percent of violation in case of PM₁₀ and PM_{2.5} has been steadily increasing since the year 2014. This phenomena is observed in all three stations.

3.2 Sources of Air Pollution

The sources of air pollution can be categorized into industrial, domestic and transportation. The major industries contributing to air pollution are fertilizer plants of IFFCO, PPL, and Iron pellet plant of ESSAR, IOCL, calcined petroleum industries, Paradeep Port and other ancillary industries. Apart from the above, the fugitive emissions from the burning of wood as domestic fuel, also contribute to air pollution in the area.

Particulate Matter, Sulfur Di-oxide and Fluoride are the three major air pollutants emitted from the industries in this area. The emission of these air-pollutants are estimated on the basis of maximum volumetric flow rate and permissible concentration and in some cases on the basis of mass flow rate permissible under the Environment (Protection) Act 1986 and Air (Prevention and Control of Pollution) Act 1981. The unit-wise estimated emissions from the major industries are presented in **Table – 3.4**.

Table – 3.4: Air pollution load from the existing industries

Sl	Name of Industry	Source	Pollution load (kg/d)		
			PM	SO2	Fluoride
1.	Paradeep Phosphates Ltd.	PAP	360	-	90
		SAP	-	5600	-
		DAP	3592		896
		Boiler	233		
		Total PPL	4185	5600	986

Sl	Name of Industry	Source	Pollution load (kg/d)		
			PM	SO ₂	Fluoride
2.	IFFCO Ltd.	PAP	389	-	98
		SAP	-	14000	-
		DAP	4191	-	1397
		Boiler	665	-	-
		Total IFFCO	5245	14000	1495
3.	IOCL Refinery			24000	
4.	ESSAR Steel Ltd.		3270	-	
		Grand Total	12700	43600	2481

Emission of SO₂ and fluoride are the major environmental concern in this area. The Sulphuric acid plants and other units of the phosphatic fertilizer plants are the major sources of SO₂ and fluoride. The particulate matters mostly comes out of the DAP and power plants.

3.3 Pollution control measures adopted by major industries

The major air polluting industries in the area and devices installed for control of air pollution is enumerated at **Table-3.9**.

Table-3.9: Air pollution control measures in major air polluting industries

Sl. No.	Name & address of the industry	Product	Capacity	APC measures
1	Indian oil Corporation Ltd, (Refinery division), Paradeep	Petro Product	15 MTPA	ESP, FGD, Bag Filters, Scrubbers and Flare Stack
2	Paradeep Port Trust, Paradeep	Export, Import Shipping Movement(To & From)	93.6 MTPA	Dry fog & water sprinkling system
3	Indian Farmers Fertilisers Cooperative Ltd, Musadia, Paradeep	Phosphatic Fertilizer	1.92 MTPA	Alkali Scrubber, Ventury Scrubber, ESP
		Electric Energy	64 MW	
4	Paradeep Phosphate Limited, Paradeep	Phosphatic Fertilizer	1.5 MTPA	Alkali Scrubber, Three Stage Fume Scrubber, Ventury Scrubber, Cyclone
		Electric Energy	55 MW	
		Zypmite	240 TPD	
5	Essar Steel Orissa Ltd, Paradeep, Jagatsinghpur	Iron ore pellet	6 MTPA	ESP, Bag filter
6	Essar Power Orissa Ltd, Bijayachandrapur, Paradeep	Coal Based CPP	2 X 30 MW	ESP, Bag filter
7	Goa Carbon Limited, Udayabata, Paradeep, Jagatsinghpur	CPC	14000 MTPA	FD cooler, Bag Filter
8	Kalinga Calciner Ltd, Udayabat, Paradeep	CPC	5000 TPM	Venturi Scrubber
9	Skol Brewery Pvt. Ltd Paradeep	Beer	2 Lakhs HLPa	Cyclone Separator

3.4 Action Plan for compliance and control of air pollution

Based on the background information, monitoring reports, an action plan for control of air pollution for Paradeep area is prepared. In this action plan, sector specific abatement strategies were drawn up. Improvement in environmental management practice, technological up-gradation in process and pollution control, development of

adequate infrastructure remained the thematic area. All the action plans were aligned to the environmental issues of the area and aims at addressing them Sector-wise. The plan and possible target period to achieve it, is presented in the **Tables 3.5 to 3.8**.

