Final Report

ACTION PLAN FOR ABATEMENT OF POLLUTION IN CRITICALLY POLLUTED INDUSTRIAL CLUSTERS (ANGUL- TALCHER AREA)

STEEL BEING POURED IN AN ELECTRIC FURNACE

ORISSA

STATE POLLUTION CONTROL BOARD, ORISSA
BHUBANESWAR
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PREFACE

Industries tend to grow in cluster due to certain favourable conditions, which provides them competitive advantage over the others infractures. Coal, water and iron ore are one of those favourable factors for Orissa, which has been attracting industries leading to clusterisation. Clusters of industries, no doubt provide competitive advantage to the industries and opportunities for waste utilisation, at the hind side, the cumulative impact on environment tends to cross the threshold of environmental carrying capacity. Assessment of environmental impacts 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) has developed a Comprehensive Environmental Pollution Index (CEPI).

This is a rational number to characterize the environmental quality of an industrial cluster following an algorithm of source-receptor-pathway framework. Industrial clusters having aggregated CEPI score of 70 and above is considered a critically polluted cluster. In Orissa there are three industrial clusters; Angul-Talcher, Ib-valley and Jharsuguda with CEPI score of more than 70, thus considered as critically polluted.

This Action Plan for abatement of pollution in Critically Polluted Industrial Cluster (CPIC) aims at identifying the boundary, critical environmental attributes and formulates action plans to abate pollution with an ultimate objective of bringing down the CEPI score. The draft action plans were presented before the Steering Committee of Central Pollution Control Board (CPCB) and also uploaded on the web site of SPCB, Orissa (*www.ospcboard.org*) for stakeholder's opinion. The final report is prepared after incorporating the views of all concerned and revised committee of CPCB. While going to the press certain omissions and commissions were observed, which were corrected and also incorporated in this printed version.

This report is being published for the sensitising all the stakeholders who can use it for implementing, monitoring and regulating the action plans. Hope, this meets the expectation of all concerned. I thankfully acknowledge the efforts of Shri Nihar Ranjan Sahoo, SEE, Shri Simanchal Dash, EE and Ms. Subhadarsini Das, AEE for preparation of this action plan.

BHUBANESWAR
December, 2010

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CONTENTS

Chapter	Titles	Page No
1	**Introduction**	01
1.1	Introduction and objectives of the study	01
1.2	Area details and location	02
1.3	Demarcation of geographical boundaries	04
1.4	CEPI Score (Air, Water, Land and Total)	07
1.5	Population details of the area	07
1.6	Industry classification and distribution	08
1.7	Grossly polluting industries (GPIs)	09
1.8	Environmental Issues in the cluster	09
1.9	Salient features : Angul – Talcher CPIC	11
2	**Water Environment**	12
2.1	Present Status	12
2.2	Sources of Water Pollution	14
2.3	Action plan for Compliance and Control of Water Pollution	16
2.4	Existing Infrastructure Facilities	18
2.5	Technological Intervention	18
2.6	Installation of (Common Effluent Treatment Plants) (ETPs)	18
2.7	Government budgetary Support Requirement	19
2.8	Data Linkages to SPCB / CPCB (of Monitoring Devices)	19
3	**Air Environment**	20
3.1	Present Status	20
3.2	Sources of Air Pollution	23
3.3	Impact of activities of nearby area on the CPIC area	24
3.4	Quantification of the Air Pollution Load and Relative Contribution by different Sources	24
3.5	Action Plan for compliance and control of air pollution	24
4	**Land Environment (Soil and Ground Water)**	29
4.1	Land Environment	29
4.2	Soil Contamination	29
4.3	Action plan for abatement, treatment and restoration of soil quality	29
4.4	Ground Water Contamination	31

	4.5	Solid waste Generation and Management	32
5	**Summary of Action Points**		34
	5.1	Summary of Proposed Action Points (Action Plan for Abatement of Pollution)	34
6	**Calculation of CEPI & Conclusion**		38
	6.1	Air Environment	38
	6.2	Water Environment	41
	6.3	Soil / Ground Water Environment	43
	6.4	Conclusion	46

i	Compliance Status to the comments received from CPCB on action plan for Angul – Talcher Area	
ii	Summary of Action Plan, industries to whom it is applicable, target date short term and long term goals, the current status with implementation scheduled	Annexure - I

List of Abbreviations

1. AAQ – Ambient Air Quality
2. AFBC – Atmospheric Fluidized Bed Combustion
3. BF – Bag Filter
4. BOD – Biochemical Oxygen Demand
5. CBM – Coal Bed Methane
6. CEPI – Comprehensive Environmental Pollution Index
7. CETP – Common Effluent Treatment Plant
8. CMH – Cubic Meter per Hour
9. CPCB – Central Pollution Control Board
10. CPP – Captive Power Plant
11. CPIC – Critically Polluted Industrial Cluster
12. CTL – Coal to Liquid
13. DO – Dissolved Oxygen
14. DRI – Direct Reduced Iron
15. D/s – Down Stream
16. EC – Environmental Clearance
17. EF – Exceedence Factor
18. EMA – Environment Management Area
19. EMP – Environmental Management Plan
20. ESP – Electrostatic Precipitator
21. GOI – Govt. of India
22. GPIs – Grossly Polluting Industries
23. HCSD – High Concentration Slurry Disposal
24. IPP – Independent Power Plant
25. ISMU – Indian School of Mining University
26. KL – Kilo Liter
27. KLD – Kilo Liter per Day
28. MCL – Mahandi Coal-field Limited
29. MLD – Million Liter per Day
30. MPN – Most Probable Number
31. MSL – Mean Sea Level
32. MTPA – Million Ton per Annum
33. MW – Mega Watt
34. NALCO – National Aluminium Company

35. NAMP – National Ambient Air Monitoring Programme
36. NOx – Oxides of Nitrogen
37. NRCD – National River Conservation Directorate
38. NTPC – National Thermal Power Corporation
39. OCP – Open Cast Project
40. OWSSB – Orissa Water Supply and Sewerage Board
41. PM – Particulate Matter
42. PPM – Parts Per Million
43. PPP – Public Private Partnership
44. REMP – Regional Environmental Management Plan
45. RSPM – Respirable suspended Particulate Matter
46. SLF – Secured Land Fill
47. SMS – Steel Melting Shop
48. SO_2 – Sulphur Dioxide
49. SPCB – State Pollution Control Board
50. SPM – Suspended Particulate Matter
51. Sq Km – Square Kilometer
52. TC – Total Colliform
53. TOC – Total Organic Carbon
54. TPP – Thermal Power Plant
55. TPA – Ton per Annum
56. TOR – Term of Reference
57. TSDF – Treatment Storage Disposal Facility
58. U/s – Up Stream

Chapter 1

Introduction

1.1 Introduction and objectives of the study

Environmental pollution in industrial clusters has been a national issue particularly in a period which is witnessing a 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 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 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 cluster. In Orissa three industrial clusters; Angul-Talcher, Ib-valley and Jharsuguda are identified with CEPI score of more than 70, thus considered as critically polluted area. However, Ib-valley and Jharsuguda industrial areas are adjacent and have overlapping geographical area, thus for clarity and comprehensiveness these two areas are considered to be one. The model action plan for abatement of pollution in the critically polluted clusters was prepared on the basis of previous studies conducted by the State Pollution Control Board (SPCB), Orissa and data collected during various monitoring programme.

Central Pollution Control Board (CPCB) has calculated the CEPI Score of **Angul-Talcher area as 82.09** and suggested Terms of Reference (TOR) to formulate an action plan for prevention, control and remediation of various environmental components of the area. The present report is outcome of the recommendation of Steering Committee of CPCB. The objectives of this model action plan is to

1. Collect background details of the area with present industrial status and determine the boundary limits of the industrial cluster
2. Determine the status of present water and air environment and critical environmental pollution issues within the cluster and draw up model action plan for abatement of pollution with infrastructural renewal, managerial and financial aspects and self monitoring system within the industrial cluster
3. Determine the status of present land and ground water environment and critical environmental land and ground water pollution issues within the cluster and draw up model action plan for abatement of land and ground water pollution within the industrial cluster
4. Determine the status of present generation of industrial and municipal solid waste and hazardous waste. For proper management draw up a model action plan for management of solid waste within the industrial cluster
5. Determine the Public Private Partnership (PPP) model for both the options of technological intervention and infrastructural renewal for effective implementation of model action plan.
6. Draw up any other specific scheme or plan for abatement of environmental pollution in the cluster
7. Incorporate the views of various stakeholders for refinement of the action plan and effective implementation.

1.2 Area details and location

Angul- Talcher area in the state of Orissa is one of the oldest industrial cluster of the country. This area is located in the central part of Orissa about 120km from the state capital Bhubaneswar and 160km from the Bay of Bengal. It is 139m above the Mean Sea Level (MSL) and is bounded between 20°37´N to 21°10´N and 84º28´E to 85º28´E **(Figure -1.1)**. The outline of coal block in Angul - Talcher area is presented at **Figure-1.2**. Industrialization started in this area quiet early with operation of coal mines

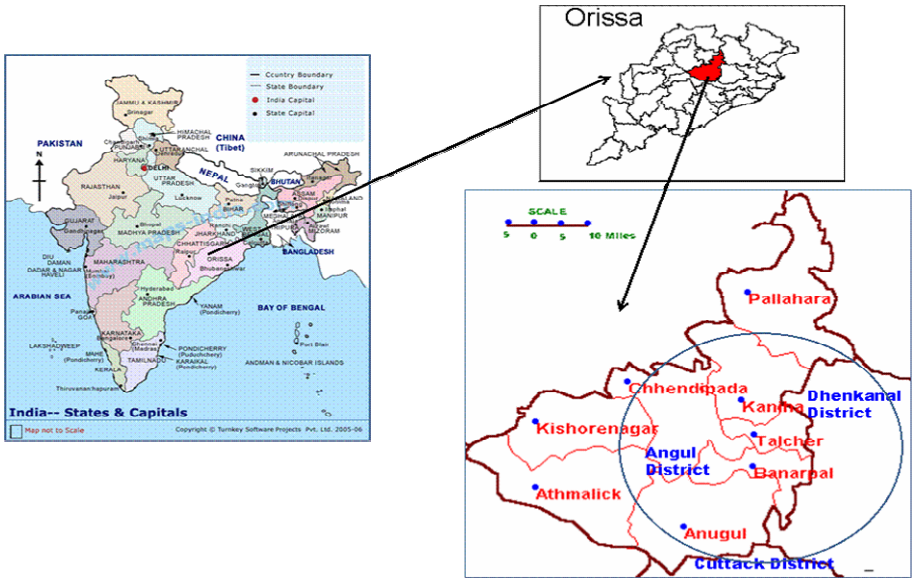


Figure-1.1 Location of Angul- Talcher industrial area

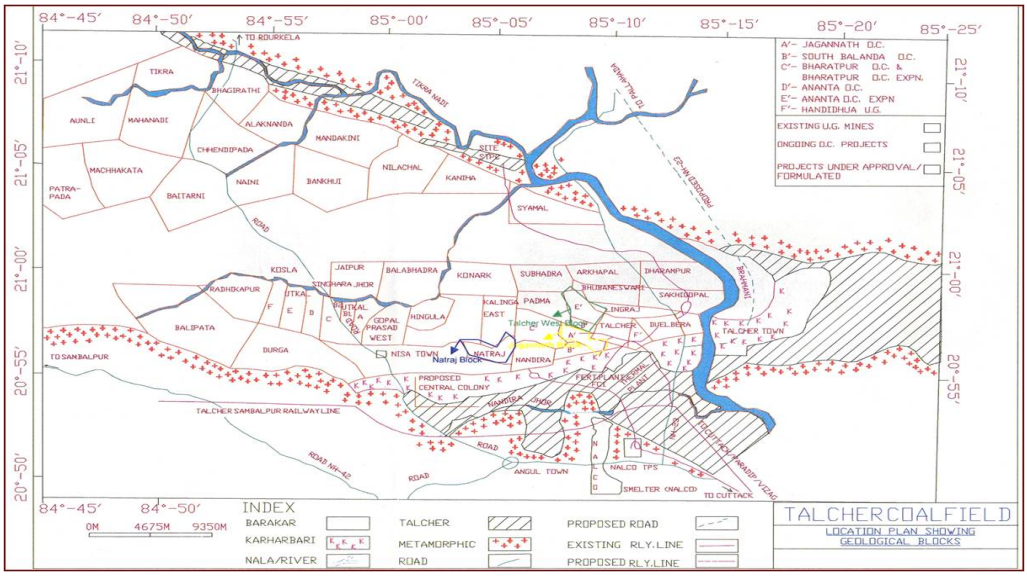


Figure-1.2 Map of Talcher coal field

The first coal mine started operating in 1922 and the area had its first operational railway line in 1923. River Brahmani and its tributaries form the main drainage system and source of water. Two National Highways pass through the area making it an attractive industrial destination. The industrial activities picked up in sixties, eighties and during first decade of this century. This area has grown steadily and now is a prominent industrial hub of the country. Coal mines, thermal power, aluminium smelting, iron and steel, sponge iron and ferro-alloys are the dominant sectors in this region.

1.3 Demarcation of geographical boundaries and impact zone with management area

Angul- Talcher area is one of the 24 problem areas of the country. SPCB had prepared a Regional Environmental Management Plan (REMP) in 1994. The action plan recommended in the study has been largely implemented. With further industrial development in the area, another study was taken up by SPCB through the Indian School of Mines University (ISMU), Dhanbad in 2009.

For demarcation of boundary of the Critically Polluted Industrial Cluster (CPIC), evaluation of the environmental quality, pollution load and drawing up the action plan, inputs from this study was extensively used. Inputs from SPCB's own monitoring and survey were also used in this exercise.

Determination of the boundary of the CPIC was started with identifying and locating the industries on a map. The positions of existing polluting industries were marked on the collated Topographic sheets. The industries and mines that have an impact on CEPI score was considered for this purpose.

The demarcation of boundary for Critically Polluted Industrial Cluster (CPIC) for Angul- Talcher area was done on the following basis.

1. *All the major polluting industries are included in the cluster***.** The industries and mines that have a bearing on CEPI score have a fall out area and the fall out area of different polluting industries and mines over lap one another to produce critically polluted cluster of area.
2. *The cluster faces common environmental problems.*
3. *MoEF notification on critically polluted area.* The respective industries and mines are located on the collated map of relevant topo sheets to demarcate the tentative critically polluted area and **Environment Management Area** for implementation of action plan in a time bound manner. This Environment Management Area is a larger area and beyond the Critically Polluted Industrial Cluster Area.

The boundary is drawn by including all the major polluting industries and mines 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 news papers and also expressed during various public hearings that were conducted in the past for different projects in the area. The boundary of CPIC area was drawn on collated Topographic sheet and is shown in blue line in **Figure- 1.3**.

