Haldia

Howrah

Asansol

Comprehensive Environmental Pollution Abatement Action Plans for the Industrial Clusters in West Bengal

West Bengal Pollution Control Board

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Comprehensive Environmental Pollution Abatement Action Plans for the Industrial Clusters in West Bengal

Action Plan for Haldia

[5 km. wide strip of industrial area on southern side of the confluence point of river Hooghly and Rupnarayan, covering Haldia Municipal Area& Sutahata Block-I and II]

FRAMEWORK OF MODEL ACTION PLAN

FOR

CRITICALLY POLLUTED INDUSTRIALAREAS/ CLUSTERS

1.0 INTRODUCTION

1.1 Area Details including brief history (background information) :

Haldia is one of the most rapidly growing towns in West Bengal and in on the deltaic tidal range of the Ganga basin. It is located at distance of 125 km South-West of Kolkata and 50 km from the Bay of Bengal at the confluence of three rivers Hooghly, Haldi & Rupnarayan in Purba Midnapore district. Haldia is also one of the biggest ports in the Eastern region and focal point for industrial development in West Bengal. The Haldia Planning Area (HPA) is bounded by the rivers Hooghly, Haldi & Hajli canal and covers a total area of around 326.85 sq. km. spread over 258 mouzas. The HPA is divided in four police stations namely, Haldia, Mahisadal, Sutahata & Durgachak. The area under Haldia police station is completely urbanized and fall within the Haldia Municipal area. The Sutahata police station, which consists of mouzas of both Sutahata I & II blocks, is the largest police station with 75% of the mouzas under rural occupation.

1.2 Location :

Haldia is located at 22.03 ° N latitude & 88.06 ° E longitude. It has an average elevation of 8 metres MSL.

1.3 Digitized Map with Demarcation of Geographical Boundaries and Impact Zones:

Fig. -1: Boundary of critically polluted area in Haldia

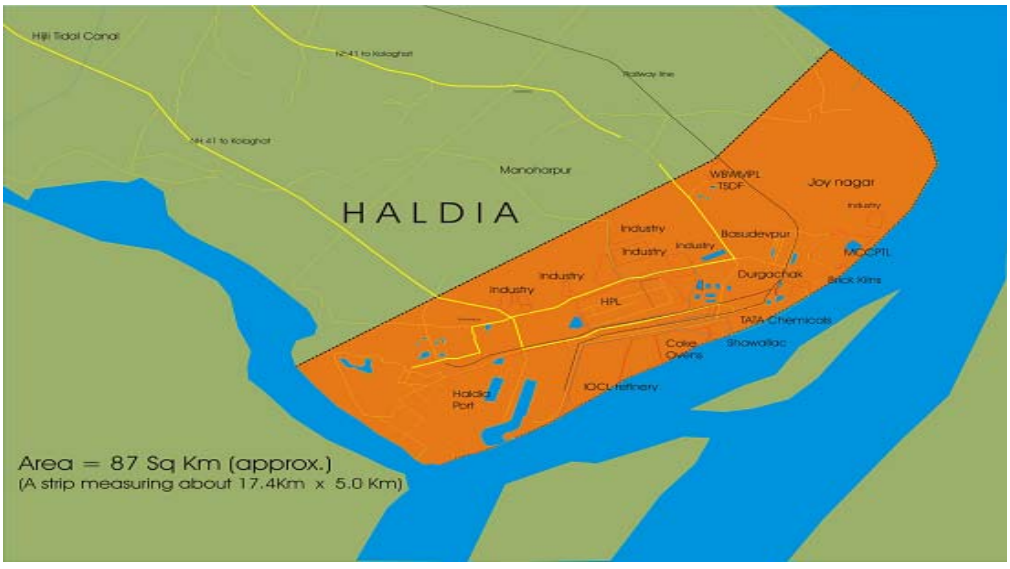
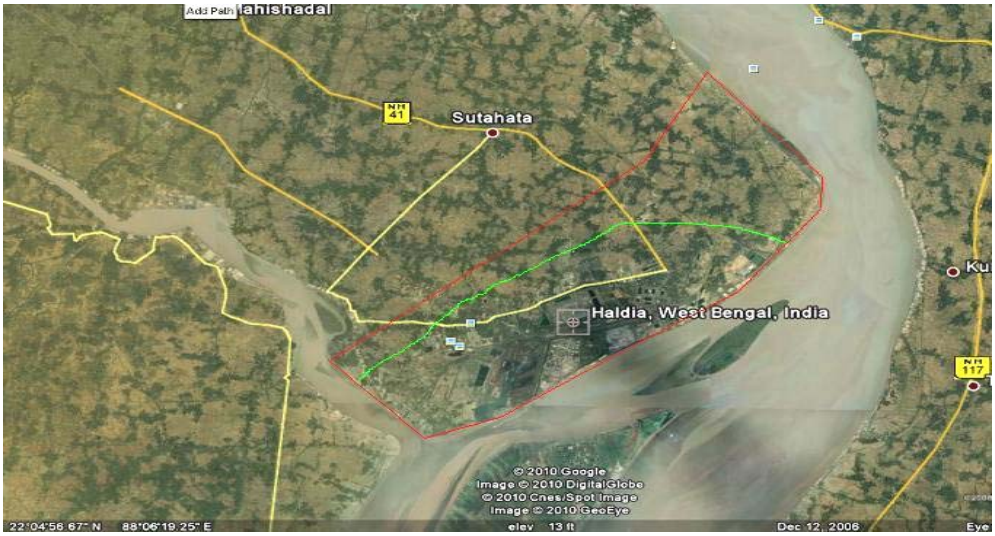


Fig. -2: Boundary (in Red line) of critically polluted area in Haldia demarcated by CPCB (Green line shows the area where industries are located within the identified area and have major impact)



1.4 **CEPI Score** (Air, Water, Land and Total): 53.75, 64.50, 57.00 and 75.43 (CPCB) and 29.875, 54.375, 57.00 and 60.00 (WBPCB).

While preparing the action plan for environmental improvement of Haldia we have assessed the steps taken by the industries in improving the environmental performance during the last one year and also the improvement in the infrastructure of the area, we calculated the CEPI taking current values for different parameters mentioned in the earlier report and found that currently calculated value of CEPIs stands at 60 which is below 70.

However, the State Board and the State Government are fully committed to fulfill the requirement mentioned with specific time frame as mentioned in the action plan.

1.5 **Total Population and sensitive receptors (hospitals, educational institutions, courts, etc.) residing in the area comprising of geographical area of the cluster and its impact zone (minimum 2km) :**

The total population of HPA is around 4.69 lakhs (as per 2001 census) while the population of the Haldia Municipal region is around 1.7 lakhs. The sensitive receptors include one sub-divisional hospital, around 7 nursing homes, about twelve educational institutions, one sub-divisional court are located within Haldia Municipal region.