Table-3.5: Action plan for control of air pollution for Fertilizer Plants

Sl. No	Action Plan	Target Period	Issues being addressed
1	All the conveyor belts within and connecting to the Port to be provided with sensor supported dust suppression arrangement	Short	SPM in ambient air
2.	Deployment of vacuum type dust cleaning machine for internal and approach connecting roads	Short	SPM in ambient air
3	Raw Material handling area needs to be fully mechanized	Medium	SPM in ambient air
4.	Development of railway siding at IFFCO for improved railway logistics to minimize road transportation	Long	SPM Ambient air, Solid waste utilization

Table-3.6: Action plan for control of air pollution for Oil Refinery

Sl. No	Action Plan	Target Period	Issues being addressed
1.	Provision of wind barrier wall around pet-coke and provision dust suppression system in pet-coke storage area	Short	Air Pollution
2.	Development of parking plaza	Medium	Air Pollution and Traffic congestion
3.	Study on impact on Ecology & Bio-diversity due to continuous stack flaring	Long	Air Pollution / Public Complaint

Table-3.7: Action plan for control of air pollution for Port

Sl. No	Action Plan	Target Period	Issues being addressed
1	All stack yard shall equipped with automatic water sprinkling system	Short	Air pollution
2	Speed of vehicle engaged for intra transportation of PPT should be mechanically restricted through speed control	Short	Air pollution
3.	Provision of sensor based dry fog/ dust suppression system at all transfer towers to minimize fugitive dust.	Short	Air pollution
4	Regular upkeep of net barrier provided along the boundary wall.	Short	Air pollution
5	Parking cum service station Facility for Trucks	Medium	Air pollution
6	Provision of Concrete/ Bituminous road with drainage facility for all transportation road, internal road connecting mineral stack yards, with mechanized sweeping facility	Medium	Air pollution
7	Maintaining minimum stock of minerals like coal, iron ore, coke, etc. (optimize detention time) to reduce fugitive emission from these minerals	Medium	Air Pollution
8	Mechanized Cargo Handling in Paradeep Port	Long	Air pollution
9	Mechanized Rake Loading Facility at Paradeep Port	Long	Air Pollution

Table-3.8: Action plan for control of air pollution through Common infrastructure and services

Sl. No.	Action plan	Target Date	Issues being addressed
1	Deployment of mechanized road sweepers in Paradeep area for cleaning of road.	Short	Resuspension of road dust
2	Computer based traffic control (for trucks) to minimize traffic congestion.	Short	Air Quality
3.	Establishment of an extensive air quality monitoring network (CAAQMS) for Paradeep Area	Medium	Air quality monitoring and assessment
4	Construction of a bypass / flyover for avoiding traffic congestion on road from gate no.-3 to zero point	Long	SPM, Traffic Congestion
5.	Development of common parking plaza for IFFCO, PPL, IOCL and Port activities.	Long	SPM in locality

Chapter 4

Land Environment (Soil and Ground water)

4.1 Land Environment

Paradeep industrial area covers an area of 121 km². Major part of this are water bodies, port, industries, urban area and other infrastructures. This is a coastal area and receives a good annual rainfall and most part of the land is not contaminated. However, the water disposal and storage facilities of the major industries in this area are potential source of groundwater and soil pollution.

4.2 Present status / quality of ground water

The ground water quality was monitored in two villages within the study area. These villages are close to the fertilizer plants and thus the water quality is expected to capture the impact of waste disposal facilities. The ground water quality data for the year 2018 is presented at **Table- 4**.