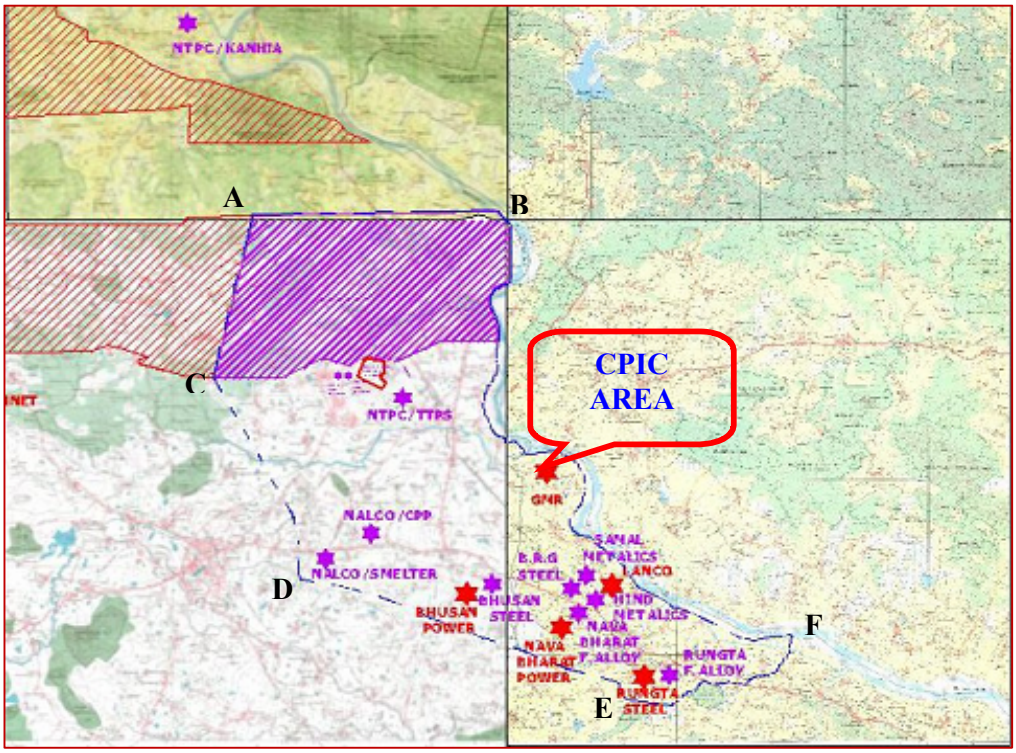


Figure-1.3: Geographical boundary of CPIC for implementation of action plan

The CPIC is a shoe shaped area bounded by river Brahmani on the East. The coordinates of the area are:

A- 21^0 00' 00" N - 83^0 07' 38" E

B- 21^0 00' 00" N - 85^0 14' 59" E

C- 20^0 55' 04" N - 85^0 06' 12" E

D- 20^0 49' 51" N - 85^0 09' 21" E

E- 20^0 46' 05" N - 85^0 18' 38" E

F- 21^0 47' 54" N - 85^0 23' 28" E

The area of the cluster is approximately 350 sq km.

1.3.1 Environmental Management Area (EMA)

The environmental management area is an area beyond the CPIC, which is expected to carry the impact of CPIC. For Angul- Talcher area this CPIC area has been demarcated as "An area bounded by a circle with a radius of 40km having Tentuloi village (85^0-00' to 85^0-15'E and 20^0-45' to 21^0-00'N) as the center. The demarcated critically polluted industrial cluster with the environmental management area is shown in **Figure-1.4**. The EMA area is 5026 Sq Km which includes CPIC area and major part of future coal block and Angul Town.

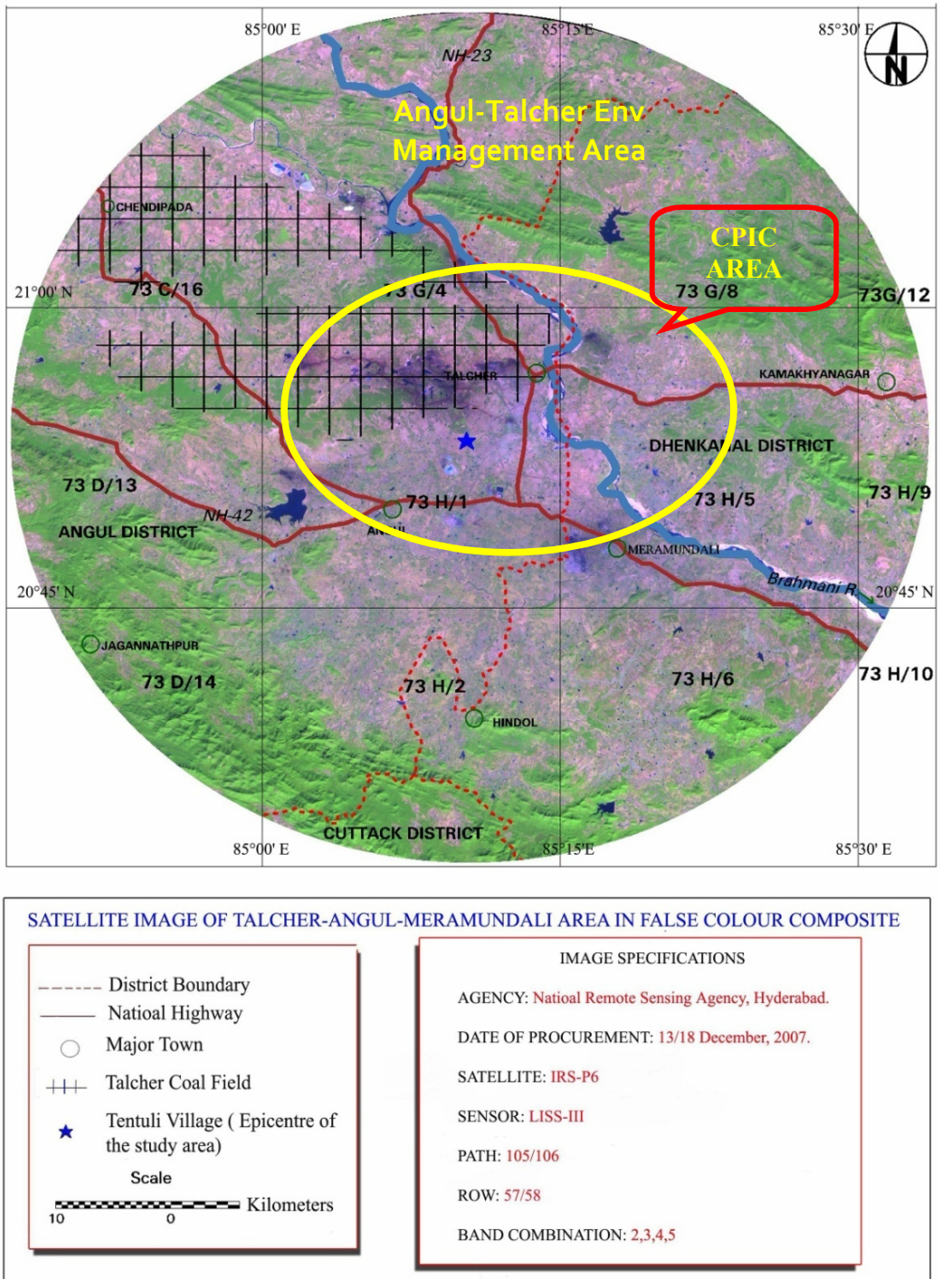


Figure- 1.4 : CPIC with Environmental Management Area

1.4 CEPI Score (Air, Water, Land and Total)

The CEPI as calculated by Central Pollution Control Board with the summary of sub indices is presented in **Table-1.1**.

Table-1.1 Abstract of CEPI score for Angul- Talcher area

	Air				Surface Water				Land/Ground water			
	A	B	C	D	A	B	C	D	A	B	C	D
Actual Value of EPI	10	9	30	15	15	9	30	15	15	10.75	25	15
Maximum Value of EPI	30	20	30	20	30	20	30	20	30	20	30	20
Total EPI	64				69				65.75			
CEPI	**82.09**											

1.5 Population details of the area

The total population of the cluster (CPIC) would be approximately 3.0 lacs. However actual population can be determined after identification of the villages within the cluster. The demographic profile of entire Angul- Talcher area covered under Environmental management area is presented at following **Table-1.2**.

Table 1.2: Brief Socio-Economic Profile of Angul and Talcher Area as a whole (*As per 2001 Census)*

Sl. No	Items	Angul District	Talcher
1.	Distribution of land areas (%)	4.09 (6375.00 sq km)	0.802 (427.93 sq. km.)
2.	Number of house holds	2,30,711	28,987
3.	Number of Villages	1,910	182
4.	Total Population	11,40,000	1,43,603
	Males	5,87,231(51.50%)	76,166(53.04%)
	Females	5, 52,769 (48.50%)	67,437(46.96%)
	Rural	9, 81,000 (86.05%)	N.A
	Urban	1, 59,000 (13.95%)	N.A
5.	Sex Ratio (Females per 1,000 males)	941	931
6.	Density of Population (per sq. km.)	179	336
7.	Total Workers	4,54,000	28,413
	Main Workers	2,99,000 (65.85%)	20,429 (71.90%)
	Marginal Workers	1,55,000 (34.15%)	7,984(28.10%)
8.	Total Literacy Rate	68.79%	N.A
	Literacy Rate – SC	56.99%	N.A
	Literacy Rate – ST	45.36%	N.A

N.A. – Not Available

1.6 Industry classification and distribution

The CPIC is dominated with RED category of industries. There are 8 number of "17- category" of highly polluting industries (RED-A) and 154 number of "54-category" (RED-B) industries. The list of RED (A) category of industries operating within the cluster is presented in **Table1.3**. The list of RED (B) categories of industries and mines operating within the cluster is presented in **Table-1.4**.

Table-1.3 : List of 17 Category of highly polluting industries i.e. Red (A) industries CPIC.

SL No	Name of the industry / mine	Product	Capacity
1	Aluminium Smelter Plant (NALCO)	Aluminium	0.345 MTPA
2	Captive Power Plant (NALCO)	Thermal Power	1080 MW
3	Talcher Thermal Power Station (NTPC)	Thermal Power	460 MW
4	Bhusan Steel Ltd. (CPP)	Thermal Power	77 MW
5	Bhusan Steel Ltd.	Integrated Steel (DRI)	3.1 MTPA
6	Bhusan Energy Ltd.	Thermal Power	300 MW
7	Nav Bharat Ventures Ltd. (CPP)	Thermal Power	94 MW
8	BRG Iron & Steel Co. Ltd.	Sponge Iron	60,000 TPA

Table-1.4 : List of RED (B) categories of industries and mines operating in CPIC

Sl No	Name of the industry/mine	Product	Capacity
1	Heavy Water Plant (DAE)	Heavy Water	62.7 TPA
2	Ananta OCP (MCL)	Coal	12.0 MTPA
3	Jagannath OCP (MCL)	Coal	4.4 MTPA
4	Lingaraj OCP (MCL)	Coal	13.0 MTPA
5	Bharatpur OCP (MCL)	Coal	15.0 MTPA
6	Balaram OCP (MCL)	Coal	6.4 MTPA
7	Hingula OCP (MCL)	Coal	12.0 MTPA
8	Bhubaneswari OCP (MCL)	Coal	10.0 MTPA
9	Chendipada OCP(MCL)	Coal	0.35 MTPA
10	Talcher U/G Colliery (MCL)	Coal	0.198 MTPA
11	Nandira U/G Colliery (MCL)	Coal	0.27 MTPA
12	Nav Bharat Ventures Ltd.	Ferro Alloy	75,000 TPA
13	Mangila Rungta (Ferro Alloy Division)(P) Ltd.	Ferro Alloy	54,000 TPA
14	Hind Mettaliks Ltd	Ferro Alloy	30,000 TPA
15	Global Coal & Mining (P) Ltd.	Beneficiated coal	2.04 MTPA
16	Aryan Energy (P) Ltd. - Beneficiated coal	Beneficiated coal	1.8 MTPA
17	Spectrum Coal & Power Ltd.	Beneficiated coal	4.8 MTPA
18	Ardee Hi-Tech Pvt. Ltd.	Beneficiated coal	0.816 MTPA

It is also observed that the capacities of some the industrial units in this cluster have grown many times during past few years. Current Sector-wise scenario of the industries operating within the CPIC is presented in **Table-1.5** and **Table 1.6**.

Table-1.5 Summary of RED Category industries in Angul- Talcher area

Sl. No.	Type of industries	Nos
1	RED-A (17 categories of highly polluting type)	08
2	RED-B (54 categories of polluting type)	144
3	RED-B (Mines)	10

Table-1.6 : Numbers and capacities of RED industries in Angul- Talcher CPIC

Sl. No	Industrial sector	Numbers	Capacity
1.	Coal mines	10	74 MTPA
2.	Thermal power plants	5	2011 MW
3.	Iron and Steel including sponge iron plants	2	3.16 MTPA
4.	Aluminum smelter	1	0.345 MTPA
5.	Ferro alloys	3	0.169 MTPA
6.	Coal Washeries	4	9.456 MTPA
7.	Heavy Water Plant	1	62.7 TPA
8.	Other Red industry including stone crushers.	136	--
9.	Orange and Green industries	12	
	Total	184	

1.7 Grossly polluting industries (GPIs)

Grossly Polluting Industry with the BOD load more than 100 Kg/day or discharging hazardous substances in the effluent are few in the CPIC. Three GPIs are operating in the CPIC are Captive power plant of NALCO, Angul, Talcher Thermal Power station of NTPC and Aluminum smelter of NALCO, Angul.