1.6 **Eco-geological features Impact Zones [the area comprising of geographical area of the cluster and its impact zone (minimum 2 km)]**

1.6.1 Major Water Bodies (Rivers, Lakes, Ponds etc.) :

The river Ganga (locally Hooghly river) and its tributary the river

Haldi and a number of small natural streams draining into them form the main inland water system. Besides, there exist several ponds and ditches in the area under concern. Ponds are utilized mainly for domestic purposes & fish rearing and occasionally for irrigation.

The Green Belt Canal (GBC) which was originally built for fire-water supply to the port area is presently carrying most of the trade effluent of the industries located at Haldia Municipal Area. The GBC has a stretch from the Oil Jetty-1 in the Haldia Dock Area to the Patikhali gate end.

Fig. -3: Stretches of Green belt canal

1.6.2 Ecological Parks, Sanctuaries, flora and fauna or any eco sensitive zones:

The ecologically sensitive Sunderbans area is around 128 km away from Haldia Port. Obliviously, the environmental impact of Haldia Industrial Area is unlikely to have any influence on the ecological sensitive Sundarban.

1.6.3 Buildings or Monuments of Historical / archaeological / religious importance: Not applicable as such, as no such important sensitive structure would be found within HPA or in the neighboring area .

1.7 Industry Classification and distribution (no. of industries per 10 sq. km. area or fraction)

1.7.1 Grossly Polluting Industries and 17 Categories - 9 nos.(List enclosed)

1.7.2 Red Category Industries (54 Categories) - 25 nos.(List enclosed)

1.7.3 Orange and Green Category industries - 90 nos.

2.0 WATER ENVIRONMENT

2.1 Present status of water environment supported with minimum one year analytical data:-

2.1.1 Water bodies / effluent receiving drains in the area important for water quality monitoring:

The GBC and the Hooghly River is regularly monitored at specific locations.

The GBC is guarded by metallic gates at both ends and does not seem to have a definite flow profile. The Patikhali gates are opened to discharge the effluent. The green belt canal receives liquid effluent, that are mostly treated, from different industries through a no. of outfalls. Except 3 nos. of units, viz. IOC, Shree Renuka Sugars Ltd. and United Phosphorous Ltd., all other units discharge their effluent to the canal indirectly i.e. to any other canal/drain/channel which is linked to GBC. IOC discharges only the overflow of its catch pit no. 6 to the canal.

Table 1: Water quality of Green Belt Canal

Stations	COD (mg/l.)		BOD (mg/l.)		Oil & Grease (mg/l.)		Sulphide (mg/l.)		Phenol (mg/l.)	
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
Near Oil Jetty	314.2	251.4	80.8	30.8	19.9	30.1	0.8	0.2	0.8	0.4
CP#1&2 Near TTLGate	153.9	219.1	44.5	44.0	5.4	2.8	0.5	0.1	1.6	0.6
CP#1&2, CP#3 ofIOCL	341.2	297.0	87.6	77.2	10.3	10.6	0.9	0.3	0.6	1.9
Special sample, near pillar no. – 582	413.6	966.3	79.5	228.1	6.3	8.5	0.8	1.9	0.6	0.3
CP#3 & CP#4 of IOCL	289.7	319.3	85.7	95.2	12.2	4.9	0.7	0.4	0.4	0.4
CP#4 & CP#5 of IOCL	203.5	161.9	77.8	45.2	13.9	2.9	1.7	4.8	0.3	0.3
CP#5 & CP#6 of IOCL	745.7	130.2	181.7	46.7	8.8	7.1	2.6	2.8	0.5	0.2
After CP#6 near HT/LT connection point	169.5	236.1	52.9	45.0	5.9	2.9	1.9	0.5	0.2	0.2
Near the Rail Gate infront of the Bridge	124.3	237.4	19.3	17.5	3.3	2.7	0.7	0.1	0.4	0.5
Infront of CFCL main gate	85.1	293.5	20.6	29.1	2.1	2.9	0.8	0.1	0.5	0.2
Near Patikhali gate	78.9	205.6	7.5	16.8	1.8	1.2	0.3	0.1	0.9	0.1

The industries are mostly located along the bank of river Hooghly and on the both sides of Haldia Petrochemical Link Road. Most of these industrial units discharge their effluent into the Green Belt canal leading to the river Hooghly. The water quality of Green Belt canal is regularly monitored by the State Board in eleven sampling stations and the trend of water quality of Green Belt canal is shown below (Table 1). The water quality of Green Belt canal shows exceedence for the parameters like COD and BOD. In case of Sulphide and Phenol, minor exceedence could be observed at one or two stations. Cyanide is not traceable. The level of toxic metals however remains within the permissible standards. **The water quality of Green Belt canal at**

different locations can be used as an indicator of the quality of discharges from individual industries, as most of the industries are having typical characteristic discharges to the Green Belt canal. Presence of any characteristic pollutants of any particular industry can always be used as a clear indication of discharge quality of typical industries discharging such parameters. **It is nevertheless a fact that the water quality of Green Belt canal is much more representative of the possible impact on the surface water bodies due to industrial discharges in this region while compared with similar analysis in the rivers which ultimately receives the effluents.**

2.1.2 Present levels of pollutants in water bodies / effluent receiving drains / ground water (routine parameters, special parameters and water toxics relevant to the area in three categories – known carcinogens, probable carcinogens and other toxics): reports given in Table 2

Table 2 : Ground Water Quality of Haldia

Ground Water Quality of Haldia during 2010 (APRIL)				
Parameter	**Unit**	**HindLever,**	**IOC, Haldia**	**EXIDE, Haldia**
Total Coliform	in MPN/100 ml	nil	nil	nil
Nitrate - N	in mg/l	0.03	0.06	0.08
pH		7.93	8.04	7.41
Fecal Coliform	in MPN/100 ml	nil	nil	nil
Water Temp	in ˚C	33	35	31
BOD	in mg/l	1.5	0.35	1
Conductivity	in µS/cm	20700	1989	20500
Total Alkalinity	in mg/l	296	268	300
TFS	in mg/l	776	994	1012
TDS	in mg/l	1572	1224	1244
Ca as CaCo3	in mg/l	105.96	114.2	85.87
Hardness as CaCo3	in mg/l	368.23	345.05	363.59
Ammonia- N	in mg/l	0.15	BDL	BDL
Turbidity	in NTU	1.1	1.14	7.91
Sodium	in mg/l	329.4	187.6	287.6
Total Kjeldahl N	in mg/l	1.09	1.02	0.8
Chloride	in mg/l	530.53	456.56	484.62
Sulphate	in mg/l	1.22	3.97	0.61
COD	in mg/l	5.55	2.77	2.31
Mg as CaCo3	in mg/l	25.24	14.6	36.92
Boron	in mg/l	0.19	0.27	0.67
TSS	in mg/l	26	28	10
Phosphate	in mg/l	0.01	0.01	0.05
Fluoride	in mg/l	0.36	0.48	0.36
Potassium	in mg/l	4	4	4
Iron Total	in µg/l	0.33	0.25	0.68
Mercury	in µg/l	4.27	4.15	3.23
Zinc	in µg/l	22	BDL	15
Nickel	in µg/l	nil	nil	nil
Chromium Total	in µg/l	nil	nil	nil
Lead	in µg/l	1.7	nil	1.94
Copper	in µg/l	nil	nil	nil
Cadmium	in µg/l	nil	nil	nil
Arsenic	in µg/l	nil	nil	nil