Table 4.5 - Ground water quality near Paradeep during 2018

Station Name	Month of Monitoring	pH	BOD, mg/l	TDS, mg/l	Total Alkalinity, mg/l	Total Hardness CaCO ₃ , mg/l	Calcium as Ca, mg/l	Magnesium as Mg, mg/l	Chloride, mg/l
1. Musadiha	May	7.9	1.4	5280	286	56	0	0.0	2998.5
	Oct	7.7	1.7	846	248	140	33.6	13.6	388.7
2. Badapadia	May	7.8	1.6	1880	276	184	56	10.7	929.5
	Oct	7.8	1.3	1190	260	54	16.8	2.9	629.7

Stn Name	Month of Monitoring	Fluoride, mg/l	Sodium, mg/l	Potassium, mg/l	Chromium Total, mg/l	Mercury, mg/l	Iron Total, mg/l	FC, MPN/ 100 ml
1. Musadiha	May	1.3	2010	56.5	0.008	<0.00006	0.500	<1.8
	Oct	0.504	280	16.8	--	--	--	<1.8
2. Badapadia	May	0.69	625	43.2	0.008	<0.00006	0.400	<1.8
	Oct	1.250	474.3	19.2	--	--	--	<1.8

4.3 Solid waste Generation and Management

The solid waste and hazardous waste generated from prominent industries and their disposal status is given at **Table- 4.7** and **Table- 4.8**.

Table-4.7: Status of Solid waste generated from industries in Paradeep PIA

Sl No	Name & address of the industry	Product	Capacity	Quantity of solid waste (TPD)	Disposal practice
1.	Indian Farmers Fertilisers Cooperative Ltd, Musadia, Paradeep	Phosphatic Fertilizer	1.92 MTPA	14,000	Gypsum Pond of an area about 200 Ac (Existing) New Gypsum pond of an area about 269 Acre (under construction)
		Electric Energy	64 MW		

Sl No	Name & address of the industry	Product	Capacity	Quantity of solid waste (TPD)	Disposal practice
2.	Paradeep Phosphate Limited, Paradeep	Phosphatic Fertilizer	1.5 MTPA	8,000	Gypsum Pond of an area about 199 Ac(Existing) New Gypsum pond of an area about 52.4 Ha (under construction)
		Electric Energy	55 MW,		
		Zypmite	240 TPD		
3.	Essar Power Odidsha Ltd, Bijayachandrapur, Paradeep	Coal Based CPP	2 X 30 MW	60	Ash Pond & Low lying area filing

Table-4.8 : Generation and disposal of Hazardous Waste from Industries

Sl No	Name & address of the industry	Hazardous Waste	Quantity/ Annum	Disposal Practice
1	Indian oil Corporation Ltd, (Refinery division), Paradeep	Spent Catalyst	2500 T	Containers under covered shed followed by disposal in Secured Land Fill of land fill volume 78000 m ³
		Spent Clay Containing Oil	720 T	Incinerator of capacity 100 Kg/Hr
		Oily sludge/ Emulsion/ Slop Oil	2748 T	Authorised Recyclers
		Organic Residue	180 T	Authorised Recyclers
2	Indian Farmers Fertilisers Cooperative Ltd, Musadia, Paradeep	Ash From Incinerator	-	Containers under covered shed followed by disposal in Secured Land Fill volume 78000 m ³
		Sulphur Mock	-	Used as Filler in DAP Plant
		Spent Catalyst	63 T	Authorized Recycler
		Acid Residue during Cleaning of Acid Storage tanks	2500 T	Used as Filler in DAP Plant
		Used Oil	30 KL	Authorized Recycler
3	Paradeep Phosphate Limited, Paradeep	Spent Resin from DM Plant	30 KL	Secured Engineering Landfill
		Sulphur Mock	4200 T	Used as Filler in DAP Plant
		Spent Catalyst	100 T	Authorized Recycler
		Acid Residue during Cleaning of Acid Storage tanks	-	Used as Filler in DAP Plant
		Used Oil	16 KL	Authorized Recycle
4.	Paradeep Port Trust Paradeep	Spent Resin from DM Plant	12 KL	Secured Engineering Landfill
		Used Oil	20 KL	Authorised Party
5	Essar Steel Orissa Ltd, (Pellet Plant) Paradeep,	Waste oil	5000 KL	Authorised Party
		Used Oil	35 KL	Authorised Recycler
6	Essar Power Orissa Ltd, Bijayachandrapur,	Waste oil and waste containing oil	15 KL	Authorised Recycler
		Used Oil	10 KL	Authorised Recycler
7	Goa Carbon Limited,	Waste oil and waste containing oil	1 KL	Authorised Recycler
8	SAB Miller India (P) Ltd./ Skol Brewery Pvt. Ltd Paradeep	Used Oil	1 KL	Authorised Recycler
		Used Oil	2 KL	Authorised Recycler