1.8 Environmental Issues in the cluster

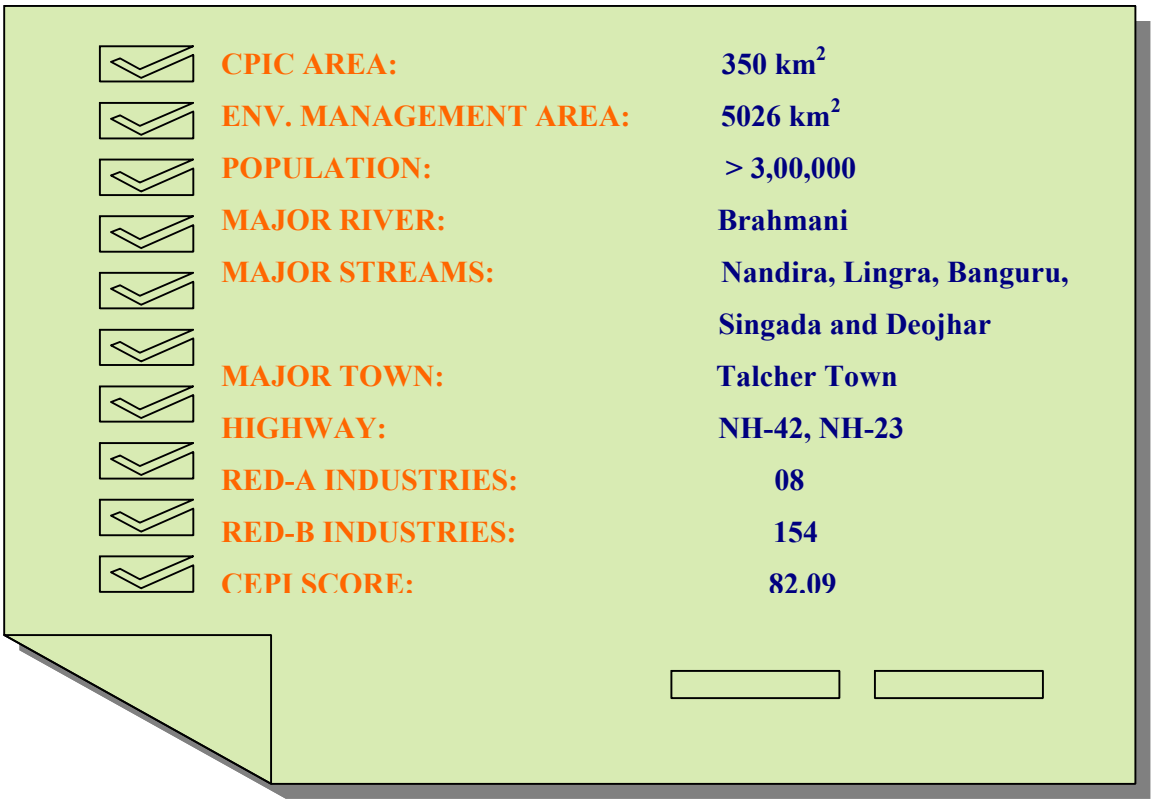
Nature and magnitude of environmental issues relevant to an area forms the basis on which action plans are drawn. To identify the critical environmental

issues in this area, all major local news papers and proceedings of public hearing conducted during last two years were scanned and the environmental issues raised are aggregated and summarized as in the following section. The identified issues were then corroborated with the various monitoring studies conducted by SPCB, Regional Environmental Management Plan prepared by ISMU, Dhanbad and the Site remediation study conducted by National Productivity Council (NPC), New Delhi.

1. River Brahmani flows along Talcher from north-west to south-east. All the industries in this area are located along the river with a stretch of about 25km. There are few small streams like Nandira, Singada, Lingara, Banguru which flows through this area and feed river Brahmani during monsoon. These feeder streams flows through the industrial cluster and carry industrial and urban wastewater. The water quality of these streams and Brahmani river in the down stream of Talcher needs to be restored.
2. A sodium dichromate plant was in operation which was subsequently closed in 1998. An estimated 79,000 MT of solid residue which is a hazardous waste is lying near the closed site and releasing hexavalent chromium to the water bodies during monsoon.
3. During monsoon the run-offs from various stock piles like coal, minerals, solid waste etc flows down the area and gets discharged to river Brahmani through its feeder streams.
4. The level of fluoride in the ground water around NALCO has been found to be higher than the norm. During post monsoon period there had also been few instances of burning of paddy crops presumably due to the effect of fluoride bearing gasses.
5. The ambient temperature of this area rises close to 50°C and the general perception is that the temperature rise is due to industrialization and mining activity. The exposed coal seam and stack yards catch fire during summer season due to self oxidation and contribute to rise in temperature.
6. The industrial activities in this area causes about 75 million tons of materials are transported between the nodes in a year. The transportation by road is a cause of nuisance, air pollution and traffic congestion.

7. The sewerage from Talcher town is discharged to river Brahmani without any treatment causing the detoriation of water quality of river Brahmani in the down stream of Talcher.
8. Amount of land being converted to ash ponds and solid waste disposal facilities is increasing day by day. This process converts agricultural land to unproductive barren land.
9. Groundwater level around the mining area is depleting due to extraction of ground water for the mining activity. This causes acute shortage of water in the surrounding villages.

1.9 The salient features: Angul- Talcher CPIC



Chapter 2

Water Environment

2.1 Present status

Brahmani is the major river flowing through Angul -Talcher area. River Brahmani and its tributaries provide bulk of water supply and carry effluent load from this area. The water quality of river Brahmani is being monitored by the Board under National Water Monitoring Programme at 18 locations in the entire stretch. Out of 18 locations 04 locations come under Angul-Talcher area. The water quality data of river Brahmani and its river system is summerised in section 2.1.2.

2.1.1 Water bodies / Effluent Receiving Drains in the Area

River Brahmani enters Angul district through Rengali reservoir and passes through Talcher sub-division. A multi purpose dam has been constructed over the Brahmani at Rengali. 250 MW of electricity is generated at Rengali hydropower station. A barrage has been constructed at 35 km down stream at a place called Samal. Other rivers of Angul district are mountain streams, which torrent in the rain and in the summer contain little or no water. However these reservoirs and barrage are outside the CPIC and in the up stream of CPIC.

Nandira, Lingra, Kisinda, Banguru, Singda and Deojhar streams/nallahs are other streams flowing within the CPIC area. Effluents and runoffs are mostly received by River Brahmani through these streams.

2.1.2 Present levels of pollutants in water bodies

The water quality of river Brahmani is being monitored by the Board under National Water Monitoring Programme at 18 locations of entire stretch. Out of 18 locations 4 locations come under Angul-Talcher area. The water quality data of river Brahmani and its river system is summarized at **Table-2.1**.

Table-2.1 Water monitoring data for Brahmani River Basin

Sl. No	Location	No. of Obs.	Annual average (2009) value (Range of values) Parameters				Frequency of violation (Percent of violation) from designated criteria value		Designated Class	Existing Class
			pH	DO (mg/l)	BOD (mg/l)	TC (MPN/100 ml)	BOD (mg/l)	TC (MPN/ 100 ml)		
1.	Samal	4	7.7 (7.1-8.2)	8.4 (6.9-9.9)	1.3 (0.9-2.1)	1310 (940-1700)	0	0	C	C
2.	Talcher FU/s (intake well of MCL, Talcher)	12	7.7 (6.9-8.5)	7.8 (6.6-9.1)	1.0 (0.2-1.8	1365 (700-2100)	0	0		C
3.	Talcher U/s, Saranga Bridge	12	7.7 (6.6-8.2)	8.1 (7.4-9.4)	1.2 (0.6-1.9)	2342 (1700-3500	0	0	C	C
4.	Kamalanga D/s	12	7.7 (6.7-8.4)	8.2 (7.4-10.0)	1.8 (0.9-2.4)	6900 (2800-11000)	0	9 (75)	C	Doesn't conform to Class C
5.	Kamalanga FD/s, Nadhara	12	7.9 (6.7-8.4)	8.2 (7.2-9.6)	1.2 (0.2-2.2)	3042 (1700-4300)	0	0		C
Class 'B' water quality Criteria (IS-2296-1982)			**6.5-8.5**	**5 and above**	**3 or less**	**500 or less**			**Outdoor bathing**	
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**	

From the data it is apparent that Brahmani is primarily affected due to sewage disposal. The State Pollution Control Board, Orissa monitors discharge of the concerned industries and mines and also monitors environmental parameters of the area. The Board also takes peoples' feedbacks during public hearings. The critical parameters were chosen by linking the environmental issues and relevance of the parameter. The water quality data of those critical parameters are presented in **Table 2.2**.

Table-2.2 : Critical Environmental parameter

SURFACE WATER QUALITY					
Parameter	**Avg. Result (mg / l)**	**Standard (mg / l)**	**Total Sample**	**Nos. of sample exceeded the norm**	**Percent sample exceeded**
Fluoride	0.716	1.5	5	1	20
BOD	1.62	8.00	5	0	0
Cd	0.0004	0.005	5	0	0
Pb	0.01	0.01	5	0	0

Source- REMP Angul- Talcher area, ISMU

For water quality parameters the results were compared with the water quality parameters as per CPCB, 2002, "Water quality criteria and goals" Monitoring of Indian national aquatic Resources series: MINARS/17/2001-2002. The data for surface water quality and ground water quality were taken for the critical season. For surface water summer season was considered as critical and for ground water quality post monsoon was considered as critical.

2.2 Sources of Water Pollution

The sources of water pollution are industrial, domestic, agricultural runoff and others. Estimated quantity of effluent generated by major industries is summarized in the following section.

2.2.1 Industrial sources

The list of major industries with discharge potential and steps taken for recycle and reuse and treatment is presented in the **Table-2.3**.

Table-2.3: Effluent generation in major industries

SL No	Name of the industry/mine	Product	Capacity	Effluent in KLD	Recycle/reuse/ treatment	Quantity of Effluent discharged to river
1	Aluminium Smelter Plant (NALCO)	Aluminium	0.345 MTPA	2640	Completely recycled except monsoon.	Periodic discharge observed.
2	Captive Power Plant (NALCO)	Thermal Power	1080 MW	10000	Completely recycled except monsoon.	
3	Talcher Thermal Power Station (NTPC)	Thermal Power	460 MW	2650	Industrial effluent completely recycled	Ash water discharged to South Balanda Colliery
4	Bhusan Steel Ltd. (CPP)	Thermal Power	77 MW	2401 (The details given at Table 2.4A)	Completely recycled except monsoon	
5	Bhusan Steel Ltd.	Integrated Steel (DRI)	3.1 MTPA		No effluent discharge.	Only run off discharge to Kisinda Jhor during monsoon.
6	Bhusan Energy Ltd.	Thermal Power	300 MW	-----	Recently commissioned. It is under observation.	
7	Nav Bharat Ventures Ltd. (CPP)	Thermal Power	94 MW	837	Completely recycled.	-----
8	BRG Iron & Steel Co. Ltd.	Sponge Iron	60,000 TPA	-----	No effluent discharge.	-----

Table-2.4A: Water consumption and waste water generation/ use of Bhusan Steel and Power Ltd.

AREA	Consumption (Cum/Day)	Waste Water Generation (Cum/Day)	Waste water use/ disposal
DRI Cooling	8159	408	Being used for road sprinkling after settling tank
Power Plant + Compressor C.T.	16292	1630	Being reclaim for ash slurry system
SMS-1	3010	151	Used on hot slag & floor cleaning
Soft Water &DMW To(SMS-1+PP+)	1826	92	Being neutralized & used for ash slurry system
Drinking water (Plant + colony	2500	120	Being treated in STP & Treated water used in gardening
Coke oven batching plant/ yard	3581	Nil	Plant yet to be commissioned
L&T Construction	3560	Nil	Used for construction water
B.F.& Tubro blower station make up water	6180	Nil	Waste water being treated in ETP and treated water being used in process
SMS-II make up water	4340	Nil	No Discharge
HSM make up water	4024	Nil	No Discharge
TOTAL QUANTITY	**51352 (2140 CMH)**	**2401 (100CMH)**	

Note : Total waste water is being collected & settled in final at stabilization pond and being used for ash slurry, washery & road sprinkling system.

2.2.2 Domestic sources

The Talcher town, NALCO Township, Township of Talcher Thermal Power Station of M/S NTPC and Townships of M/S Mahanadi Coal Filelds Ltd. are the major sources of domestic effluent to the surrounding water body of River Brahmani and its tributaries. Some of the industrial townships have installed STPs and Municipalities are yet to install Sewage Treatment Plants.

Table2.4- Quantity of effluent generated by Townships with disposal status

Sl No	Township	Effluent Quantity in MLD	Receiving water body	STP Status
1.	Talcher Town	10.0 (Estimated).	Brahmani	STP under construction
2	TTPS Township	18.0	Nandira	STP established
3.	MCL Townships	12.0	Deojhar, Nandira Banguru	STP established but needs up-gradation.
4	NALCO Township	6.0	Kisinda jhor	STP established

2.3 Action Plan for compliance and control of water pollution

Based on the background information, monitoring reports, findings of REMP prepared by ISMU, Dhanbad and factoring into the public concerns on local environmental issues voiced through the local news papers and through the public hearings conducted by SPCB for the proposed projects in this area an action plan for Angul- Talcher 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 is prepared after a few rounds of brain storming sessions between the officers, including the concerned Regional Officer of SPCB.

The plan and possible target date to achieve it, is presented in the **Table- 2.5** to **Table-2.9**.

Table-2.5 Action Plan for control of water pollution in Thermal Power Plants

Sl. No	Action plan	Target Date	Issues being addressed
1.	All lean slurry disposal system to be converted to (High Concentration Slurry Disposal) HCSD/ Mine void filling	31.03.2012	• Water (Cd & Hg) • Land requirement
2.	All the thermal power plants shall adopt zero discharge.	31.03.2012	Water scarcity

Table-2.6 : Action Plan for control of water pollution in Coal Mines

Sl. No	Action plan	Target Date	Issues being addressed
1.	Creation of reservoir for storage of mine drainage water and runoff which can be used for industrial purpose	31.03.2013	Water conservation
2.	Making provision for supply of drinking water in the peripheral villages of coal mining area	31.12. 2011	Water scarcity
3.	Back filling of the mine voids and restoration of the mined out area. An action plan to be prepared.	30.06.2011	Land degradation

Table-2.7 : Action Plan for control of water pollution in Iron & Steel and Ferro Alloys Sector

Sl. No	Action plan	Target Date	Issues being addressed
1.	All steel plants and sponge iron plants to develop collection and treatment facility for mineral char and coal pile run off during monsoon.	30.06.2011	Water pollution

Table-2.8 : Action Plan for control of water pollution in Aluminium Plants

Sl. No	Action plan	Target Date	Issues being addressed
1.	Construction of secured engineering landfill by NALCO within its premises	31.03.2011	Fluoride in water and soil
2.	Conducting a comprehensive wastewater audit for the smelter plant including runoff management	31.03.2012	Fluoride in water and soil

Table-2.9 : Action Plan for control of water pollution through Common infrastructure services

Sl. No.	Action plan	Target Date	Issues being addressed
1.	Construction of a sewage treatment plant for Talcher town.	31.12-2012	Organic pollution of river
2.	Construction of water impoundment structures in Nandira, Lingra, Singda and Bangur nallah	31.03.2015	Water conservation
3.	Remediation of contaminated site near ORICHEM Ltd.	31.03 2012	Chromium pollution
4.	The establishment of on-line monitoring station for water quality monitoring of River Brahmani and online data transmission facility with SPCB and CPCB. The parameters shall also include Fluoride, Cadmium and TOC.	31.03.2013	Real time Data transmission.

Sl. No.	Action plan	Target Date	Issues being addressed
5.	Pb, Cr, Cd and Fluoride concentrations in Ground water is to be monitored.	31.03.2013	Data availability
6.	All the STPs will be provided with a stand-by DG sets to prevent discharge of sewage during power failure	31.03.2012	BOD and TC

2.4 Existing infrastructure facilities

The industrial townships of NALCO, TTPS and M/s MCL have already installed Sewage Treatment Plants (STPs) and using treated sewage effluent for gardening purpose. Installation of sewage treatment plant of 2 MLD (Million Liters per day) capacities for Talcher town by Orissa Water Supply and Sewerage Board (OWSSB), Government of Orissa is under progress with the financial support of National River Conservation Directorate (NRCD) Government of India. Planning process for a second STP for Talcher town has already been initiated by OWSSB.

2.5 Technological Intervention

The following technological interventions are suggested.