2.1.3 Predominant sources contributing to various pollutants:
Oil Refinery, Petro- chemical units, Pesticide manufacturing unit, Lead-acid battery manufacturing unit, Vegetable Oil processing units, Fertilizer manufacturing unit and Sugar Refining unit.

2.2 Sources of water pollution

2.2.1 Industrial- effluent generated by the various process industries - 20-22 MGD.

2.2.2 Domestic- municipal sewage arising out of the residential establishments – 1.5-2.0 MGD.

2.2.3 Others (Agricultural runoff, leachate from MSW dump, illegal dump site etc.)- NA.

2.2.4 Impact on surrounding area under consideration- (ground water reports enclosed)

2.3 Details of Water Polluting Industries in the area / cluster :

Oil Refinery, Petro-chemical units, Pesticide manufacturing unit, Vegetable Oil processing units, Lead-acid battery manufacturing unit, Fertilizer manufacturing unit and Sugar Refining unit.

2.4 Effluent Disposal Method Recipients water bodies etc.

All the units have established Effluent Treatment Plants (ETPs). The treated effluent is discharged mainly to the GBC (which leads to River Hooghly) and directly to the River Hooghly in a couple of cases.

2.5 Quantification of wastewater pollution load and relative contribution by different sources viz industrial / domestic

2.6 Action Plan for compliance and control of pollution

The State Board and the State Government are fully committed to take appropriate actions to fulfill the objective of improving the environmental condition of Haldia with specific time bound action. In the following section the action plans and their commissioning and completion are illustrated below mentioning also the progress during the last one year.

Table 3 : Status of compliance by the Industries

Name of the industry	Technology adopted during last one year			Time frame	Remarks
	Air	Water	Land		
M/s. India Oil Corpn. Ltd. (Haldia Refinery)	1. Steps to reduce VOC emission 16 nos. fixed tank are converted to floating roof double sealed tank 2. Online motoring facilities for Sox, Nox,PM-2.5, NH3, Pb, O3, Bengne, As, Ni,	1. Augmentation of existing ETP – To improve the quality of treatment as per MINARS and maximize reduce treat	Save disposal of oils sludge – by Bio-Methanation	Jan 2010	All ready implemented

Name of the industry	Technology adopted during last one year			Time frame	Remarks
	Air	Water	Land		
	3. Flare gas recovery system 4. Once through Hydrocracker Project	water (Recycling increase 0.42 – 0.66 m3 / MT of crude production 2. Rain water harvesting through 03 nos. Wells		May 2010 2010	
2. Haldia Petro chemical Ltd.	1.Replacement of the faulty flare tip during Revamp Shutdown. 2.Establishment of LDAR system across all the plants – periodical monitoring and quantification of fugitive emission/leakage from various pump seals, flange joints, valves, compressors etc. with the help of PID Analyzers. Arresting of these leakages on periodical maintenance/opportunity based maintenance/shutdown of the plant and re-checking of leakage/fugitive emission. An approx. expenditure towards this LDAR programme 3. Foam seal and Foam Pourer system in External Floating Roof Tank in order to arrest/minimize leakage of hydrocarbon 4. Nitrogen blanketing in Internal Floating Roof Tank with installation of Pressure Control Valve to arrest venting of hydrocarbon vapour 5.Started measurement of PM2.5 w.e.f 01/09/2010 – in addition, the	1. Na2 S is converted sodium thiosulphate by oxidation process in NCU 2. Neutralization by CPI in NCU for removal of floating oil from fules 3. Up gradation in TPI Separator to improve oil recovery . 3. Up gradation of Sanitary Sewer Treatment System	De watering poly electrolyte is used to achieve better sludge consistency finally the sludge is stored in secured On-Site storage pit. Co-processing of spent catalyst shall be started.	2009-2010	An approx. expenditure of Rs. 1.5 Crore Rs. 10 Lacs

Name of the industry	Technology adopted during last one year			Time frame	Remarks
	Air	Water	Land		
	measurement of the same by High Volume Sampler 6. Change of fuel from Naptha to fuel gas			Oct. 2010	
3. Exide Industries Ltd.	1.Forming operation as already discarded in Automotive section. 2. Up gradation of exhaust system in rotary shaker area 3. Bag filter install spine casting	**1.** Reuse /Recycle of effluent (195Kl/day) 2. Elimination of NH3 dipping operation.	**-**	Already implemented	Conversion in progress already 250 laks Also reduce sludge generation
3. MCC PTA India Cor. Pvt. Ltd.	1. Off-gas and VOC-combustion unit Desulphurization unit has been installed for flue gas cleaning 2. LDAR Monitoring in Expansion plant has been initiated and will be completed by end of 2010. 3. Installation of automatic air quality monitoring station . 4. Online stack & VOC monitoring have been installed at various strategic points. 5. Double sealed equipment have been installed to reduce VOC at source. 6. Low NOx burners, Alkaline scrubber and Dedicated incinerator have been installed. 7. Reduction in Consumption of FO (20%)	1. New & dedicated Waste water treatment plant with Equalization tank (Activated Sludge with diffused aeration) installed in Expansion plant. The same is DCS controlled with on-line monitoring facilities like in the existing plant. 2. Marine Impact Assessment study for additional discharge from the new plant has been conducted. The study shows no adverse impact on the	1. Co-processing of solid Hazardous waste (ETP & Process Sludge, Scrap PTA, PTA Liner, Oil & Chemical soaked cotton waste) with M/s Ambuja Cements initiated & now waiting for trial burn in their Incinerator. 2. Used & Waste Oil is being periodically disposed off through Registered Recycler & Reprocessor. Initiative taken for Re-processing & taking back the contaminated Heat Transfer	Already implemented	**-** **2010** **2009-2010**