4.4 Action plan for abatement, treatment and restoration of normal soil quality

Based on the background information and monitoring reports, an action plan for Paradeep area is prepared. In this action plan, sector specific abatement strategies were drawn up and presented in **Table- 4.1 to 4.5**.

Table-4.1 : Action plan for control of land and ground water pollution in Phosphatic Fertilizer Plants

Sl. No.	Action Plan	Target Period	Issues being addressed
1	Provision of mechanized wheel washing facility having effluent treatment and recycling facility at exit point of all gypsum ponds	Short	Land contamination
2	Collection and recycling of seepage water from gypsum pond	Short	Land/ surface water contamination around gypsum ponds
3	Development of strategic plan for controlling and minimizing fluoride emission during adverse weather conditions which includes options of reducing operational load and stoppage of production	Medium	Crop damage
4	Explore the bulk utilization of gypsum in cement, soil amendment and other activities including road making.	Medium	Industrial waste utilisation
5	Neutralization and treatment of contaminated surrounding sites of surge ponds of PPL and IFFCO	Long	Surface runoff and ground water contamination
6	Development of railway siding at IFFCO for improved railway logistics to minimize road transport	Long	Ambient air, Solid waste utilization

Table-4.2 : Action plan for control of land and ground water pollution in Petroleum oil Refineries

Sl. No.	Action plan	Target Period	Issues being addressed
1.	Explore the utilization of Petroleum Coke in Co-processing in Cement industries	Short	Industrial Solid waste disposal
2.	Storage of treated water of ETP for captive consumption in the process and gardening in the IOCL township	Medium	Water scarcity
3.	Provide mechanically operated waste converters for colony, canteen, office complex, and recovery of useful products.	Medium	Municipal Solid waste disposal

Table-4.3 : Action plan for control of land and ground water pollution in Port

Sl. No.	Action plan	Target Period	Issues being addressed
1.	Provision of composting plant for the port township	Short	Municipal Solid Waste Management
2.	Provision of briquetting mineral units within the port premises for utilization of mineral fines	Medium	Solid waste utilization

Table-4.4: Action plan for control of land and ground water pollution in Common infrastructure and services

Sl. No	Action Plan	Target Period	Issues being addressed
1.	Selenium, Lead, Cadmium and Fluoride concentrations in Ground water is to be monitored.	Short	Data availability
2.	Establishment of Municipal Solid Waste Management Door to door collection- segregation, composting and land fill) facility for Paradeep or decentralize mechanized solid waste converter using thermal decomposition	Medium	Municipal Solid Waste Utilization
3.	Promotion of industries within SPA, which uses waste products like fly ash, phosphor-gypsum, waste oil, and waste heat.	Medium	Industrial Waste utilization

Chapter 5

Summary of Action Points

5.1 Summary of Proposed Action Plans for Abatement of Pollution

In this action plan, sector specific abatement strategies were drawn up for improvement in environmental management practice, technological up-gradation in process and pollution control, development of adequate infrastructure remained the thematic area. All the action plans were aligned to the environmental issues of the area and aims at addressing them Sector-wise.