1. Sewage treatment plant for Talcher town with complete sewerage network is required.
2. The sewage treatment schemes of MCL townships needs to be upgraded.
3. The industries & mines in the area and other institutions of the area should be encouraged to adopt rain water harvesting practices.

Appropriate action points have been included in the action plan.

2.6 Installation of (Common Effluent Treatment Plants) CETPs

CETP may not be feasible in this area since the industry and mines operating in area have their own Effluent treatment and sewage treatment plants; their up-gradation will improve the water quality of receiving water bodies. The STPs should have dedicated DG sets at all pumping locations to avoid overflow of untreated effluent during power failure.

2.7 Government Budgetary Support Requirement

The budgetary support of Union and State Government is necessary for improvement of road net work and installation of sewage treatment plants for urban local bodies.

2.8 Data linkages to SPCB/ CPCB (of Monitoring Devices)

The water quality monitoring station at Brahmani at all the locations of **Table 2.1** needs to have online facility. Besides this water quality of streams which carry the effluent needs to be identified at critical locations. The data transmission of online data needs to be integrated with offices of SPCB and CPCB. Action plan for on-line monitor is included as action plan.

3.1 Present Status

Ambient Air Quality Monitoring is being carried out by State Pollution Control Board, Orissa at three locations in Angul-Talcher area within the demarcated CPIC area. Month wise maximum, minimum and average values of monitoring data for 2009-10 with respect to **Suspended Particulate Matter (SPM)**, **Respirable Suspended Particulate Matter (RSPM), Sulphur Dioxide (SO_2) & Oxides of Nitrogen (NO_X)** are given in **Table.3.1** to **Table-3.3** .

Table- 3.1 Ambient Air Quality Data of NALCO NAGAR, ANGUL 2009

Month	No of obs	Category	Daily average and Range			
			SPM ($\mu g/m^3$)	RSPM ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_X ($\mu g/m^3$)
Jan	8	R	177 (137-217)	91 (78-111)	8.5 (7.9-9.3)	17.6 (15.5-19.7)
Feb	6	R	194 (163-225)	90 (73-112)	9.7 (8.3-11.2)	20.1 (16.9-21.6)
March	7	R	169 (145-189)	83 (68-95)	6.3 (5.3-7.5)	15.2 (14-16.6)
April	5	R	196 (173-229)	95 (87-109)	7.3 (6.1-8.8)	16.9 (14.4-19.5)
May	6	R	159 (137-206)	79 (68-97)	8 (6.7-9)	16.9 (14.9-19.7)
June	7	R	165 (114-201)	80 (52-95)	7.2 (6.3-7.7)	15.9 (12.3-18)
July	8	R	140 (105-185)	73 (53-96)	7.2 (5.4-9)	17.3 (14.6-20)
Aug	7	R	102 (64-140)	53 (32-72)	7.1 (4.5-10.1)	15.7 (11.8-18.3)
Sept	7	R	130 (96-178)	71 (52-93)	7.2 (5.5-10)	17.6 (13.9-19.7)
Oct	8	R	166 (132-227)	79 (64-93)	8.9 (7.2-10.8)	17.5 (15.7-19.2)
Nov	8	R	182 (149-226)	81 (65-98)	8.9 (6.8-10.8)	18.4 (16.2-20.8)
Dec	8	R	205 (165-223)	88 (70-98)	9.3 (10.2-10.3)	18.4 (15.2-20.4)
Annual	88	R	165 (64-229)	80 (32-112)	8 (4.5-11.2)	17.3 (11.8-21.6)

Table 3.1 A: Ambient Air Quality Exceedence Factor-2009

Area with Location points	Type	SO_2 ($\mu g/m^3$)	NO_X ($\mu g/m^3$)	RSPM ($\mu g/m^3$)	SPM ($\mu g/m^3$)
NALCO Township, NALCO Nagar	R	L	L	H	H

NB:- R- Residential , L- Low , H- High

Table-3.2 Ambient Air Quality Data of T.T.P.S, TALCHER, ANGUL -- 2009

Month	No of obs	Category	Daily average and(Range)			
			SPM ($\mu g/m^3$)	RSPM ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_X ($\mu g/m^3$)
Jan	9	I	233 (173-303)	109 (90-127)	10.6 (8.1-13.3)	20.1 (16.8-28.5)
Feb	8	I	228 (160-304)	102 (85-115)	10.9 (8.1-12.3)	21.1 (16.9-24.4)
March	9	I	243 (175-306)	110 (65-130)	11.1 (9-13.8)	19.8 (18.2-21.3)
April	8	I	231 (131-313)	100 (67-126)	9.6 (8.3-11.3)	18.5 (17.1-20)
May	8	I	214 (115-261)	96 (63-117)	10.5 (6.1-19.6)	18.4 (14.6-20.7)
June	9	I	201 (123-271)	90 (68-114)	9.4 (6.5-12)	17.1 (13.3-20.6)
July	9	I	145 (97-172)	77 (53-92	8.9 (6.2-10.8)	19.2 (15.4-21.5)
Aug	9	I	131 (87-209)	71 (54-94)	7.1 (5.3-10)	17.3 (13.3-22.3)
Sept	8	I	169 (132-198)	85 (63-98)	10.1 (7.3-11.6)	19.5 (15.3-21.3)
Oct	9	I	234 (144-274)	97 (66-113)	11.5 (10.1-14)	20.2 (18-22.7)
Nov	9	I	251 (145-330)	99 (73-117)	10.6 (7.2-12)	19.7 (15-21.9)
Dec	9	I	262 (227-314)	102 (88-116)	10.8 (9-11.9)	20.4 (18.6-22.1)
Annual	104	I	204 (87-330)	95 (53-130)	10.1 (5.3-19.6)	19.3 (13.3-28.5)

Table 3.2 A : Ambient Air Quality Exceedence Factor-2009

Area with Location points	Type	SO_2 ($\mu g/m^3$)	NO_X ($\mu g/m^3$)	RSPM ($\mu g/m^3$)	SPM ($\mu g/m^3$)
TTPS, Talcher	I	L	L	M	M

NB:-I- Industrial, L- Low, M- Moderate

Table-3.3 : Ambient Air Quality Data of MCL, TALCHER, ANGUL-2009

Month	No of obs	Category	Daily average and Range			
			SPM ($\mu g/m^3$)	RSPM ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_X ($\mu g/m^3$)
Jan	9	I	374 (285-419)	172 (138-203)	16.2 (13.1-19.3)	26.8 (24.3-30)
Feb	8	I	400 (336-466)	172 (135-231)	15.9 (14.8-16.8)	26.8 (25.1-28.1)
March	9	I	403 (331-450)	152 (129-183)	17.4 (16.4-18.7)	28.2 (25.8-30.1)
April	8	I	285 (202-369)	103 (75-132)	16 (13.4-18.4)	27 (25.1-33.1)
May	8	I	267 (179-301)	117 (88-142)	14 (8.5-15.9)	27.6 (22.7-29.5)
June	9	I	201 (146-235)	85 (73-101)	14.6 (11.5-16.4)	27.2 (24.1-30.4)
July	9	I	170 (117-228)	82 (55-106)	10.7 (6.8-13.9)	23.8 (21.8-25.6)
Aug	9	I	192 (108-240)	90 (57-116)	12.3 (9.5-14.6)	22.1 (18.7-24.8)
Sept	8	I	144 (117-206)	67 (56-83)	12.5 (11.6-13.2)	26.4 (24.7-27.5)
Oct	9	I	212 (102-291)	86 (53-124)	12.2 (8.7-13.5)	27.8 (24.6-29.2)
Nov	9	I	228 (185-283)	101 (85-116)	13.8 (13-15)	28.9 (27.2-31.3)
Dec	9	I	326 (231-415)	150 (110-179)	13.6 (12.6-14.8)	29.2 (28-31.9)
Annual	104	I	267 (102-466)	115 (53-231)	14.1 (6.8-19.3)	26.8 (18.7-33.1)

Ambient Air Quality Exceedence Factor-2009

Area with Location points	Type	SO_2 ($\mu g/m^3$)	NO_X ($\mu g/m^3$)	RSPM ($\mu g/m^3$)	SPM ($\mu g/m^3$)
Coal Field Area, Talcher	I	L	L	M	M

NB:-I- Industrial, L- Low, M- Moderate

The critical parameters were chosen by linking the environmental issues and relevance of the parameter. The abstract of data collected from SPCB's own monitoring and data collected by ISMU, Dhanbad during preparation of REMP for Angul- Talcher area is summarized in **Table-3.4**.

Table-3.4: Critical Environmental parameter

AIR QUALITY					
Parameter	**Avg. Result (µg / m^3)**	**Standard (µg / m^3)**	**Total Nos. of Samples**	**Nos. of sample exceeded the norm**	**Percent sample exceeded (%)**
Fluoride	2.647	2.86*	208	73	35
SO_2	26.46	80	688	0	0
SPM	178.89	200	688	104	15
RPM	85	100	688	138	20

***The standard for fluoride in ambient air was adopted from Kentucky State, USA.**

For fluoride in ambient air the standard for Kentucky was taken as the reference norm as suggested by ISMU, Dhanbad in their report.

3.1.1 Critical locations for air quality monitoring

The critical locations of ambient air quality monitoring are

i. MCL mining area
ii. Talcher town
iii. Khadagaprasad village
iv. Banarpal

Monitoring of these stations are required over and above the NAMP monitoring stations. AAQ monitoring stations should be set up at these areas with online monitoring and data logging facility for monitoring and transmission of data.

3.2 Sources of Air Pollution

The sources of air pollution can be categorized into industrial, domestic and mines. The major industries contributing to air pollution are thermal power plants of NALCO and NTPC and Smelter of NALCO besides sponge iron plants like BRG Iron & Steel and Bhusan Steel Ltd. Apart from the above sources the fugitive emissions from the burning of wood and coal as domestic fuel, transportation of vehicles and emissions from the mines also contribute to air pollution in the area.

3.3 Impact of activities of nearby area on the CPIC area

The major air pollution potential in the CPIC is Suspended particulate matter and PM_{10}. Fluoride is also a major concern around NALCO Smelter. However activities outside the CPIC area are not significant to have impact on CPIC area.

3.4 Quantification of the Air Pollution Load and Relative Contribution by different Sources

The pollution load from the major air polluting industries is listed in Table-3.5

Table 3.5- Air pollution load from major industries

SL No	Name of the industry	Product	Capacity	PM in Kg/day	SO_2 in Kg/Day
1	Aluminium Smelter Plant (NALCO)	Aluminium	0.345 MTPA	892	6580
2	Captive Power Plant (NALCO)	Thermal Power	1080 MW	31743	146880
3	Talcher Thermal Power Station (NTPC)	Thermal Power	460 MW	7192	62560
4	Bhusan Steel Ltd. (CPP)	Thermal Power	77 MW	400	10472
5	Bhusan Steel Ltd.	Integrated Steel (DRI)	3.1 MTPA	7500	10800
6	Bhusan Energy Ltd.	Thermal Power	300 MW	4906	40800
7	Nav Bharat Ventures Ltd. (CPP)	Thermal Power	94 MW	969	12784
8	BRG Iron & Steel Co. Ltd.	Sponge Iron	60,000 TPA	104	2880
9	Nav Bharat Ventures Ltd.	Ferro Alloy	75,000 TPA	1088	-
10	Rungta Ferro Alloy (P) Ltd.	Ferro Alloy	54000 TPA	211	-
11	Hind Mettaliks Ltd	Ferro Alloy	30000 TPA	177	-

3.5 Action Plan for compliance and control of air pollution

Based on the background information, monitoring reports, findings of REMP prepared by ISMU, Dhanbad and factoring into the public concerns on local environmental issues voiced through the local news papers and through the public hearings conducted by SPCB for the proposed projects in this area an action plan for control of air pollution for Angul- Talcher 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. Action plan is prepared after a few rounds of brain storming sessions between the officers, including the concerned Regional Officer of SPCB. The plan and possible target date to achieve it, is presented in the **Tables 3.6 to 3.9**.

Table-3.6 : Action plan for control of air pollution for Thermal Power Plants

Sl. No	Action plan	Target Date	Issues being addressed
1.	All TPPs to install ESP/BF to meet the emission standard of 50 mg/m^3 with one spare field • Existing Plants • Future Plants	• 31.03.2012 • Concurrently with commissioning	• SPM & RPM in ambient air
2.	Online monitoring with real time display facility to be installed	30.06.2011	Particulate matter
3.	Real time ambient air quality monitoring (SO_x, NO_x, CO, $PM_{10,}$ $P.M_{2.5}$)	31.03.2011	SPM, RPM, SO_2, NO_X

Table-3.7 : Action plan for control of air pollution for Coal Mines

Sl. No	Action plan	Target Date	Issues being addressed
1.	A dedicated coal transport corridor to be constructed in Talcher coalfields.	31.03.2015	SPM in ambient air, Traffic Congestion
2.	Use of surface miner for coal mining purpose. At least 60% coal in this area to be produced by surface miner technology.	31.03.2013	Particulate matter
3.	Enhancement of rake loading facility in the coal mines.	31.03.2015	SPM, Traffic Congestion
4.	MCL to take up a comprehensive coal mine fire control plan	30.06.2011	SO_2, Heat

Table-3.8 : Action plan for control of air pollution for Iron & Steel and Ferro Alloys Sector

Sl. No	Action plan	Target Date	Issues being addressed
1.	All DRI plants to install ESPs, in the kiln, bag filter in dust generating points and pneumatic dust handling system	31.03.2011	Air pollution (SPM)
3.	Installation of online stack monitoring system with real time display system	30.06.2011	Particulate matter
4.	Real time ambient air quality monitoring (SO_x, NO_x, CO, $PM_{10,}$ $P.M_{2.5}$)	31.03.2011	SPM, SO_2, NOx, RPM

Table-3.9: Action plan for control of air pollution for Aluminium Plants

Sl.No.	Action plan	Target Date	Issues being addressed
1.	1st and 2nd pot line of NALCO are to be upgraded to meet the emission norm of 0.3 kg of fluoride per ton of Aluminum by revamping the fume treatment plant.	31.03.2012	Fluoride in air
2.	Online stack emission monitoring system with display system shall be installed	31.06.2011	Fluoride in air
3.	Installation of fluoride removal (Fume treatment) system from bake oven plant	31.03.2012	Fluoride in air
4.	Real time ambient air quality monitoring (SO_x, NO_x, CO, $PM_{10,}$ $P.M_{2.5}$)	31.03.2011	SO_2, NOx, CO, RPM

Table-3.10: Action plan for control of air pollution through Common infrastructure and services

Sl.No.	Action plan	Target Date	Issues being addressed
1.	Establishment of an extensive air quality monitoring network for Angul- Talche area	31.03.2013	Air quality parameter
2.	Construction of a bypass / flyover for avoiding traffic congestion on the national highway near Bhushan Steel & Power plant.	31.03.2013	SPM, Traffic Congestion
3.	Monitoring of $PM_{2.5}$ and Ozone on the points of traffic congestions should be done.	31.03.2013	Data generation for decision making

3.5.1 Existing infrastructure facilities – Ambient Air Quality Monitoring (AQM) network

There are 3 AAQ monitoring stations in CPIC area under NAMP and one AAQ monitoring stations within the EMP area. The major industries also have their monitoring stations. SPCB also envisages expansion of its network under NAMP.