Name of the industry	Technology adopted during last one year			Time frame	Remarks
	Air	Water	Land		
		River.	Oil into our system.		
4. United Phosphorus Ltd.(M/s. Shaw Wallace India Ltd.)	1.Instalation of new FVC boiler with bag filter as APCD 3. Methanol recovery from effluent before entry to ETP	1. Use of solvent in place of chilled water 2. Recovery of solvent increase from 92% to 97% by tertiary heat exchanger 3. Separation of Hydrazine as hydrazine sulphate and recovered the same ths COD redues from 350,000 to 70, 000 mg/l	-	Already implemented	2009-2010
5. Tata Chemicals Ltd.	1. Dry Fog system and water sprinkling System. (Coal Handling plant, coke Handling plant, Material Handling System, Wagon Trippler) 2. Fully covered Wagon Tippler and conveyor belts . (Coal unloading station). 3. Green Belt Development. Within factory premises. 4. Power plant with 16 nos of WHRBs. Along with the process.	1. Boiler blow down water is mixed with quenching pond water and is used for Coke quenching purpose in 2 rows 2. Cooling Tower discharge water is mixed with quenching pond water and is used for Coke quenching purpose in other 2 rows 3.Quenching	1.Coke Swamp breeze is the only solid waste (non – hazardous in nature) generated from the process. The average generation of swamp breeze is approx 1000 tons per month which is being sold to third party completely 2. Total 15000 (approx) numbers of trees planted till date, nearly 2000 saplings have been planted	Already implemented	1.5 Crs 20 Crs 40 lakhs / year since last two months 850 Crs

Name of the industry	Technology adopted during last one year			Time frame	Remarks
	Air	Water	Land		
		water is fully recycled in the process with "zero discharge" in surface drain. 4. The gypsum pond is provided with 2.4 KM long HDPE lining to prevent leahing.	in HIT road, Haldia.		
6.Electrosteel Casting Ltd.	1. Increased DFS (21 nos.) points at crusher transfer and stock house. 2. Enclose of the bottom pace of iron crusher, coal and iron fines by Bankers to reduce fugitive emission 3. Concreting of unpaved road 4. Installation of additional pneumatic system for handling of bottom ash 5. Moistening of raw material with sprinkler during loading and unloading period	1. Recycling the Ejector condensates order of carbine auxiliary system to boiler 2. Reduction of soot blowing operation 3. Rain water harvesting 4. Recycling CPP blow down water	1. MSW installed by Haldia Municipality 2. Already planted 2015 saplings inside factory premises.	2009-2010	Already implemented Invested approx. 8.75 lacs
7.Shree Renuka Sugars Ltd.	1. Installation of Dense Phase Pneumatic fly ash handling system at ESP 2. Improve ash handling system by bullets. 3. Installation of bag filter at coal crushing area of Power Plant. 4. Use of imported (low ash content) coal to improve stack emission quality.	1. Installation of new pipe line for discharging treated effluent to GBC 2.	1. Solid waste is disposed through WBWML. And ETP sludge is used in gardening purpose. 2. Planted approx. 6000 plants	2010	Already invested 150.0 lacs
8. Dhunseri Petrochem & Tea Ltd.	1. On-line stack monitoring 2. Three field ESP with economizer in CPP 3. On-line ambient air quality monitoring.	1.Recycling of treated water for dust suppression at coal handling area	-	2009-2010	Already implemented Already invested 167.5 lacs

Name of the industry	Technology adopted during last one year			Time frame	Remarks
	Air	Water	Land		
		2. Rain water harvesting 3. Concreting total in-plant road to minimize dust pollution. 4. Steam stripping of effluent to reduce effluent load.			

The only industry discharging cyanide in effluent M/s. CFCL is closed.

2.6.1 Existing infrastructure facilities – Water quality monitoring networks, ETPs, CETPs, Sewerage Treatment Plant of industry (STPs), surface drainage system, effluent conveyance channels / outfalls etc.:
The State Board monitors the level of pollutants in the River Hooghly and the GBC regularly. Besides this the individual units are monitored w.r.t. their effluent discharge by maintaining a proper schedule. All the units have established Effluent Treatment Plants (ETPs) of their own. There is no CETP. One STP exists for the industrial township.

2.6.2 Pollution control measures installed by Industries- effluent treatment plants have been installed by the industrial establishments.

2.6.3 Technological Intervention

2.6.3.1 Inventorization of prominent industries with technological gaps - M/s Tata Chemical Ltd. (non-compliance w.r.t. to Fluoride in water). ETP to be upgraded w.r.t. to Fluoride removal from the effluent.

2.6.3.2 Identification of low cost and advanced cleaner technology for pollution control.- 2-column lime stone reactor for Fluoride removal (low cost) and installation of RO unit as tertiary treatment (advanced technology). [IOC, Haldia Refinery has already installed a RO system to treat its effluent so that it becomes suitable for reuse.]

2.6.4 Infrastructure Renewal

2.6.4.1 Details of existing infrastructural facilities- The Green Belt Canal with its various contributory channels carrying industrial

effluent, domestic effluent and storm water.

2.6.4.2 Need of up gradation of existing facilities - proper maintenance (by dredging/de silting) of the GBC and canals/drains connected to it.

2.6.4.3 De-silting of water tanks, drains, rivulets, etc.- de siltation of the GBC.

2.6.4.4 Construction of lined drains/ connections- drains connected to the GBC to be lined for about 7 km.

2.6.4.5 Treatment and management of contaminated surface water bodies – No such water bodies other than GBC.

2.6.4.6 Rejuvenation/ Management Plan for important eco-geological features – Not applicable.

2.6.4.7 Carrying of effluent from industrial units located in non-industrial locations to CETP facilities by lined drains/ pipelines only and prevention of their disposal into city sewerage/ surface drains – Not required as there is no such industrial unit in non-industrial area.

2.6.4.8 Installation of Gen sets at CETPs- Not applicable.

2.6.5 Managerial and Finance aspects –

2.6.5.1 Cost and Time estimate – Rs. 604 approx. To be completed by 2015.

2.6.5.2 Identified Private / Public sector potential investors and their contribution / obligation - Not identified

2.6.5.3 Government Budgetary support requirement - Required

2.6.5.4 Hierarchical and structured managerial system for efficient implementation – Major infrastructural program will be coordinated by HDA & HMC while the industrial aspects will be coordinated by the State Board.

2.6.6 Self Monitoring System in Industries (ETPs) - exist.

2.6.7 Data Linkages to SPCB / CPCB (of monitoring devices) – presently not existing.

3.0 AIR ENVIRONMENT

3.1 Present status of Air Environment supported with minimum one year analytical data

3.1.1 Critical locations for air quality monitoring - one Automatic Ambient Air Quality Monitoring Station and four Semi Automatic Air Quality Monitoring Stations present.