Table - 5.1: Action Plan for abatement of pollution in Phosphatic Fertiliser Plants

Sl. No.	Action Plan	Target (Short/Medium/Long)	Issues being addressed
Abatement of Water Pollution			
1.	Conducting comprehensive wastewater audit for phosphatic fertilizer industries including run-off management	Short	Water Conservation
2.	Establishment of New Gypsum pond of IFFCO with HDPE lining with a life of 15 Yrs	Short	Water contamination of nearby areas
3.	Establishment of New Gypsum pond of PPL with HDPE lining with a life of 15 Yrs	Short	Water contamination of nearby areas
4.	Provision of Surge Pond with impervious lining all along the gypsum pond with provision of Garland Dyke for PPL and IFFCO	Medium	Water contamination of nearby areas
Abatement of Air Pollution			
1	All the conveyor belts within and connecting to the Port to be provided with sensor supported dust suppression arrangement	Short	SPM in ambient air.
2.	Deployment of vacuum type dust cleaning machine for internal and approach connecting roads	Short	SPM in ambient air
3	Development of railway siding at IFFCO for improved railway logistics to minimize road transport	Long	SPM Ambient air, Solid waste utilization
Abatement of Soil/Ground water pollution			
1	Provision of mechanized wheel washing facility having effluent treatment and recycling facility at exit point of all gypsum ponds	Short	Land contamination
2	Collection and recycling of seepage water from gypsum pond.	Short	Land/ surface water contamination around gypsum ponds
3	Development of strategic plan for controlling and minimizing fluoride emission during adverse weather conditions which includes options of reducing operational load and stoppage of production	Medium	Crop damage
4	Explore the bulk utilization of gypsum in cement, soil amendment and other activities including road making.	Medium	Industrial waste utilisation
5	Neutralization and treatment of contaminated surrounding sites of surge ponds of PPL and IFFCO	Long	Surface runoff and ground water contamination

Table - 5.2: Action Plan for Abatement of Pollution in Oil Refinery

Sl. No.	Action plan	Target (Short/Medium/Long)	Issues being addressed
Abatement of Water Pollution			
1.	Conducting comprehensive wastewater audit including run-off management	Short	Water Conservation
2.	Utilization of treated water from ETP for different heads so as to minimize fresh intake water.	Medium	Water Conservation
3.	Installation of desalination plant to reduce fresh water consumption	Long	Water scarcity
Abatement of Air Pollution			
1.	Provision of wind barrier wall around pet-coke and provision dust suppression system in pet-coke storage area.	Short	Air Pollution
2.	Development of parking plaza	Medium	Air Pollution and Traffic congestion
3.	Study on impact on Ecology & Bio-diversity due to continuous stack flaring	Long	Air Pollution / Public Complaint
Abatement of Soil/Ground water pollution			
1.	Explore the utilization of Petroleum Coke in Co-processing in Cement industries	Short	Industrial Solid waste disposal
2.	Storage of treated water of ETP for captive consumption in the process and gardening in the IOCL township	Medium	Water scarcity
3.	Provide mechanically operated waste converters for colony, canteen, office complex, and recovery of useful products.	Medium	Municipal Solid waste disposal

Table - 5.3: Action Plan for abatement of Pollution in Port

Sl. No.	Action Plan	Target (Short/Medium/Long)	Issues being addressed
Abatement of Water Pollution			
1	Provision of adequate number of Settling Pits for all drainage networks and utilization of settled water for dust suppression and plantation.	Short	Water Pollution
2	Provision of a Sewage Treatment Plant for the port township	Short	Water Pollution
3	Provision of Centralized Automobile Servicing Center with an ETP facility. The treated effluent shall be reused in vehicle washing.	Medium	Water Pollution
Abatement of Air Pollution			
1	All stack yard shall equipped with automatic water sprinkling system	Short	Air Pollution
2	Speed of vehicle engaged for intra transportation of PPT should be mechanically restricted through speed control	Short	SPM in ambient air
3.	Parking cum service station Facility for Trucks	Medium	Air Pollution
4	Provision of Concrete/ Bituminous road with drainage facility for all transportation road, internal road connecting mineral stack yards, with mechanized sweeping facility	Medium	Air pollution (SPM)
5	Mechanized Cargo Handling in Paradeep Port	Long	Air pollution
6	Mechanized Rake Loading Facility at Paradeep Port	Long	Air Pollution
Abatement of Soil/Ground water pollution			
1.	Provision of composting plant for the port township	Short	Municipal Solid Waste Management
2.	Provision of briquetting mineral units within the port premises for utilization of mineral fines	Medium	Solid waste utilization