3.5.2 Pollution control measures installed by the individual sources of pollution

The major air polluting industries in the area and devices installed for control of air pollution is enumerated at **Table-3.11**.

Table-3.11: Air pollution control measures in major air polluting industries

SL No	Name of the industry	Product	Capacity	Air Pollution Control Equipment and Measures
1	Aluminium Smelter Plant (NALCO)	Aluminium	0.345 MTPA	Fume Treatment Plant
2	Captive Power Plant (NALCO)	Thermal Power	1080 MW	ESP
3	Talcher Thermal Power Station (NTPC)	Thermal Power	460 MW	ESP
4	Bhusan Steel Ltd. (CPP)	Thermal Power	77 MW	ESP
5	Bhusan Steel Ltd.	Integrated Steel	3.1 MTPA	ESP and Bag Filters
6.	Bhusan Energy Ltd.	Thermal Power	300 MW	ESP
7	Nav Bharat Ventures Ltd. (CPP)	Thermal Power	94 MW	ESP
8	BRG Iron & Steel Co. Ltd.	Sponge Iron	60,000 TPA	ESP
9	Nav Bharat Ventures Ltd.	Ferro Alloy	75,000 TPA	Bag house
10	Rungta Ferro Alloy (P) Ltd.	Ferro Alloy	54000 TPA	Bag house
11	Hind Mettaliks Ltd	Ferro Alloy	30000 TPA	Bag house

3.5.3. Inventorisation of industrial sources of pollution with technological gaps

The inventory of industrial source of air pollutants are presented in Table-3.5.

3.5.4 Identification of low cost and advance cleaner technology for air pollution control

The advance technology that can be further installed for control of air pollution is fluoride scrubber in the Bake oven unit of the smelter plant of NALCO and additional fields in the ESP for thermal power plants. They have been appropriately included in the action plan.

3.5.5 Introduction or switch over to cleaner fuel

Coal to liquid (CTL) and Coal Bed Methane (CBM) can be considered as clean fuel substitutes of coal in the area. However, they are in R&D level at present and need huge investment for its implementation. A few proposals in this regard has been received however its outcome is still uncertain.

3.5.6 Need for infrastructure Renovation

On-line AAQ monitoring stations should be set up in this area to get on-line real time data for taking appropriate measures. The SPCB, NALCO, Bhusan Steel & Power, NTPC will take up for establishment of online AAQ monitoring stations in this area.

3.5.7 Development of roads

The road improvement programme should be taken up by MCL and other authorities in this area. Separate coal transportation corridor should be implemented to control fugitive emission from coal transport. Fly over / by passes on the National and State Highways should be constructed to avoid traffic congestion.

3.5.8 Impact on CEPI score after installation / commissioning of full fledged air pollution control systems

The CEPI score is likely to come down with the implementation/ commissioning of all Air Pollution Control Measures. The details are presented in Chapter-6.

Chapter 4

Land Environment (Soil and Ground water)

4.1 Land Environment

Out of total 350 Sq km area of CPIC about one third is coal bearing area. The remaining two third area are mostly covered with houses, industrial units, ash ponds and slag dump area. There are few patches of agricultural land near the confluence point of Nandira and close to river Brahmani.

4.2 Soil Contamination

Contamination of soil due to industrial and mining activities is not prominent leaving aside few areas close to the industries. Moreover the problem of soil degradation in mining and dumpsites of industrial waste are more prominent. However there are a few sites which are contaminated and are listed below.

i. *Area around NALCO Smelter*- Discharge from Aluminium Smelter has some fluoride content. But forage fluoride mostly remains within the norm.

ii. *Around ORICHEM*- The old contaminated site of ORICHEM has chrome bearing waste lying there for last two decades.

iii. *Ash pond areas*: The ash pond areas of individual TPPs are also potential risk prone areas and need close monitoring.

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

Based on the background information, monitoring reports, findings of REMP prepared by ISMU, Dhanbad and factoring into the public concerns on local environmental issues voiced through the local news papers and through the public hearings conducted by SPCB for the proposed projects in this area an action plan for Talcher- Angul 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 Thermal Power Plants

Sl. No.	Action plan	Target Date	Issues being addressed
1.	Create silo for a capacity of at least 2 to 3 days ash generation for its dry storage and subsequent utilization for cement and fly ash based products	31.12.2011	Ash utilization

Table-4.2 : Action plan for control of land and ground water pollution in Coal Mines

Sl.No.	Action plan	Target Date	Issues being addressed
1.	Adoption of concurrent mine filling with dry ash from the thermal power plants	30.06.2012	Ash disposal
2.	Back filling of the mine voids and restoration of the mined out area. An action plan to be prepared.	30.06.2011	Land degradation

Table-4.3 : Action plan for control of land and ground water pollution in Iron & Steel and Ferro Alloys Sector

Sl.No.	Action plan	Target Date	Issues being addressed
1.	Use of SMS slag and ferro alloys slag for haul road construction in the mine area	30.06.2012	Metallurgical solid waste utilization
2.	The char generated by the DRI industries is to be utilized in AFBC boilers as a supplementary fuel	31.03.2013	Solid waste utilization.

Table-4.4 :Action plan for control of land and ground water pollution in Aluminium Plants

Sl.No.	Action plan	Target Date	Issues being addressed
1.	Construction of secured engineering landfill by NALCO within its premises	31.03.2011	Fluoride in water and soil
2.	Conducting a comprehensive wastewater audit for the smelter plant including runoff management	31.03.2012	Fluoride in water and soil
3.	Installation of hazardous waste incinerator by NALCO.	31.03.2011	Hazardous waste
4.	Co-processing of spent pot lines in Cement Kilns	31.12.2011	Hazardous waste

Table-4.5: Action plan for control of land and ground water pollution in Common infrastructure and services

Sl. No	Action plan	Target Date	Issues being addressed
1.	Construction of a sewage treatment plant for Talcher town	31.03.2013	Organic pollution of river
2.	Remediation of contaminated site near ORICHEM Ltd.	31.03 2012	Chromium pollution
5.	Construction of a bypass / flyover for avoiding traffic congestion on the national highway near Bhushan Steel & Power plant.	31.03.2013	SPM, Traffic Congestion

4.4 Ground Water Contamination

Contamination of ground water with fluoride has been found in villages around NALCO smelter. Under a scheme drinking water is supplied by NALCO to 11 villages around it which has shown high fluoride in ground water.

4.4.1 Present status / quality of ground water

The present status of fluoride in ground water in the nearby villages around NALCO smelter is presented at **Table- 4.6**.

Table 4.6 Fluoride Content Analysis of Cultivable Soil in Angul- Talcher Area

Locations	Soil fraction (%)		pH (1:2.5; w/v)	EC (1:2.5; w/v), dS/cm	Max WHC (%)	Organic carbon (%)	Available N (ppm)	Fluoride (as F^-), ppm
	+2mm	-2mm						
1. Gadrakhai	13.64	86.53	8.32	0.503	34.23	2.64	142.8	4.67
2. Baragundari	20.36	79.63	6.79	0.183	37.04	2.88	152.4	3.69
3. Bonda	15.75	84.24	7.90	0.423	44.90	2.68	165.2	4.58
4. Kuladh	15.65	84.34	7.57	0.504	41.20	2.37	162.0	<0.50
5. Tulsipal	17.34	82.65	8.15	0.363	30.30	2.01	148.4	7.63
6. Agorbonda	13.95	86.04	6.75	0.437	44.10	2.34	144.8	4.37
7. Badabahal	16.36	83.64	8.14	0.596	42.70	2.35	136.8	0.107
8. Chourdia	13.82	86.22	6.21	0.423	36.40	1.92	117.6	2.89
9. Kankinali	16.60	83.40	7.21	0.341	39.20	1.73	104.0	3.86
10. Jhajiribahal	18.96	81.04	8.12	0.532	40.14	1.63	108.6	1.16
11. Nanguliaberha	17.20	82.80	6.32	0.341	40.23	1.24	96.7	3.62

Source- REMP report on Angul- Talcher area, ISMU, Dhanbad

4.4.2 Source Identification (Existing sources of Ground Water Pollution)

Fluoride in ground water is found around NALCO smelter. It was documented that fluoride is endemic in this area and leaching from NALCO smelter can also be additional source of fluoride.

4.4.3 Ground water quality monitoring programme

It is proposed to conduct round the year monitoring of ground water in villages around NALCO smelter. Lead, Chromium, Cadmium and Fluoride concentration in ground water needs to be monitored.

4.4.4 Action Plan for control of pollution including cost / time aspects

The action plan can be drawn to provide treated pipe water to all the fluoride affected villages in NALCO Smelter management area. The summary of action plan stipulates the target date against which the action is to be completed.

4.5 Solid waste Generation and Management

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

Table-4.7: Solid waste generated from prominent industries and their disposal

SL No	Name of the industry/mine	Product	Capacity	Solid waste	Disposal	Remarks
1	Aluminium Smelter Plant (NALCO)	Aluminium	0.345 MTPA	6000 TPA (SPL)	6000 TPA	Stored under cover shed
2	Captive Power Plant (NALCO)	Thermal Power	1080 MW	7200 TPD (Fly ash)	7200 TPD	Disposed at ash pond
3	Talcher Thermal Power Station (NTPC)	Thermal Power	460 MW	3220 TPD (Fly ash)	3220 TPD	Disposed at void mine of South Balanda
4	Bhusan Steel Ltd. (CPP)	Thermal Power	77 MW	340 TPD (Fly ash)	340 TPD	Disposed at solid waste dump site
5	Bhusan Steel Ltd.	Integrated Steel	3.1 MTPA	1230 TPD (Char & Slag)	1230 TPD	Disposed at ash pond
6	Bhusan Energy Ltd.	Thermal Power	300 MW	Recently commissioned unit. 5400 TPD (Fly ash) to be generated.	5400 TPD	To be disposed at mine quarry of Jagannath OCP
7	Nav Bharat Ventures Ltd. (CPP)	Thermal Power	96 MW	766 TPD (fly ash)	766 TPD	Disposed at Balanda colliery

SL No	Name of the industry/mine	Product	Capacity	Solid waste	Disposal	Remarks
8	BRG Iron & Steel Co. Ltd.	Sponge Iron	60,000 TPA	75,600 TPA (Char & slag)	45,600 TPA	Reused for road construction and low land filling
9	Nav Bharat Ventures Ltd.	Ferro Alloy	75,000 TPA	186 TPD (slag)	186 TPD	Disposed at solid waste dump site
10.	Rungta Ferro Alloy (P) Ltd.	Ferro Alloy	54,000 TPA	96 TPD (slag)	48 TPD	48 TPD reused for road construction
11	Hind Mettaliks Ltd.	Ferro Alloy	30000 TPA	53 TPD (slag)	53 TPD	Used for land filling.

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

Sl No	Nature of Hazardous waste	Quantity
1.	Used oil and waste containing oil	1900 KL/ Annum
2.	Fluoride and cyanide containing Hazardous Waste	11,000 Ton/ Annum

4.5.1 Identification of waste minimization and waste exchange options

Few options are listed below.

- Spent Pot Lines of Aluminium Smelter can be used in Thermal Power Plants.
- Fly Ash can be used in cement plant and in brick making.

4.5.2 Existing TSDF / Incineration facilities including capacities

There is no TSDF/ incineration facility in the CPIC area. The major Hazardous waste generator is NALCO. It is proposed to have Secured Land Fill (SLF) facility in its own premises.

4.5.3 Treatment and management of contaminated waste disposal sites etc.

The option of in situ treatment of contaminated site of ORICHEM and transfer of hazardous waste was evaluated. Considering space constraint it is proposed to dispose the waste in common TSDF near Sukinda.

4.5.4 Impact on CEPI score after proper management of Solid waste

CEPI is expected to come down with the implementation of above action plans. The details are presented in Chapter-6.

Chapter 5

Summary of Action Points

5.1 Summary of Proposed Action Points (Action Plan for Abatement of Pollution)

Based on the background information, monitoring reports, findings of REMP prepared by ISMU, Dhanbad and factoring into the public concerns on local environmental issues voiced through the local news papers and through the public hearings conducted by SPCB for the proposed projects in this area an action plan for Angul- Talcher 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. Action plan is prepared after a few rounds of brain storming sessions between the officers, including the concerned Regional Officer of SPCB. The plan and possible target date to achieve it, is presented in the **Tables 5.1 to 5.5.**

Table 5.1 Action Plan for abatement of pollution in Thermal Power Plants

Sl. No.	Action plan	Target Date	Issues being addressed
1.	All TPPs to install ESP/BF to meet the emission standard of 50 mg/m^3 with one spare field • Existing Plants • Future Plants	• 31.03.2012 • Concurrently with commissioning	• SPM and RPM in ambient air
2.	All lean slurry disposal system to be converted to (High Concentration Slurry Disposal) HCSD or mine void filling	31.03.2012.	• Water (Cd & Hg) • Land requirement
3.	Online monitoring with real time display facility to be installed	30.06.2011	Particulate matter
4.	Create silo for a capacity of at least 2 to 3 days ash generation for its dry storage and subsequent utilization for cement and fly ash based products	31.12.2011	Ash utilization

Sl. No.	Action plan	Target Date	Issues being addressed
5.	Real time ambient air quality monitoring (SO_x, NO_x, CO, $PM_{10,}$ $PM_{2.5}$)	31.03.2011	SPM, RPM, SO_2, NO_X
6.	All the thermal power plants shall adopt zero discharge	31.03.2012	Water scarcity

Table - 5.2: Action Plan for Abatement of Pollution in Coal Mines

Sl. No.	Action plan	Target Date	Issues being addressed
1.	A dedicated coal transport corridor to be constructed in Talcher coalfields.	31.03.2015	SPM in ambient air, Traffic Congestion
2.	Creation of reservoir for storage of mine drainage water and runoff which can be used for industrial purpose	31.03.2013	Water conservation
3.	Use of surface miner for coal mining purpose. At least 60% coal in this area to be produced by surface miner technology.	31.03.2013	Particulate matter
4.	Adoption of concurrent mine filling with dry ash from the thermal power plants	30.06.2012	Ash disposal
5.	Making provision for supply of drinking water in the peripheral villages of coal mining area	31.12.2011	Water scarcity
6.	Enhancement of rake loading facility in the coal mines.	31.03.2015	SPM, Traffic Congestion
7.	MCL to take up a comprehensive coal mine fire control plan	30.06.2011	SO_2, Heat
8.	Back filling of the mine voids and restoration of the mined out area. An action plan to be prepared.	30.06.2011	Land degradation

Table - 5.3 : Action Plan for abatement of Pollution in Iron & Steel And Ferro Alloys Sector

Sl. No.	Action Plan	Target Date	Issues being addressed
1.	All DRI plants to install ESPs, in the kiln, bag filter in dust generating points and pneumatic dust handling system	31.03.2011	Air pollution (SPM)
2.	All steel plants and sponge iron plants to develop collection and treatment facility for mineral char and coal pile runoff during monsoon.	30.06.2011	Water pollution

Sl. No.	Action Plan	Target Date	Issues being addressed
3.	Installation of online stack monitoring system with real time display system	30.06.2011	Particulate matter
4.	Real time ambient air quality monitoring (SO_x, NO_x, CO, $PM_{10,}$ $PM_{2.5}$)	31.03.2011	SPM, SO2, NOx, RPM
5.	Use of SMS slag and ferro alloys slag for haul road construction in the mine area	30.06.2012	Metallurgical solid waste utilization
6.	The char generated by the DRI industries is to be utilized in AFBC boilers as a supplementary fuel	31.03.2013	Solid waste utilization.