3.1.2 Present levels of pollutants in air (routine parameters, special parameters and air toxics relevant to the area in three categories – known carcinogens, probable carcinogens and other toxic). Please see Table - 2 & 3

Table 2 : Ambient Air Quality at Haldia

Station	Month	RPM(µg/m^3)	SO_2(µg/m^3)	NO_2(µg/m^3)
Supermarket	Nov. 2009	78	11.1	45.0
	Dec. 2009	68	11.2	50.6
	Apr. 2010	29	10.7	50.7
	May. 2010	29	10.7	50.7
WBIIDC Building	Nov. 2009	91	11.3	46.5
	Dec. 2009	112	11.0	49.2
	Apr. 2010	37	11.4	50.5
	May. 2010	37	11.3	50.5
Bhowanipur	Nov. 2009	88	11.0	45.9
	Dec. 2009	116	10.9	49.4
	Apr. 2010	41	12.7	53.1
	May. 2010	41	12.7	53.1
Bhunia-Raichak	Nov. 2009	62	10.6	44.2
	Dec. 2009	85	10.5	49.5
	Apr. 2010	50	11.7	52.5
	May. 2010	50	11.7	52.5
National Standard		**100**	**80**	**80**

Table 3: Levels of Carbon Monoxide and Ozone at Haldia

	Dec. 2009	Jan. 2010	Feb. 2010	National Standard
Ozone (ppb)	15.21	16.5	20.5	**100 µg/m^3**
Carbon Monoxide (mg/m^3) (00:00 to 08:00)	1.84	1.4	1.1	**2 mg/m^3**
Carbon Monoxide (mg/m^3) (08:00 to 16:00)	1.04	1.0	0.7	**2 mg/m^3**
Carbon Monoxide (mg/m^3) (16:00 to 24:00)	2.29	1.8	1.1	**2 mg/m^3**

Both CO & O3 in Haldia air remain below the National Standard even during the winter months when air quality becomes worse due to stagnation of air caused by temperature inversion.

3.1.2 Predominant sources contributing to various pollutants –
Industrial pollution arising out of different industries like refineries, fertilisers, pesticides, petro- chemical, industrial batteries, sponge iron industries, non-recovery type coke ovens, vegetable oil processing etc.

3.2 Sources of Air Pollution viz industrial, domestic (Coal & Biomass Burning), natural and Transport & Heavy Earth Movers.- Other than industrial pollution, vehicular pollution and pollution generated in domestic settlements due to fossil fuel burning.

3.3 Air Polluting Industries in the area/ cluster- 32 nos. including 7 grossly polluting industries.

3.4 Impact of activities of nearby area on the CEPI Area-Ambient air quality data given in Table 2& 3.

3.5 Quantification of the air pollution load and relative contribution by different sources - Not quantified.

3.6 Action Plan for compliance and control of pollution

3.6.1 Existing infrastructure facilities – Ambient air quality monitoring network through Respiratory Dust Sampler (RDS) and Automatic Ambient Air Quality Monitoring Station (AAQMS) unloading the air quality data in the Central Server at Paribesh Bhawan.

3.6.2 Pollution Control Measures installed by the individual sources of pollution- Report enclosed.

3.6.3 Technological Intervention

3.6.3.1 Inventorisation of prominent industries with technological gaps- No such industry.

3.6.3.2 Identification of low cost and advanced cleaner technology for pollution control- Not applicable.

3.6.3.3 Introduction and switch over to cleaner fuel- 02 nos. industries.

3.6.4 Need of Infrastructure Renovation-

3.6.4.1 Development of Roads- Development of HPL Link Road has been done for 6.2 km, at NH standard. Road from HPL Lind Rd. to M/s. Electrosteel Castings Ltd. is being developed and such work upto M/s. Emami Biotech Ltd. has been taken up.

3.6.5 Impact on CEPI score after installation / commissioning of full fledged air pollution control systems –Will be measured after implementation of action plans. However, during intermediate time the score will be verified to acess the success of action plan.

3.6.6 Managerial and Finance aspects

3.6.6.1 Cost and Time estimate

3.6.6.2 Identified Private / Public sector potential investors and their contribution / obligation

3.6.6.3 Government Budgetary support requirement

3.6.6.4 Hierarchical and structured managerial system for efficient implementation

3.6.7 Self monitoring system in industries (Stacks, APCDs)- Almost all the

industries are being monitored maintaining a proper schedule to judge the efficacy of the APCDs as suggested by WBPCB for controlling process emission.

3.7 Data Linkages to SPCB / CPCB (of monitoring devices)- Automatic ambient monitoring station installed by WBPCB has the facility of accessing the data on line.

4.0 LAND ENVIRONMENT (Soil and Ground Water)

4.1 Soil contamination

4.1.1 Present Status of land environment supported with minimum one year analytical data- No such evidence.

4.1.2 Critical locations for land / soil pollution assessment and ground water monitoring- Three (03) aquifer monitoring stations already exist

4.1.3 Present levels of pollutants in land/ soil and ground water (routine parameters, special parameters and water toxics relevant to the area in three categories – Report enclosed. (known carcinogens, probable carcinogens and other toxic)

4.1.4 Predominant sources contributing to or posing danger of pollution of land and ground water such as hazardous / toxic wastes or chemicals dumps/ storage etc. - Nil. All hazardous waste generating industries dump their waste in TSDF facility exist in that area.

4.1.5 Sources of Soil Contamination – No evidence available so far.

4.1.6 Types of existing pollution- Not applicable.

4.1.7 Remedies for abatement, treatment and restoration of normal soil quality- Not applicable

4.2 Ground water contamination

4.2.1 Present Status / quality of ground water –

The Central Ground Water Board is of the view that the underground water situation in Haldia is fragile and advices against indiscriminate sinking of tube wells for fresh water. Hydro chemical characteristic of the ground water in this region in which fresh water group of aquifers occurs within span of 120-300 m sandwiched between saline to brackish aquifers.

4.2.2 Source Identification (Existing sources of Ground water Pollution)- In process

4.2.3 Ground water quality monitoring program- SPCB done periodically at three stations.

4.2.4 Action Plan for control of pollution including cost/ time aspects – (1)

Establishment of proper lining under the gypsum pond of M/s. TATA Chemicals to take care of fluoride contamination in land and ground water (Completed at a cost of Rs.1.5 crores); (2) De-siltation followed by treatment of contaminated Green Belt canal are in progress and expected to be completed within 2012).