Table: 5.4: Action Plan for abatement of pollution in Fishing Processing Units in Paradeep

Sl. No.	Action Plan	Target Date	Issues being addressed
1.	Provision of ETP for treatment of washings from fish landing centers	Short	Water Pollution
2.	Utilization of solid waste generated at fish landing center	Medium	Solid waste utilization

Table: 5.5 Action Plan for abatement of pollution through Common infrastructure and services including fishing activity

Sl. No.	Action plan	Target Date	Issues being addressed
Abatement of Water Pollution			
1	Construction of a sewage treatment plant for Paradeep Municipality	Short	Organic pollution of river
2	Selenium, Pb, Cd and Fluoride concentrations in Ground water is to be monitored	Short	Data availability
3	The establishment of on-line monitoring station for water quality monitoring of River Mahanadi and online data transmission facility with SPCB and CPCB	Medium	Real time Data estimation and transmission.
4	Construction of water impoundment and rain water harvesting structures	Long	Water conservation
5	Preparation of prefeasibility report and development of facility for central pooling of surplus treated effluent of PPL, IFFCO, ESSAR, IOCL and using the same for common cause i.e road dust suppression, firefighting, industrial use etc.	Long	Water conservation
Abatement of Air Pollution			
1	Deployment of mechanized road sweepers in Paradeep area for cleaning of road	Short	Resuspension of road dust.
2	Computer based traffic control (for trucks) to minimize traffic congestion	Short	Air Quality
	Establishment of an extensive air quality monitoring network (CAAQMS) for Paradeep Area	Medium	Air quality monitoring and assessment
3	Construction of a bypass / flyover for avoiding traffic congestion on road from gate no.-3 to zero point	Long	SPM, Traffic Congestion
4.	Development of common parking plaza for IFFCO, PPL, IOCL and Port activities	Long	SPM in locality
Abatement of Soil/Ground water pollution			
1.	Selenium, Pb, Cd and Fluoride concentrations in Ground water is to be monitored	Short	Data availability
2.	Establishment of Municipal Solid Waste Management Door to door collection- segregation, composting and land fill) facility for Paradeep or decentralize mechanized solid waste converter using thermal decomposition	Medium	Municipal Solid Waste Utilisation
3.	Promotion of industries within SPA, which uses waste products like fly ash, phosphor-gypsum, waste oil, and waste heat	Medium	Industrial Waste utilization

Chapter 6

Monitoring Protocol for Paradeep Area

6.1 Monitoring Agency, Industrial Cluster/ Area and Frequency of Sampling

The Monitoring of Ambient Air/ Surface Water (SW)/ Ground Water (GW) within industrial area shall be undertaken for the parameters prescribed by CPCB through an outside third party agency (laboratory) recognized under Environmental Protection Act 1986 and accredited under NABL having such facility.

6.2 Sampling Locations

Sampling locations shall be decided so as to cover the entire area of impact zone and the nearby area. The locations, as described below, have been fixed by Monitoring team of CPCB during 2013 and the locations so monitored during 2013 shall be continued in future. The CEPI score is to be determined based on the outcome of results of the critical parameters monitored at the following locations.

6.2.1 Ambient Air Quality Monitoring Locations

Sample Code	Monitoring Location	Latitude	Longitude
PRA/ AAQ - 1	Roof of PPL Guest House (PPL Township)	20° 16' 27.13"N	086° 38' 24.95"E
PRA /AAQ - 2	Roof of PPT Staff Quarter (PPT Colony)	20° 16' 04.73"N	086° 38' 47.44"E
PRA /AAQ - 3	Roof of STP of IFFCO (IFFCO Colony)	20° 19' 21.39"N	086° 39' 18.01"E
PRA / AAQ - 4	Online AAQ Monitoring station operating inside the RO, SPC Board, Paradeep	20° 15' 33.0"N	086° 39' 56.0"E
PRA / AAQ - 5	Inside the campus of IOCL Pipeline Division	20° 14' 34.75"N	086° 36' 48.67"E
PRA / AAQ - 6	Village Ramnagar	20° 22' 34.09"N	086° 40' 53.31"E
PRA / AAQ - 7	Village Kujanga	20° 19' 12.30"N	086° 31' 14.58"E
PRA / AAQ - 8	Village Mahakalpada	20° 24' 59.09"N	086° 35' 54.83"E