Table : 5.4 : Action Plan for abatement of pollution in Aluminium Plants

Sl. No.	Action Plan	Target Date	Issues being addressed
1.	1st and 2nd pot line of NALCO to be upgraded to meet the emission norm of 0.3 kg of fluoride per ton of Aluminum deterioration by revamping the fume treatment plant.	31.03.2012	Fluoride in air
2.	Online stack emission monitoring system with display system shall be installed	31.06.2011	Fluoride in air
3.	Installation of fluoride removal (Fume treatment) system from bake oven plant	31-.03-2012	Fluoride in air
4.	Construction of secured landfill by NALCO within its premises	31.03.2011	Fluoride in water and soil
5.	Conducting a comprehensive wastewater audit for the smelter plant including runoff management	31.03.2012	Fluoride in water and soil
6.	Real time ambient air quality monitoring (SO_x, NO_x, CO, $PM_{10,}$ P.$M_{2.5}$)	31.03.2011	SO_2, NOx, CO, RPM
7.	Installation of hazardous waste incinerator by NALCO.	31.03.2011	Hazardous waste
8.	Co-processing of spent pot lines in Cement Kilns		Hazardous waste

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

Sl. No.	Action plan	Target Date	Issues being addressed
1.	Construction of a sewage treatment plant for Talcher town	31.12-2012	Organic pollution of river
2.	Establishment of an extensive air quality monitoring network for Angul- Talcher area	31.03.2013	Air quality parameter

Sl. No.	Action plan	Target Date	Issues being addressed
3.	Construction of water impoundment structures in Nandira, Lingra, Singda and Bangur nallah	31.03.2015	Water conservation
4.	Remediation of contaminated site near ORICHEM Ltd.	31.03 2012	Chromium pollution
5.	Construction of a bypass / flyover for avoiding traffic congestion on the national highway near Bhushan Steel & Power plant.	31.03.2013	SPM, Traffic Congestion
6.	Promotion of industries within CPIC area which uses waste products like fly ash, char and waste heat.		Waste utilization
7.	The establishment of on-line monitoring station for water quality monitoring of River Brahmani and online data transmission facility with SPCB and CPCB. The parameters shall also include Fluoride, Cadmium and TOC.	31.03.2013	Real time Data transmission.
8.	Pb, Cr, Cd and Fluoride concentrations in Ground water is to be monitored.	31.03.2013	Data availability
9.	Monitoring of PM2.5 and Ozone on the points of traffic congestions should be done.	31.03.2013	Data generation for decision making
10	All the STPs will be provided with a stand-by DG sets to prevent discharge of sewage during power failure	31.03.2012	BOD and TC

Chapter 6

Calculation of CEPI

6.1 AIR ENVIRONMENT

6.1.1 Pollutants (A)

The total study area of Angul-Talcher is 350 km^2. In this area mainly mining, iron & steel, ferroalloys, thermal power generation and Aluminium smelting activities going on. Depending on this industrial activities the three critical air pollutants are fluoride, Sulphure Dioxide (SO_2) and Respirable Particulate Matter (RPM).

a. Factor # A1 – Presence of Toxin

The aforesaid three air pollutants are not assessed as acute or systemic. So the three parameters are coming under group - A and there combination is A A A. The penalty value for this combination is 0.

A1 = 0.

b. Factor # A2 – Scale of Industrial Activities

In the study area 8 nos. of R17 category industries and 154 nos. of R54 category industries are operating. So out of Large (5), Medium (2.5) and Limited (1) the scale of industrial activities is **Limited** and it has the scoring 1.

A2 = 1

Now the pollutant Factor is A = A1 x A2

$\Rightarrow$ A = 0 x 1

$\Rightarrow$ **A = 0**

6.1.2 Pathway (B)

a. Factor # B1 – Ambient Pollutant Concentration

The ambient environmental quality has been categorized into four broad categories based on exceedence factor.

$$\text{Exceedence Factor (EF)} = \frac{\text{Observed Mean concentration of critical pollutant}}{\text{Prescribed standard for the respective pollutant and area class}}$$

EF for Fluoride

- Total 208 nos of samples of Fluoride taken in the study area.
- The mean concentration of the Fluoride analysis is 2.647.
- The prescribed standard for Fluoride is 2.86.
- EF = 2.647 / 2.86 = 0.93
- 0.93 is Moderate (M) scoring and comes between 0.5 to 1.0. So its scoring is 2.

EF for SO_2

- Total 688 nos of samples of SO_2 taken in the study area.
- The mean concentration of the SO_2 analysis is 26.46.
- The prescribed standard for SO_2 is 80.
- EF = 26.46 / 80 = 0.33
- 0.33 is Low (L) scoring and comes below 0.5. So its scoring is 1.

EF for RPM

- Total 688 nos of samples of RPM taken in the study area.
- The mean concentration of the RPM analysis is 85.
- The prescribed standard for RPM is 100.
- EF = 85 / 100 = 0.85
- 0.85 is Moderate (M) scoring and comes between 0.5 to 1.0. So its scoring is 2.
- The final combination for ambient pollutant is M L M. The scoring of this combination is maximum of three. So scoring value for M is **2**.
- The combination value for M L M is **0**.
- **B1 = 2 + 0 = 2**

b. Factor # B2 – Evidence of adverse impact on people

In the study area there is evidence of symptoms of exposure. But there is no evidence of fatality or disease(s) leading to fatality (such as) cancer due to exposure. So the scoring value is 3.

B2 = 3

c. Factor # B3 – Reliable evidence of adverse impact on eco-geological features

In the study area there is evidence of symptoms of exposure. But there is no evidence of loss of flora / fauna / significant damage to eco-geological features, (irreparable loss / damage). So the scoring value is 3.

B3 = 3

Hence, the pathway factor B = B1 + B2 + B3

$\Rightarrow$ B = 2 + 3 + 3

$\Rightarrow$ **B = 8**

6.1.3 Receptor (C)

a. Factor # C1 – Number of people potentially affected within 2 km radius from industrial pollution source.

The population is more than 1 lakh in the study area .

Hence, **C1 = 5**

b. Factor # C2

SNLF = (Number of samples exceeded the standard / total number of samples) x (Exceedence Factor)

(i) Flouride

Total No of Samples taken = 208

Number of samples exceeded the standard = 73

Exceedence Factor = 0.93

SNLF = (73 / 208) x 0.93

= 0.3264 which is 0.25 – 0.5

Hence C_{21} = 2 (High)……..(1)

(ii) SO_2

Total No of Samples taken = 688

Number of samples exceeded the standard = 0
Exceedence Factor = 0.33

SNLF = (0 / 688) x 0.33
= 0

Hence C_{22} = 1.0 (Low)……..(2)

(iii) RPM

Total No of Samples taken = 688
Number of samples exceeded the standard = 176
Exceedence Factor = 0.85

SNLF = (176 / 688) x 0.85
= 0.2174 which is < 0.25

Hence C_{23} = 1.5 (Moderate)……..(3)

The combination of SNLF is H L M and the penalty for it is 0.

C_2 is the addition of maximum of equation no. 1, 2 & 3 and penalty value.

Hence C_2 = 2 + 0
= 2

c. Factor # C_3 – Additional Risk to sensitive receptors

Within 2 km radius from source no historical / archeological / religious / national parks / sanctuary / ecological habitat.

But 500 no of sensitive population is within 2km radius from source.

Hence C_3 = 5

Thus the Receptor factor $C = (C_1 \times C_2) + C_3$

$\Rightarrow C = (5 \times 2) + 5$

C = **15**

6.1.4 Additional Risk Assesment

Factor # D

- Pollution Control in Large scale Industries – Adequate
- Pollution Control in Medium & Small scale Industries – Adequate
- Pollution Control in Common Facilities – Inadequate

The combination is A A I.

Hence **D = 10**

i_a = Sub-Index Score = A + B + C+ D
= 0 + 8 + 15 + 10
= 33

6.2 WATER ENVIRONMENT

6.2.1 Pollutants (A)

Depending on the industrial activities in the CPIC area the three critical water pollutants are Fluoride, BOD and Cadmium (Cd).

a. Factor # A1 – Presence of Toxin

The aforesaid three air pollutants are not assessed as acute or systemic. So the three parameters are coming under group - A and there combination is A A A. The penalty value for this combination is 0.

A1 = 0.

b. Factor # A2 – Scale of Industrial Activities

In the study area 8 nos. of R17 category industries and 154 nos. of R54 category industries are operating. So out of Large (5), Medium (2.5) and Limited (1) the scale of industrial activities is **Limited** and it has the scoring 1.

A2 = 1

Now the pollutant Factor is A = A1 x A2

$\Rightarrow$ A = 0 x 1

$\Rightarrow$ **A = 0**

6.2.2 Pathway (B)

a. Factor # B1 – Ambient Pollutant Concentration

The ambient environmental quality has been categorized into four broad categories based on exceedence factor.

$$\text{Exceedence Factor (EF)} = \frac{\text{Observed Mean concentration of critical pollutant}}{\text{Prescribed standard for the respective pollutant and area class}}$$

EF for Fluoride

- Total 5 nos of samples of Fluoride taken in the study area.
- The mean concentration of the Fluoride analysis is 0.716.
- The prescribed standard for Fluoride is 1.5.
- EF = 0.716 / 1.5 = 0.477
- 0.477 is Low (L) scoring and comes below 0.5. So its scoring is 1.

EF for BOD

- Total 5 nos of samples of BOD taken in the study area.
- The mean concentration of the BOD analysis is 1.62.
- The prescribed standard for BOD is 8.
- EF = 1.62 / 8 = 0.202
- 0.202 is Low (L) scoring and comes below 0.5. So its scoring is 1.

EF for Cadmium (Cd)

- Total 5 nos of samples of Cd taken in the study area.
- The mean concentration of the Cd analysis is 0.0004.
- The prescribed standard for Cd is 0.005.
- EF = 0.0004 / 0.005 = 0.08
- 0.08 is Low (L) scoring and comes below 0.5. So its scoring is 1.

- The final combination for ambient pollutant is L L L. The scoring of this combination is maximum of three. So scoring value for M is **1**.
- The combination value for L L L is **0**.
- **B1 = 1 + 0 = 1**

b. Factor # B2 – Evidence of adverse impact on people

In the study area there is evidence of symptoms of exposure. But there is no evidence of fatality or disease(s) leading to fatality (such as) cancer due to exposure. So the scoring value is 3.

B2 = 3

c. Factor # B3 – Reliable evidence of adverse impact on eco-geological features

In the study area there is evidence of symptoms of exposure. But there is no evidence of loss of flora / fauna / significant damage to eco-geological features, (irreparable loss / damage). So the scoring value is 3.

B3 = 3

Hence, the pathway factor B = B1 + B2 + B3

$\Rightarrow$ B = 1 + 3 + 3

$\Rightarrow$ **B = 7**

6.2.3 Receptor (C)

a. Factor # C1 – Number of people potentially affected within 2 km radius from industrial pollution source.

The population is more than 1 lakh in the study area.

Hence, $\mathbf{C_1 = 5}$

b. Factor # C_2

SNLF = (Number of samples exceeded the standard / total number of samples) x (Exceedence Factor)

(i) Flouride

Total No of Samples taken = 5

Number of samples exceeded the standard = 1

Exceedence Factor = 0.48

SNLF = (1 / 5) x 0.48

= 0.096 which is < 0.25

Hence C_{21} = 1.5 (Moderate)……..(1)

(ii) BOD

Total No of Samples taken = 5

Number of samples exceeded the standard = 0

Exceedence Factor = 0.202

SNLF = (0 / 5) x 0.202

= 0

Hence C_{22} =1(Low)……..(2)

(iii) Cd

Total No of Samples taken = 15

Number of samples exceeded the standard = 12
Exceedence Factor = 0.08

SNLF = (0/ 5) x 0.08
= 0
Hence C_{23} = 1 (Low)……..(3)

The combination of SNLF is M L L and the penalty for it is 0.
C_2 is the addition of maximum of equation no. 1, 2 & 3 and penalty value.
Hence C_2 = 1.5 + 0
= 1.5

c. **Factor # C_3 –** Additional Risk to sensitive receptors

Within 2 km radius from source no historical / archeological / religious / national parks / sanctuary / ecological habitat.
But 500 no of sensitive population is within 2km radius from source.
Hence C_3 = 5

Thus the Receptor factor $C = (C_1 \times C_2) + C_3$
$\Rightarrow C = (5 \times 1.5) + 5$
$\Rightarrow$ **C = 12.5**

6.2.4 Additional Risk Assesment

Factor # D

- Pollution Control in Large scale Industries – Adequate
- Pollution Control in Medium & Small scale Industries – Adequate
- Pollution Control in Common Facilities – Inadequate

The combination is A A I.
Hence **D = 10**

i_w = Sub-Index Score = A + B + C+ D
= 0 + 7 + 12.5 + 10
= 29.5

6.3 SOIL / GROUND WATER ENVIRONMENT

6.3.1 Pollutants (A)

Depending on the industrial activities in the CPIC area the three critical ground water pollutants are Fluoride, Calcium Hardness and Turbidity.

a. **Factor # A1** – Presence of Toxin

The aforesaid three air pollutants are not assessed as acute or systemic. So the three parameters are coming under group - A and there combination is A A A. The penalty value for this combination is 0.

A_1 = 0.

b. **Factor # A2** – Scale of Industrial Activities

In the study area 8 nos. of R17 category industries and 154 nos. of R54 category industries are operating. So out of Large (5), Medium (2.5) and Limited (1) the scale of industrial activities is **Limited** and it has the scoring 1.

A_2 = 1

Now the pollutant Factor is A = A1 x A2

$\Rightarrow$ A = 0 x 1

$\Rightarrow$ **A = 0**

6.3.2 Pathway (B)

a. Factor # B1 – Ambient Pollutant Concentration

The ambient environmental quality has been categorized into four broad categories based on exceedence factor.

$$\text{Exceedence Factor (EF)} = \frac{\text{Observed Mean concentration of critical pollutant}}{\text{Prescribed standard for the respective pollutant and area class}}$$

EF for Fluoride

- Total 24 nos of samples of Fluoride taken in the study area.
- The mean concentration of the Fluoride analysis is 1.103.
- The prescribed standard for Fluoride is 1.
- EF = 1.103 / 1 = 1.103
- 1.103 is High (H) scoring and comes between 1 and 1.5. So its scoring is 3.