4.2.5 Treatment and management of contaminated ground water bodies etc.- Not Available.

4.2.6 Impact on CEPI score after abatement of pollution- CEPI Score will significantly reduce.

4.3 Solid Waste Generation and Management

4.3.1 Waste Classification and Quantification

4.3.1.1 Hazardous waste – 7760.554 MT/year

4.3.1.2 Bio-medical waste – 169.5 Kg/day

4.3.1.3 Electronic waste – Inventorisation of E-waste for Haldia has not yet been undertaken. However, initiative has already been taken for development of a common E-waste management facility for state of W.B .

4.3.1.4 Municipal Solid waste / Domestic waste / Sludge from ETPs / CETPs / STPs and other industrial sources – 50 MT/day

4.3.1.5 Plastic Waste-Not yet quantified .

4.3.1.6 Quantification of wastes and relative contribution from different sources- Quantification of hazardous industrial waste, bio-medical waste and MSW is as per 4.3.1, 4.3.2 &4.3.1.4…..

4.3.2 Identification of waste minimisation and waste exchange options- M/s. UPL & M/s. Tata Chemicals.

4.3.3 Reduction / Reuse / Recovery / Recycle options in the co-processing of wastes - 02 nos of industries (namely Exide Industries Ltd. and Tata Chemicals) are reusing their waste in process.

4.3.4 Infrastructural facilities-Infrastructure already exists but need further expansion/up gradation.

4.3.4.1 Existing TSDF / Incineration facilities including capacities- Yes.
Direct Landfill – 1,20,000 TPA
Stabilisation - 60,000 TPA
Incineration - 20,000 TPA

4.3.4.2 Present status / performance and need of up gradation of existing facilities including enhancement of capacities -. Capacity of the First cell of the land fill facility will be exhausted shortly and development of second cell is in progress.

4.3.4.3 Treatment and management of contaminated waste disposal sites etc.- Management of Green Belt as mentioned in item no.

4.3.4.4 Impact on CEPI score after proper management of Solid Wastes- CEPI Score will reduce.

5.0 PPP Model

5.1 Identification of project proposals (for both the options i.e. technology intervention and infrastructure renewal) for implementation under the PPP model under the Action Plan-
Integrated Common TSDF for hazardous waste, bio-medical waste and MSW facility has been developed by M/s. West Bengal Waste Management Ltd., a joint venture company of HDA and M/s. Ramky Environment Engineers Pvt. Ltd. & (ii) Water Treatment Plant and Water Supply system as been managed by M/s. Haldia Water Management ltd a joint venture company of M/s.JUSCO and H.D.A.

5.2 Identification of stakeholders / agencies to be involved and to evolve financial and managerial mechanisms for implementation of PPP projects- HDA, Industrial entrepreneur and WBPCB.

6.0 Other infrastructural Renewal Measures

6.1 Green Belts - To be developed.

6.2 Development of Industrial Estate(s) - Infrastructure of existing small scale industrial estate to be upgraded.

6.3 Development / shifting of industries located in the non-industrial areas to the existing / new industrial estates -

7.0 Specific Schemes:

7.1 GIS-GPS system for pollution sources monitoring –HDA is preparing GIS map for old planning area where all the industries and other utilities will be marked.

7.2 Hydro-geological fracturing of water bodies rejuvenation - Not available.

7.3 In-situ remediation of sewage - Units having their individual septic tank and soak pits.

7.4 Utilization of MSW inert by gas based brick kilns - Nil

7.5 Co-processing of wastes in cement industries - Nil.

- **Public Awareness and Training Programmes-** Always to be encouraged.

- **Overall Impact of Installation / commissioning of pollution control equipments / measures on the CEPI score -** Would be reduced significantly.

- **Assessment of Techno-economical feasibility of pollution control systems in clusters of small / medium scale industries. - Not assessed.**

- **Efforts shall be made to encourage use of Bio-compost and Bio-Fertilizer along with the chemical fertilizer in the state to minimize the unutilized chemical fertilizer run-off into the natural water resources from agriculture fields (through Govt. policy) -** Efforts are being made.

Summary of proposed action points :

Short Term Action Points (upto 1 year, including continuous Activities)

Sl. No.	Action Points (including source & mitigation measures)	Responsible Stake Holders	Time Limit	Cost	Remarks
1.	Continuous on-line monitoring system for all other relevant stacks to be installed. The data generated will be transferred to CPCB through SPCB. Currently VOC monitoring in IOC and the adjacent area through VOC meter. This programme will be further augmented by commissioning one additional Continuous Ambient Air Quality Monitoring System. Two more High Volume Samplers to be installed in Township A part of FO may be replaced by low-Sulphur fuel gas. On-line stack monitoring system to be installed for the incinerator stack. Out of 900m stretch of the GBC previously earmarked, 500m has been de-silted. The rest portion i.e., 400m will be de-silted and to be bio-remediated, if possible. Application of high emissivity ceramic coating in Crude Distillation in Unit-2	M/s IOCL- Haldia Refinery	31/03/2011 2011 31/12/2010 31/03/2011 31/12/2010	-	- to be borne by the unit.
2.	Monitoring system & off-gas burning system for VOC reduction for the old plant to be completed.	M/s MCCPTA	30/06/2011	-	to be borne by the unit.

Sl. No.	Action Points (including source & mitigation measures)	Responsible Stake Holders	Time Limit	Cost	Remarks
	Program for reusing the treated water for various plant purposes like gardening, maintaining green belt, road washing, etc., in order to reduce total water consumption. Will set up AAQ monitoring station.		30/06/2011 30/06/2011		
3.	Nitrogen blanketing in Internal Floating Roof Tank with installation of Pressure Control Valve to arrest venting of hydrocarbon vapour. Program for reusing the treated water for various plant purposes like gardening, maintaining green belt, road washing, etc., in order to reduce total water consumption. Usage of metallic gaskets in all pressurized hydrocarbon pipeline/flange/pump joints Connection of all PSVs/TSVs to 120 m high Flare Stack Benzene Recovery Unit for collection of benzene vapors during loading	M/s Haldia Petrochemicals Ltd	30/06/2011	-	to be borne by the unit.
4.	Continuous on-line monitoring systems with real time reading to be installed for the stack connected to TFHs. Leak Detection & Repair (LDAR) program along with installation of gas sensors to be explored. Will set up AAQ monitoring station. Program for reusing the treated water for various plant purposes like gardening, maintaining green belt, road washing, etc., in order to reduce total water consumption. Steam stripping of effluent to reduce effluent load On-line stack monitoring of Coal Heater	M/s South Asian Petrochemicals Ltd (M/s. Dhunseri Petrochem & Tea Ltd.)	31/03/2011 30/06/2011 30/06/2011 30/06/2011	60 lacs 50 lacs 3.5 lacs	to be borne by the unit.
5.	Another 7 nos. DFS to be installed in different locations Off-line bag filter for Product House is under progress and expected to be completed	M/s Electrosteel Castings Ltd	30/06/2011 31/03/2011	6.0 lacs 10.0 lacs	to be borne by the unit.