6.2.2 Surface Water Sampling Locations

Sample Code	Monitoring Location	Latitude	Longitude
PRA / SW - 1	Paradeep u/s (Chaumuhani)/ Mahanadi	20° 19' 57.02"N	86° 34' 25.61"E
PRA / SW - 2	Paradeep d/s (Jawahar Guest House)/ Mahanadi	20° 17' 31.37"N	86° 42' 55.36"E
PRA / SW - 3	Athrabanki/ Taladanda Canal	20° 18' 36.25"N	86° 37' 47.12"E
PRA / SW - 4	Paradeep/ Sea	20° 17' 49.78"N	86° 42' 41.79"E
PRA / SW - 5	Athrabanki Creek	20° 17' 22.47"N	86° 39' 12.77"E
PRA / SW - 6	Kaudia	20° 17' 53.88"N	86° 41' 22.20"E
PRA /SW - 7	Taladanda u/s (Kujang)	20° 17' 55.30"N	86° 39' 01.12"E
PRA / SW - 8	Santhra Creek	20° 16' 08.05"N	86° 35' 05.00"E

6.2.3 Ground Water Sampling Locations

Sample Code	Monitoring Location	Latitude	Longitude
PRA / GW – 1	Bada Padia Market Complex(Paradeep Municipality)	20 15'59" N	86 39'32" E
PRA / GW – 2	Musadiha (Near ESSAR & IFFCO)	20 19'14" N	86 39'48" E
PRA / GW – 3	Hanuman Temple (Near RO Office)	20 15'53" N	86 40'04" E
PRA /GW – 4	Trilachanpur back side of Paradeep Refinery	20 14'48" N	86 34'59" E
PRA /GW – 5	PPL Campus	20 15'37" N	86 37'37" E
PRA /GW – 6	Oil storage area of HPCL,BPCL & IOCL	20 17'12" N	86 37'32" E
PRA /GW – 7	Kujanag	20 19'12" N	86 31'20" E
PRA /GW – 8	CHC Atharabanki	20 17'27" N	86 38'50" E

6.3 Monitoring Parameters

Indicator parameters have been set for monitoring of recipient Ambient air quality, Surface water, and Ground Water quality by CPCB. These parameters have been considered for monitoring by third party.

6.3.1 Ambient air quality monitoring

- i. SO₂, NO₂, PM₁₀, PM_{2.5}, Lead and Ammonia (for 24 hourly average monitoring values)
- ii. O₃, CO(for 1 hrly average and 8 hrly average)
- iii. Benzene, Benzo (a) Pyrene, Arsenic & Nickel (for 24 hrly average value).

6.3.2 Water quality monitoring.

Basic water quality requirements (for surface water and ground water both) are as follows:

i) Simple parameters-

Sanitary survey, general appearance, color, smell, transparency and ecological* (presence of animals like fish, insects etc. only in case of surface water bodies.

ii) Regular monitoring parameters

pH, O&G, suspended solids in mg/l(SS limits is applicable only during non-monsoon period) , DO(%saturation)for surface water only, DO in eutrophicated waters should include measurements for diurnal variations, COD in mg/l, BOD in mg/l, electrical conductivity in μ mhos/cm, total dissolved solids, nitrite-nitrogen, nitrate-nitrogen,(NO₂+NO₃)Total nitrogen in mg/l, free ammonia, total residual chlorine , cyanide, fluoride, chloride, sulphate, sulphides, total hardness, dissolved phosphates, SAR, Total coliforms, fecal coliform(MPN/100ml).

iii) Special parameters-

Total phosphorous, TKN, Total ammonia (NH₄+NH₃)- nitrogen, phenols, surface active agents, anionic detergents, organo- chlorine pesticides, pah, pcb, AND PCT, Zinc, Nickel, Copper, Hexavalent chromium, chromium total, arsenic(total, lead, cadmium, mercury, manganese, iron, vanadium, selenium, boron.

iv) Bio-assay (zebra fish) test-for specified samples only.