EF for Ca Hardness

- Total 24 nos of samples of Ca Hardness taken in the study area.
- The mean concentration of the Ca Hardness analysis is 154.363.
- The prescribed standard for Ca Hardness is 75.
- EF = 154.363 / 75 = 2.06
- 2.06 is Critical (C) scoring and come more than 1.5. So its scoring is 6.

EF for Turbidity

- Total 24 nos of samples for Turbidity taken in the study area.
- The mean concentration of the Turbidity analysis is 6.581.
- The prescribed standard for Turbidity is 5.
- EF = 6.581 / 5 = 1.32
- 1.32 is High (H) scoring and comes between 1 and 1.5. So its scoring is 3.
- The final combination for ambient pollutant is H C H. The scoring of this combination is maximum of three. So scoring value for C is **6**.
- The combination value for H C H is **1.75**.
- **B1 = 6 + 1.75 = 7.75**

b. Factor # B2 – Evidence of adverse impact on people

In the study area there is evidence of symptoms of exposure. But there is no evidence of fatality or disease(s) leading to fatality (such as) cancer due to exposure. So the scoring value is 3.

B2 = 3

c. Factor # B3 – Reliable evidence of adverse impact on eco-geological features

In the study area there is evidence of symptoms of exposure. But there is no evidence of loss of flora / fauna / significant damage to eco-geological features, (irreparable loss / damage). So the scoring value is 3.

B3 = 3

Hence, the pathway factor B = B1 + B2 + B3

$\Rightarrow$ B = 7.75 + 3 + 3

$\Rightarrow$ **B = 13.75**

6.3.3 Receptor (C)

a. Factor # C1 – Number of people potentially affected within 2 km radius from industrial pollution source.

The population is more than 1 lakh in the study area.
Hence, **C_1 = 5**

b. Factor # C_2

SNLF =(Number of samples exceeded the standard / Total number of samples)x (Exceedence Factor)

(i) Flouride

Total No of Samples taken = 24
Number of samples exceeded the standard = 6
Exceedence Factor = 1.10

SNLF = (6 / 24) x 1.10
= 0.275 which is between 0.25 and 0.5
Hence C_{21} = 2 (High)……..(1)

(ii) Ca Hardness

Total No of Samples taken = 24
Number of samples exceeded the standard = 13
Exceedence Factor = 2.06

SNLF = (13 / 24) x 2.06
= 1.116 which is > 0.5
Hence C_{22} =3 (Critical)……..(2)

(iii) Turbidity

Total No of Samples taken = 24
Number of samples exceeded the standard = 13
Exceedence Factor = 1.32

SNLF = (13/ 24) x 1.32
= 0.715 which is > 0.5
Hence C_{23} = 3 (Critical)……..(3)

The combination of SNLF is H C C and the penalty for it is 2.
C_2 is the addition of maximum of equation no. 1, 2 & 3 and penalty value.
Hence C_2 = 3 + 2
= 5

c. **Factor # C_3 –** Additional Risk to sensitive receptors

Within 2 km radius from source no historical / archeological / religious / national parks / sanctuary / ecological habitat.
But 500 no of sensitive population is within 2km radius from source.
Hence $C_3 = 5$

Thus the Receptor factor $C = (C_1 \times C_2) + C_3$
$\Rightarrow C = (5 \times 5) + 5$
$\Rightarrow$ **C = 30**

6.3.4 Additional Risk Assessment

Factor # D

- Pollution Control in Large scale Industries – Adequate
- Pollution Control in Medium & Small scale Industries – Adequate
- Pollution Control in Common Facilities – Inadequate

The combination is A A I.
Hence **D = 10**

i_s = Sub-Index Score = A + B + C+ D
= 0 + 13.75 + 30 + 10
= 53.75

Calculation of the Aggregated CEPI

CEPI = $i_m + \{(100 - i_m) \times (i_2/100) \times (i_3/100)\}$
= 53.75 + {(100- 53.75) x (33 / 100) x (29.5 / 100)}

CEPI = 58.2524

6.4 Conclusion

The action plan has been prepared to address the environmental issues identified by the people and verified scientifically. The target dates are chosen considering the nature of the activity and its relative importance from environmental point of view .Implementation and monitoring being key aspects of success of an action plan, a framework for monitoring and evaluation of performance of the industrial cluster with CEPI as the key indicator is proposed to be in place, once the action plans are frozen after adequate refinement.

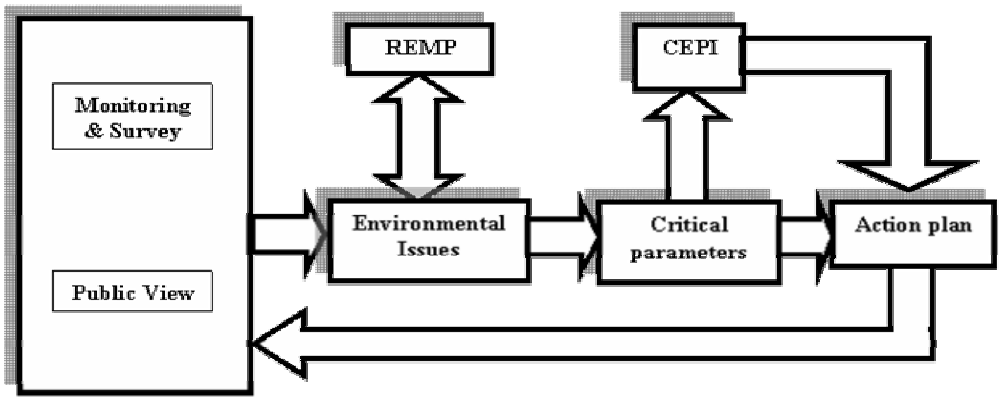


Fig-Framework of review of action plan

The main text of this document presents the action plans sector wise. The detailed industry wise action plan is presented in appendix I. The appendix also indicates the target date of each action and corresponding stakeholder agency who will implement the action plan. During the preparation of this action plan several actions were also taken up simultaneously. Some of the actions are already completed and some are under implementation. These actions have caused significant improvement in the environmental quality of the area. CEPI was calculated on the basis of recent monitoring data of the SPCB and REMP data collected by ISMU during their study. The revised CEPI from **82.09** to **58.25**, indicates the improvement in environmental quality, which is now well below the level of criticality. However, after the remaining actions are implemented the score is expected to come down further.

Compliance status to the comments received from CPCB on action plan for Angul-Talcher area

SL No	Comments	State Pollution Control Board's view
1	Details of effluent generation, mode of treatment and final disposal from Bhushan Steel Limited (CPP), Bhushan Steel Limited and Bhushan Energy Limited need to be addressed and incorporated in the Final Action Plan.	Included in the action plan
2	Conversion of Lean Slurry disposal system to High concentration slurry disposal system should be completed by 31st March, 2012	It is proposed to have a portfolio of options for ash disposal. High concentration slurry and mine void filling are the options. The State Board is pursuing. Retrofitting these systems usually has long lead time since there is only one supplier of diaphragm pump in the world. Thus the target date may be kept as 31.03-2014. The action plan is appropriately modified.
3	• Detailed plan for remediation of contaminated site near ORICHEM Ltd. should be evolved alongwith details of quantity of solid waste and clearly defined strategy for ultimate disposal of accumulated waste. • Responsible stakeholder for the same should be incorporated.	• A remediation plan was prepared by NPC New Delhi. It is estimated that about 79000 ton of hazardous waste is lying at the site. Out of the suggested options, disposal in TSDF was considered to be suitable by SPCB. • The responsible stake holder for implementing the remediation plan will be the ORICHEM Ltd.
4	Requirement of 8 MLD STP needs to be incorporated in the Action Plan as mentioned in Table 2.4	The requirement of STP is being drawn up by Orissa Water Supply and Sewerage Board (OWSSB) in a phased manner. A 2 MLD STP is under construction and another 2 MLD STP is in the design phase.
5	Typographical errors need to be corrected. 60% coal production by 31st March, 2012 and 100% coal production by 31st March, 2013 using surface miner technology should be ensured and this needs to be incorporated.	Typographical error corrected. 100% coal production by surface miner may not be feasible due to various practical reason. We may therefore stick to original stipulation of 60% by 2013.
6	Responsible stakeholders for establishment of air quality monitoring network and construction of fly over / bypass must be incorporated in the Action Plan.	Incorporated in the action plan. The bye pass is being constructed by M/S Bhusan Steel Ltd.

7	A comprehensive proposal with Coal to Liquid and Coal Bed Methane technologies need to be prepared and submitted by 31st March, 2011 and its implementation by 31st December, 2012.	This is a futuristic project and presently in R & D Stage. It may not be possible to include it as an action plan at present.
8	Possibility of coal transportation by belt conveyors need to be explored and the same may be implemented (if feasible) by 31st December, 2011.	In this area coal is transported through all modes; by rail, by road and through conveyor.
9	Time limit for installation of silo should be 31st December, 2011.	Agreed
10	Possibility should be explored for co-processing of Spent pot lining in Cement kilns.	Trial for co-processing in thermal power plant already commenced. Efforts are on for trial operation in cement kiln
11	Detailed plan for remediation of contaminated site near ORICHEM alongwith quantity of solid waste present and a well defined strategy for ultimate disposal of accumulated waste should be incorporated in the Action Plan. Stakeholders responsible for the same should also be included in the plan.	A remediation plan is already prepared by NPC. Out of the suggested options, disposal in TSDF was considered to be suitable by SPCB. The responsible stake holder for implementing the remediation plan will be the ORICHEM Ltd.
12	Time limit for installation of ESP/Bag Filters should be reduced to 31st March, 2012	Agreed.
13	Conversion of Lean Slurry disposal system to High concentration slurry disposal system should be completed by 31st March, 2012	It is proposed to have a portfolio of options for ash disposal. High concentration slurry and mine void filling are the options the State Board is pursuing. The action plan is appropriately modified.
14	Time limit for installation of silo should be 31st December, 2011.	Agreed.
15	Feasibility report with technical details and facts for adopting zero discharge policy in Thermal Power Plants should be prepared so that it could be monitored and implemented within the prescribed time limit.	Achieving zero discharge in TPPs is feasible during non-monsoons season.
16	Target date for construction of dedicated coal transport corridor should be reduced to 31st March, 2013. Typographical errors need to be corrected.	Dedicated coal transport corridor is a long term project. It needs various action like, planning, land acquisition and construction. Thus it may be considered to keep the target data as 31-03-2015. Typographical error corrected
17	Typographical errors need to be corrected. 60% coal production by 31st March,	Typographical error corrected. 100% coal production by surface miner may not be feasible due to various practical reasons. We may

	2012 and 100% coal production by 31st March, 2013 using surface miner technology should be ensured and this needs to be incorporated.	therefore stick to original stipulation of 60% by 2013.
18	Provision for drinking water in peripheral villages should be ensured by 31st December, 2011.	Agreed
19	Adequate technology identified (if any) may be indicated with a clear line of action for control of mine fire.	This is a national problem. It is only proposed to optimize production and dispatch to maintain minimum stock. It may not be possible to identify appropriate technology by SPCB.
20	Time limit for upgradation of 1-2 potline of NALCO should be reduced to 31st March, 2012.	Agreed
21	Time limit for installation of fluoride removal system should be reduced to 31st March, 2012.	Agreed
22	Time limit for construction of STP should be reduced to 31st December, 2012.	Agreed.
23	Time limit for construction of water impoundment structures should be reduced to 31st March, 2012.	Construction of water impoundment structure are long action, hence may not be possible before year 2015.
24	Other Suggestions 1. Sector-wise action plans need details regarding various stakeholders.	This is done and appended to the main report as Annexure-1.
	2. Detailed health impact study should be carried out through a reputed agency.	A health status report has been prepared as part of REMP for Angul-Talcher.
	3. CEPI should be evaluated for same criteria pollutants considered by CPCB on the basis of the real time data after implementation of short term and long term action plans.	CEPI is revaluated and included in report as chapter-6.
	4. Present status and future plan for greenbelt development should be incorporated as per the norms fixed in the master plan of the area with respect to area under greenbelt, no. and type of saplings.	The master plan is being prepared by CEPT University Ahmedabad. Green belt will be developed as per the master plan.

	5. Demographic details and water drainage pattern and road networks in 2 km buffer zone should be incorporated.	Incorporated in the final report
	6. Online monitoring system linked with regional office and head office of CPCB / SPCBs should be included in plan.	Incorporated in the final report
	7. DG sets should be provided at all pumping stations of CETPs/STPs (if any) to avoid overflow of untreated effluent during power failure in all clusters.	Included in the final action plan
	8. Action points to be elaborated in terms of quantification / sources of pollution and cost components.	The cost component will be worked out while implementing the action plan.
	9. Action Plan for industries undergoing expansion and those which obtained Environmental Clearance and yet to be commissioned also need to be incorporated.	The sectoral action plans will be applicable to all the future plants in respective sectors.
	10. Pb, Cr, Cd and Fluoride concentrations in Ground water should be monitored.	Agreed.
	11. Existing infrastructure alongwith future plans for sewage treatment in the cluster.	Included in action plan.
	12. Responsible stakeholders for the various activities mentioned under the Action Plan should be identified and incorporated in the Action Plan accordingly	Stakeholder wise action plan is appended in the final report as Annexure-1.

	13. Monitoring of PM2.5 and Ozone on the points of traffic congestions.	Agreed.
	14. Online water quality monitoring of Fluoride, cadmium and TOC also to be included.	Agreed.
	15. Proposal for in-situ Bio-remediation of sewage w.r.t. organic pollution load reaching in River.	This will be a research project, thus may be excluded from the action plan
	16. Explore the feasibility and technical viability of reduction of Chromium (Cr 6^{+} to Cr 3^{+}) by using flue gases or other technological option.	This will be a research project, thus may be excluded from the action plan
	17. Issue of management of coal washery rejects should also be considered on priority.	Agreed.
	18. Explore the possibility of use of SMS slag and Ferro-alloy slag for road construction.	Included in the action plan
	19. Plan for Char utilization in Thermal Power Plants.	Utilisation of char as supplementary fuel in AFBC Boilers is included as action plan.

	20. Study needs to be conducted to find out the cause for the instances of burning of paddy crops around NALCO. Following factors/ causes could be examined for the same- • Emissions • from Aluminium smelters- HF and HCl. • Fungal/ Aerosol spots	A study is conducted by the State Govt. through EPTRI to investigate the cause of paddy burning and suggest preventive measure.