Sl. No.	Action Points (including source & mitigation measures)	Responsible Stake Holders	Time Limit	Cost	Remarks
	Total unpaved road to be concreted More green belt to be developed The unit has already installed 2 nos. Continuous on-line stack monitoring systems to be installed for the stacks connected to the rotary kilns & the coke ovens. Will install automatic AAQ monitoring station with real-time reading. Will install monitoring system for Benzo(a)pyrene.		31/07/2011 31/03/2010	3.5 lacs 0.30 lacs	
6.	Proper cover for open air storage of raw-materials/coal to be done. Will install monitoring system for Benzo(a)pyrene.	M/s Tata Steel Ltd - Hooghly Met Coke Div.	31/03/2011	-	to be borne by the unit.
7.	The unit has already installed 2 WHRBs for 2 (out of 3) coke ovens. It will provide WHRB for the 3rd coke oven also. Will install monitoring system for Benzo(a)pyrene.	M/s Ennore Coke Ltd	31/03/2011	-	to be borne by the unit.
8.	Continuous on-line stack monitoring systems to be installed for the stack connected to Aluminium melting furnaces. The neutralized effluent from the neutralizing chamber to be passed through an Iron-removal filter prior to discharge/reuse of the effluent which is to be installed.	M/s Manaksia Ltd	31/03/2011 31/03/2011	---------	to be borne by the unit.
9.	Will install Dry Fog Dust suppression systems for controlling fugitive emission. The unit has multi-Cyclone & Bag-filter as the APCDs for the Sub-merged Electric Arc Furnaces. Will enclose collection hoppers of bag houses on all sides with opening door for removal of bag-filter dust	M/s Modern India Concast Ltd	31/12/2010 31/12/2010	-	to be borne by the unit.
10.	Will install Dry Fog Dust suppression systems for controlling fugitive emission. The unit has Bag-filter as the APCD for the Sub-merged Electric Arc Furnaces. Will enclose collection hoppers of bag-houses on all sides with opening door for	M/s Rohit Ferro Tech Ltd.	31/12/2010 31/12/2010	-	to be borne by the unit.

Sl. No.	Action Points (including source & mitigation measures)	Responsible Stake Holders	Time Limit	Cost	Remarks
	removal of bag-filter dust.				
11.	Minimization of water consumption to be explored through reuse of water. Use of NaOH in place of lime in the ETP to be explored for minimization of sludge generation.	M/s Exide Industries Ltd	31/03/2011 31/03/2011	-	to be borne by the unit.
12.	Continuous on-line stack monitoring systems to be installed for the 8 tph coal-fired boiler. ETP will be augmented and upgraded for handling existing as well as incremental waste-water load.	M/s United Phosphorous Ltd	30/06/2011 31/03/2011	-	to be borne by the unit.
13.	Continuous on-line stack monitoring system to be installed for the stack connected to the 90 TPH pulverized coal-fired boiler. Continuous effort to be made to minimize spillage & leakage from the process to reduce effluent generation. Necessary steps for abatement of odour arising out of spillage of raw sugar during transportation/unloading to be taken.	M/s Shree Renuka Sugars Ltd	31/03/2011 31/03/2011 31/03/2011	-	to be borne by the unit.
14.	Continuous on-line stack monitoring systems to be installed for monitoring particulate matter emission & Interlocking facility shall be provided with the APCD. Continuous on-line stack monitoring system for monitoring NOx to be provided for the stack connected to the Rotary Kiln of the STPP plant stack. Facility for monitoring ambient air quality at least 3 locations shall be developed. ETP to be upgraded to meet permissible limit for Fluoride.	M/s Tata Chemicals Ltd	31/03/2011 30/06/2011 30/06/2011 31/03/2011	-	to be borne by the unit.
15.	Continuous on-line monitoring systems for stacks (connected to coal/oil-fired boiler/TFH with real time reading to be installed. Pneumatic Ash handling system to be adopted for collection and disposal of ash from the bottom of the APCDsn (ESP/Bag-filter/Cyclone Separator) Dust extraction system shall be installed in the coal crushing section.	Vegetable Oil Processing Units (M/s Adani Wilmar Ltd., M/s Ruchi Soya Industries Ltd., M/s Gokul Refoils & Solvent Ltd., M/s K.S. Oils Ltd., M/s Emami Bio-Tech	30/06/2011 30/06/2011 30/06/2011	-	to be borne by the unit.

Sl. No.	Action Points (including source & mitigation measures)	Responsible Stake Holders	Time Limit	Cost	Remarks
	Treated water shall be reused for various purposes like gardening / maintaining green belt, sprinkling in dust prone area, etc.	Ltd.)	31/12/2010		

Long Term Action Points (more than 1 year)

Sl. No.	Action Points (including source & mitigation measures)	Responsible Stake Holders	Time Limit	Cost	Remarks
1.	Will install 2 additional WHRBs for the 2 coke oven plants. Green belt to be developed over at least 33% of the plant premises.	M/s Electrosteel Castings Ltd	31/03/2012 31/03/2012	-	to be borne by the unit.
2.	Green belt to be developed over at least 33% of the plant premises.	M/s Modern India Concast Ltd	31/03/2012	-	to be borne by the unit.
3,.	Green belt to be developed over at least 33% of the plant premises.	M/s Rohit Ferro Tech Ltd	31/03/2012	-	to be borne by the unit.
4.	Automatic grid caster to be installed	M/s Exide Industries Ltd	30/11/2011	-	to be borne by the unit.
5.	Green belt to be developed over at least 33% of the plant premises. Future proposal of re-utilization of treated effluent in process.	M/s United Phosphorous Ltd	31/12/2012	-	– to be borne by the unit.
6.	Facility for rain water harvesting to be implemented	Individual industry	31/12/2012	-	to be borne by the unit.
7.	De-siltation of Greenbelt canal and new drainage facility is to be made to link with the Greenbelt canal.	IOC & KoPT.	31/12/2013	6.00 cr.	to be borne by the stake holders. HDA may coordinate.
8.	Development of infrastructure such as improvement of road conditions, railway flyover, construction of Truck terminals and parking facility.	Railway Authority, KoPT, Haldia Municipality and NHAI.	31/12/2015	4945.6 cr.	To be borne by the stake holders. A plan has been submitted and it is under consideration for external aid. HDA may coordinate.
9.	Proper infrastructure for Collection, transportation, segregation, treatment and disposal of Municipal solid waste	M/s. WBWML and Haldia Municipality	31/12/2012	1 cr.	to be borne by concerned Authority.
10.	Development of adequate Greenbelt along the periphery of each individual industry as well as industrial estate.	Concerned industry and Municipal Authority	31/12/2012	5.0 cr.	to be borne by concerned Authority.
11.	Training / Awareness Program for off-site	District	31/12/2012	50.0	To be borne