6.4 Frequency of Monitoring:

The frequency of monitoring shall be twice in a year i.e. post monsoon season and pre monsoon season. Three samples shall be collected with a gap of one or two days at each location during each round of monitoring in all the CPAs. At each of the CPA, 24 hourly Ambient Air Quality monitoring shall be carried out for the parameters as specified in protocol. Also representative sample for the surface water quality and ground water quality shall be collected from prominent surface and ground water bodies located in and around CPAs. However if at any location the parameter value comes out to be critical a more frequent sampling can be done.

Appendix - A

List of Red Category of industries in Paradeep PIA

Sl No	Name & address of the industry	Capital cost in crore	Product and Capacity		Area in Ha
1	Indian oil Corporation Ltd, (Refinery division), Paradeep	33,698	Petro Product	15 MTPA	1353.269
2	Paradeep Port Trust, Paradeep	1,989.69	Export Import Shipping Movement (To & From)	93.6 MTPA	2543.667
3	Indian Farmers Fertilisers Cooperative Ltd, Musadia, Paradeep	3,630	Phosphatic Fertilizer Sulphuric Acid Phosphoric Acid Electric Energy	1.92 MTPA 7000 TPD 2650 TPD 64 MW	839.72
4	Paradeep Phosphate Limited, Paradeep	1,040	Phosphatic Fertilizer DAP SAP PAP Electric Energy Zypmite	1.5 MTPA 5000 TPD 4400 TPD 1400 TPD 55 MW 240 TPD	923.50
5	Essar Steel Orissa Ltd, Paradeep, Jagatsinghpur	1,315.08	Iron ore pellet Wet Iron Ore Grinding	6 MTPA 4.75 MTPA	40.0
6	Essar Power Orissa Ltd, Bijayachandrapur, Paradeep	360.35	Coal Based CPP	2 X 30 MW	40.468
7	Indian Oil Corporation Ltd (PHBPL), Paradeep	2,993	Transportation Of Crude Oil through Pipeline Crude Oil Storage	11 MTPA 90,00,000 TPM	128.37
8	Indian Oil Corporation Ltd, Paradeep Lighterage Terminal, Paradeep	285	SKO HSD MS	48270 KL 48465 KL 27990 KL	30.42

Sl No	Name & address of the industry	Capital cost in crore	Product and Capacity		Area in Ha
9	IOCL (LPG Terminal), Rangiarah, Paradeep	158.9	LPG Storage		21.34
10	Bharat Petroleum Corporation Ltd.(Coastal oil Installation), Paradeep	63	Kerosine,	13165 KL	10.11
			HSD	30180 KL	
			Petrol	10300 KL	
			Ethanol	45 KL	
11	H.P.C.L, Paradeep Terminal, Paradeep	90	Storage of HSD	300 TPD	20.25
			SKO	30 TPD	
			MS	100 TPD	
12	Goa Carbon Limited, Udayabata, Paradeep, Jagatsinghpur	32.72	CPC	14000 MTPA	4.86
13	KalingaCalciner Ltd, Udayabat, Paradeep	36.39	CPC	5000 TPM	10.94
14	Skol Brewery Pvt. Ltd Paradeep	22.72	Beer	2 Lakhs HLP A	10.94
15	Adani Wilmar Ltd. (Cargil India Pvt Ltd.)	109.72	Refined Soyabean Oil	9100 MTM	9.19
			Refined Palm Oil	5100 MTM	
			Refined Palmolein Oil	7400 MTM	
			Vanaspati	5300 MTM	



STATE POLLUTION CONTROL BOARD, ODISHA
BHUBANESWAR
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