Annexure - I

Annexure-1

SUMMARY OF ACTION PLAN, INDUSTRIES TO WHOM IT IS APPLICABLE, TARGET DATE, SHORT TERM AND LONG TERM GOALS, THE CURRENT STATUS WITH IMPLEMENTTATION SCHEDULE

Action Plan for abatement of pollution in Thermal Power Plants

Sl. No.	Action plan	Stakeholder agency	Target date	Goal/ Short term or Long term	Current status with action plan for implementation
1.	All TPPs to install ESP/BF to meet the emission standard of 50 mg/Nm^3 with one spare field.	NALCO, CPP	31-03-2012	Long term goal	Currently all units are prescribed with stack emission standard for 100 mg/Nm^3. Directions will be issued for achieve a standard of 50 mg/Nm^3 shortly.
		TTPS, Talcher	31-03-2012	Long term goal	The ESPs of TTPS Talcher is being upgraded to meet the standard of 100 mg/Nm^3
		Nav Bharat Ventures Ltd.	31-03-2012	Long term goal	Direction will be issued to meet standard of 50 mg/Nm^3
		Bhusan Steel Ltd. CPP	31-03-2012	Long term goal	Direction will be issued to meet standard of 50 mg/Nm^3
		Bhusan Energy Ltd. (IPP)	31-03-2012	Long term goal	Direction will be issued to meet standard of 50 mg/Nm^3
2.	All lean slurry disposal system to be converted to (High Concentration Slurry Disposal) HCSD/ Mine void filling	NALCO, CPP	31-03-2012	Long term goal	Currently the ash is disposed in lean phase. HDSD with mine void filling system is now under design stage.
		TTPS, Talcher	31-03-2012	Long term goal	Mine void filling through wet disposal is currently in practice. Direction for HCSD is issued.
		Nav Bharat Ventures Ltd.	31-03-2012	Long term goal	Mine void filling through dry disposal is currently in practice
		Bhusan Steel Ltd. CPP	31-03-2012	Long term goal	Dry disposal method has been adopted by this industry.

Sl. No.	Action plan	Stakeholder agency	Target date	Goal/ Short term or Long term	Current status with action plan for implementation
		Bhusan Energy Ltd. (IPP)	31-03-2012	Long term goal	Dry disposal and mine void filling has been envisaged for this plant.
3.	Online monitoring with real time display facility to be installed	NALCO, CPP	30-06-2011	Short term goal	Online monitors installed for Units No- 7, 8, 9 and 10.
		TTPS, Talcher	30-06-2011	Short term goal	Online monitors installed in all the stacks.
		Nav Bharat Ventures Ltd.	30-06-2011	Short term goal	Direction issued for installation of online monitors in stacks.
		Bhusan Steel Ltd. CPP	30-06-2011	Short term goal	Online monitors installed in two stacks.
		Bhusan Energy Ltd. (IPP)	30-06-2011	Short term goal	Online monitors installed in two stacks.
4.	Create silo for a capacity of at least 2 to 3 days ash generation for its dry storage and subsequent utilization for cement and fly ash based products	NALCO, CPP	31-12-2011	Short term goal	4 Silos of capacity 1500 T each and 2 silos of capacity 2000 tons each installed.
		TTPS, Talcher	31-12-2011	Short term goal	2 Silos of capacity 1000 T each installed.
		Nav Bharat Ventures Ltd.	31-12-2011	Short term goal	2 Silos of capacity 350 T each and 2 silos of capacity750 tons each installed.
		Bhusan Steel Ltd. CPP	31-12-2011	Short term goal	One silo of capacity 200 T installed.
		Bhusan Energy Ltd. (IPP)	31-12-2011	Short term goal	4 Silos of capacity 1000 T each and 2 silos of capacity 250 tons each installed.
5.	Real time ambient air quality monitoring (SO_x, NO_x, CO, $PM_{10,}$ $PM_{2.5}$)	NALCO, CPP	31-03-2011	Short term goal	Direction issued for installation. It is under procurement stage.
		TTPS, Talcher	31-03-2011	Short term goal	Real time ambient air monitoring station installed.
		Nav Bharat Ventures Ltd.	31-03-2011	Short term goal	Direction issued for installation.
		Bhusan Steel Ltd. CPP	31-03-2011	Short term goal	Real time ambient air monitoring station installed.

Sl. No.	Action plan	Stakeholder agency	Target date	Goal/ Short term or Long term	Current status with action plan for implementation
		Bhusan Energy Ltd. (IPP)	31-03-2011	Short term goal	Direction issued for installation. It is under procurement stage.
6.	All the thermal power plants shall adopt zero discharge.	NALCO, CPP	31-03-2012	Short term goal	Zero discharge adopted except periodic storm discharge during monsoon.
		TTPS, Talcher	31-03-2012	Short term goal	Zero discharge adopted except periodic storm discharge during monsoon.
		Nav Bharat Ventures Ltd.	31-03-2012	Short term goal	Zero discharge adopted except periodic storm discharge during monsoon.
		Bhusan Steel Ltd. CPP	31-03-2012	Short term goal	Dry ash disposal of ash is adopted.
		Bhusan Energy Ltd. (IPP)	31-03-2012	Short term goal	Dry ash disposal is envisaged.

Action Plan for Abatement of Pollution in Coal Mines

Sl. No.	Action plan	Stakeholder agency	Target date	Goal/ Short term or Long term	Current status with action plan for implementation
1.	A dedicated coal transport corridor to be constructed in Talcher coalfields to control SPM in ambient air and traffic congestion.	Mahanadi Coal Fields Ltd for its operating and future coal mines in Talcher area and Other Govt. agency as applicable	31-03-2015	Long term goal	Internal corridors with concrete roads have been constructed in some of the major mines. Suitable steps will be taken for complete implementation of this action plan.
2.	Creation of reservoir for storage of mine	Same as above	31-03-2013	Long term goal	Direction will be issued to MCL for implementation.

Sl. No.	Action plan	Stakeholder agency	Target date	Goal/ Short term or Long term	Current status with action plan for implementation
	drainage water and run off which can be used for industrial purpose for water conservation				
3.	Use of surface miner for coal mining purpose. At least 60% coal in this area to be produced by surface miner technology for control of particulate matter in ambient air	Same as above	31-03-2013	Long term goal	The surface miners are currently in use. The present level of production using surface miner technology is at 50 %. The MCL authority will be asked to enhance the capacity production and achieve the target level by 31-03-2013.
4.	Adoption of concurrent mine filling with dry ash from the thermal power plants to facilitate concurrent ash disposal.	Same as above	30-06-2012	Short term goal	The feasibility of concurrent ash filling is now evaluated. This has to be dovetailed with the existing mine plan.
5.	Making provision for supply of drinking water in the peripheral villages of coal	Same as above	31-12-2011	Short term goal	MCL will be communicated in this regard shortly. Presently 30 villages are covered under water supply scheme by MCL.

Sl. No.	Action plan	Stakeholder agency	Target date	Goal/ Short term or Long term	Current status with action plan for implementation
	mining area to solve the problem of water scarcity in nearby areas.				
6.	Enhancement of rake loading facility in the coal mines for control of SPM in ambient air and traffic congestion.	Same as above	31-03-2015	Long term goal	A suitable direction in this regard will be issued by the SPCB.
7.	MCL to take up a comprehensive coal mine fire control plan for control of SO_2 in ambient atmosphere and heat in the area.	Same as above	30-06-2011	Short term goal	A direction has already been issued to limit the stock volume to 5% of its total production. MCL will be communicated to prepare a comprehensive action plan in this regard shortly.
8.	Back filling of the mine voids and restoration of the mined out area. An action plan to be prepared for control of land degradation in the area.	Same as above	30-06-2011	Short term goal	Mine restoration plan is included in the respective EMP. Old mines will be directed to prepare an action plan.

Action Plan for abatement of Pollution in Iron & Steel Sector

Sl. No.	Action plan	Stakeholder agency	Target date	Goal/ Short term or Long term	Current status with action plan for implementation
1.	All DRI plants to install ESPs, in the kiln, bag filter in dust generating points and pneumatic dust handling system for control of air pollution in the area	Bhusan Steel Ltd.	31.03.2011	Short term goal	Installed
		BRG Iron and Steel Ltd.	31.03.2011	Short term goal	Installed
2.	All steel plants and sponge iron plants to develop collection and treatment facility for mineral char and coal pile runoff during monsoon for control of water pollution	Bhusan Steel Ltd.	30.06.2011	Short term goal	Direction issued for compliance.
		BRG Iron and Steel Ltd.	30.06.2011	Short term goal	Direction issued for compliance.
3.	Installation of online stack monitoring system with real time display system for monitoring and subsequent control of particulate matter	Bhusan Steel Ltd.	30.06.2011	Short term goal	Installed in two stacks. For rest of the stacks it is under implementation.
		BRG Iron and Steel Ltd.	30.06.2011	Short term goal	Direction to be issued.
		Navabharat Ventures Ltd. (Ferro Alloy)	30.06.2011	Short term goal	Direction issued for installation.

Sl. No.	Action plan	Stakeholder agency	Target date	Goal/ Short term or Long term	Current status with action plan for implementation
4.	Real time ambient air quality monitoring (SO_x, NO_x, CO, $PM_{10,}$ $PM_{2.5}$ evaluation of air quality data	Bhusan Steel Ltd.	31.03.2011	Short term goal	Installed
		BRG Iron and Steel Ltd.	31.03.2011	Short term goal	Direction to be issued
		Navabharat Ventures Ltd. (Ferro Alloy)	31.03.2011	Short term goal	Direction issued for compliance.
5.	Use of SMS slag and ferro alloys slag for haul road construction in the mine area for utilization of metallurgical solid waste	Navabharat Ventures Ltd. (Ferro Alloy)	30.06.2012	Longt term goal	Currently the slag is used in their own road. Surplus is to be sent to mines area.
		Mangilal Rungta (P) Ltd (Ferro Alloy)	30.06.2012	Long term goal	Currently the slag is used in their own road. Surplus is to be sent to mines area.
		Hind Mettaliks Ltd. (Ferro Alloys)	30.06.2012	Long term goal	Currently the slag is used in their own road. Surplus is to be sent to mines area.
		Bhusan Steels Ltd.	30.06.2012	Long term goal	Currently the slag is used in their own road. Surplus is to be sent to mines area.
		BRG Steel Ltd.	30.06.2012	Long term goal	Currently the slag is used in their own road. Surplus is to be sent to mines area.

Action Plan for abatement of pollution in Aluminium Plants

Sl. No.	Action plan	Stakeholder agency	Target date	Goal/ Short term or Long term	Current status with action plan for implementation
1.	1st and 2nd pot line of NALCO to be upgraded to meet the emission norm of 0.3 kg of fluoride per ton of Aluminum by revamping the fume treatment plant for control of fluoride in ambient air	NALCO	31-03-2012	Short term goal	The action plan is currently under implementation and is expected to be completed within stipulated target date.
2.	Online stack emission monitoring system with display system shall be installed for evaluation of load of fluoride in ambient air.	NALCO	31-06-2011	Short term goal	The action plan is currently under implementation and is expected to be completed within stipulated target date.
3.	Installation of fluoride removal (Fume treatment) system from bake oven plant control of fluoride in air.	NALCO	31-03-2012	Short term goal	Fume treatment system is installed in one bake oven. It is under implementation in 2nd bake oven and is expected to be completed within stipulated target date.
4.	Construction of secured landfill by NALCO within its premises for control fluoride in water and	NALCO	31.03.2011	Short term goal	Secured land fill at NALCO is completed.

	soil				
5.	Conducting a comprehensive wastewater audit for the smelter plant including runoff management by ultimate control of fluoride in water and soil.	NALCO	31.03.2012	Short term goal.	IIT Roorkee is now conducting the audit. Likely to be completed within the target date.
6.	Real time ambient air quality monitoring (SO_x, NO_x, CO, $PM_{10,}$ $PM_{2.5}$) for evaluation of environmental parameters.	NALCO	31.03.2011	Short term goal	It is under implementation and is likely to be completed within target date.
7.	Installation of hazardous waste incinerator by NALCO for disposal of hazardous waste	NALCO	31.03.2011	Short term goal	It is under implementation.
8.	Co-processing of spent pot-lining in Cement kilns	Cement plants and NALCO		Long term	Trial for co processing in thermal power plants already commenced. Efforts for trial for co- processing in cement kilns are on.

Action Plan for abatement of pollution through Common infrastructure and services

Sl. No.	Action plan	Stakeholder agency	Target date	Goal/ Short term or Long term	Current status with action plan for implementation
1.	Construction of a sewage treatment plant for Talcher town for control of organic pollution in river.	OWSSB	31-12-2012	Long term goal	The requirement of STP is drawn by Orissa Water Supply and Sewerage Board in a phased manner. A 2 MLD STP is under construction and another 2 MLD STP is in design phase.
2.	Establishment of an extensive air quality monitoring network for Angul- Talcher area for evaluation of air quality parameters in the area.	SPCB, NALCO, NTPC, Bhusan Steel	31-03-2013	Long term goal	The NTPC Talcher, Bhusan Steel Ltd. have already installed, NALCO is implementing it. Direction is to be issued to MCL for implementation. SPCB is preparing a plan for comprehensive air quality monitoring network.
3.	Construction of water impoundment structures in Nandira, Lingra, Singda and Bangur nallah for water conservation.	Water Resources Department and user agency	31-03-2015	Long term goal	Department of Water Resources, Govt of Orissa has been informed to take up this action.
4.	Remediation of contaminated site near ORICHEM Ltd for control of leaching of chromium.	ORICHEM Ltd.	31-03-2012	Long term goal	A remediation plan is already prepared by NPC. Out of the suggested options disposal in TSDF was considered to be suitable by SPCB. ORICHEM will be implementing stakeholder for this remediation option.
5.	Construction of a bypass / flyover for avoiding traffic congestion on the national highway near	Bhusan Steel Ltd. and NHAI	31-03-2013	Short term goal	The action plan is currently under implementation and is expected to be completed within stipulated period.

Sl. No.	Action plan	Stakeholder agency	Target date	Goal/ Short term or Long term	Current status with action plan for implementation
	Bhushan Steel & Power plant for control of traffic congestion and SPM.				
6.	Promotion of industries within CPIC area which uses waste products like fly ash, char and waste heat for gainful utilization of solid waste			Long term goal	This action can be implemented after the moratorium on establishment of industries is kept in abeyance. SPCB has already stipulated rebate on consent fees for industries using the waste product as a promotional initiative.
7.	The establishment of on-line monitoring station for water quality monitoring of River Brahmani and online data transmission facility with SPCB and CPCB. The parameters include Fluoride, Cadmium and TOC.	NALCO TTPS (NTPC) Talcher	31.03.2013	Long term goal	Direction will be issued
8.	Pb, Cr, Cd and Fluoride concentrations in Ground water is to be monitored.	MCL	31.03.2013	Long term goal	Direction will be issued

Sl. No.	Action plan	Stakeholder agency	Target date	Goal/ Short term or Long term	Current status with action plan for implementation
9.	Monitoring of $PM_{2.5}$ and Ozone on the points of traffic congestions should be done.	NALCO, Bhusan Ltd. And MCL	31.03.2013	Long term goal	Direction will be issued
10	All the STPs will be provided with a stand-by DG sets to prevent discharge of sewage during power failure	Respective stake holders like MCL, TTPS, NALCO etc.	31.03.2012	Long term goal	Included in the action plan. The direction will be issued.