Sl. No.	Action Points (including source & mitigation measures)	Responsible Stake Holders	Time Limit	Cost	Remarks
	emergency	Administration, Haldia Municipality and HDA.		lakhs	by the stake holders. To be coordinated by ADM, Haldia.
12.	Setting up of Automatic air quality monitoring stations including introduction of VOC monitoring in strategic location especially Chemical and Petro-Chemical industries.	Individual industries	31/12/2012	-	To be borne by the concerned unit. Work to be coordinated by the State Board.
13.	To materialize the Co-processing of hazardous waste in long run To install similar Off-gas burning unit in the existing plant based on the performance of the present installation with an investment of 2.6 Million US $. To install similar Alkaline scrubber in the existing plant for flue gas cleaning for reduction of SOx based on the performance of the present installation. To upkeep the existing green belt & landscaping with new plantation.		2014 2013	3 Million US $.	to be borne by the unit.
14.	Laying of sewerage system and sewage treatment plant	HDA & Haldia Municipality	31/12/2015	213.93 cr.	to be borne by the stake holders. A plan has been submitted and it is under consideration for external aid.
15.	Storm water management	HDA, Haldia Municipality and Irrigation Deptt.	31/12/2013	198 cr.	to be borne by concerned Authority.

List of 17 Categories & GPI Industries

Sl. No.	Name of the Industries
1.	Indian Oil Corporation Limited, Haldia Refinery
2.	Haldia Petrochemicals Limited
3.	MCCPTA India Corporation Pvt. Limited
4.	Tata Chemicals Limited
5.	Exide Industries Limited
6.	United Phosphorous Limited
7.	South Asian Petrochemicals Limited
8.	Electrosteel Castings Limited
9.	Shree Renuka Sugar Limite

List of Red & Sp. Red Category Industries

Sl. No.	Name of Industries
1.	Mars Chemical Company, Durgachak Industrial Estate.
2.	Alide Corporation, Mohona Commercial Complex, Haldia Township
3.	Shamman Ispat Ltd.
4.	Haldia Retreading Company, Hazramore, Basudevpur.
5.	Pioneer Minerals (P) Ltd.
6.	Allied Technipark, Dighasipur, Chakdwipa.
7.	Consolidated Fibres & Chemicals Ltd.
8.	Hind Lever Chemicals Ltd.
9.	Hindusthan Fertilizer Corporation Ltd.
10.	IBP Co. Ltd.
11.	Poddar Silicates
12.	Durgachak Gas Service
13.	Quasim Chemicals (P) Ltd.
14.	Swazol Organics
15.	United Phosphorous Ltd.
16.	Unicrystal Technochem

17.	Praxair India Ltd.
18.	Hindusthan Lever Ltd.
19.	Ruchi Infrastructure Ltd.
20.	M. P. Glychem Industries Ltd.
21.	International Seaports (Haldia) (P) Ltd.
22.	East India Chemicals Ltd.
23.	CWHFC-HCIL (JV), The First Club
24.	Tinna Overseas Ltd.
25.	Hindusthan Lever Ltd.

CEPI calculation methodology

Calculation of the Sub- Index

After calculating A, B, Ca and D; calculate the sub indeed score as:
SCORE = (A+B+C+D)

A (Pollutant score) = (Estimated score Based on the dated on the presence of toxins + Score based on the pollutant concentration date)

B(Pathway score) = (Estimated score based on the pollutant concentration data = Score based on the impact on people + Score based on the impact on eco-geological features)

C (Receptor score) = (Estimated score based on potentially affected population + Score based on the level of exposure + Score based on the risk to sensitive receptors)

D (Additional high risk element) = (Based on the information on pollution control facilities)

Sub indeed scores to be calculated for each of the individual environmental components that is, Air Environment, Surface Water Environment, and Soil & Ground Water Environment separately.

Calculation of the Aggregated CEPI

The aggregated CEPI Score can be calculated as.

$CEPI = i_m + \{(100-i_m)x\ (i_2/100)x(i_3/100)\}$
Where, i_m – maximum sub indeed; and i_2 and i_3 are sub indices for o6her media

Formula for calculation the final value of CEPI is illustrated in table below2 using some hypothetical values of sub –indices. These values hav3 been chosen in a manner so as to bring out the most important characteristics of the aggregating method.

Industrial area / cluster	Air index	Water index	Land index	CEPI (rounded t6o next integer)
A	60.00	60.00	60.00	75
B	60.00	60.00	50.00	72
C	60.00	50.00	50.00	70
D	50.00	50.00	50.00	63

CALCULATION OF CEPI SCORE BY WBPCB

AIR

WBPCB

Estimation A

Pollutants	Category	Score	Remark
Benzene	C	4	
Benzopyrene	C	0	
CO	A	1.75	(Penalty)
A1 = 4+0+1.75 = 5.75			
R17 R54	2-10 10-154	2.5	per 10 sq.km.
A2 = 2.5			
A = A1 x A2 = 5.75 x 2.5 = 14.375			

Estimation B

Pollutants	Average Concentration	Exceedence Factor	Score
Benzene*	1.97	0.4	1
Benzopyrene*	BDL	0.0	0
CO**	1.36	0.68	2

* Source : Enviortech East Report for Jan. 2010

** Source: Dec 09, Jan 10, Feb 10 - three months Automatic Ambient Air Quailty Station data from the WBPCB station

Score

B1 = 1+2 = 3

B2 = 0 (No reliable evidence symptoms of exposure on People)

B3 = 3 (Symptoms of exposure on Eco-geological features)

Note: Although no such report is available in WBPCB, however, considering the score 3 from CPCB CEPI calculation for B3 it is assumed such report exists and is assigned a score of 3 for the present study

B=B1+B2+B3

B = 6

Estimation C

Population Exposed: ~ 100,000

C1 = 3

Pollutants	Samples Exceeded / total no. of samples x EF	SNLF	Score
Benzene	0/2x0.4	0	0
Benzopyrene	0/2x0	0	0
CO	39/247x0.68	<0.25	1.5

C2 = 1.5

C3 = 0

C = C1 x C2 + C3 = 3 x 1.5 + 0 = 4.5

Estimation D

D = 5

Considering the score table for additional high risk element Factor D and definition of inadequate facilities, the score is assigned as 5, as emission has been monitored thrice and the common facility complied two times (66%)

Estimation AIR EPI

Air EPI = A + B + C + D = 14.375 +6 + 4.5 + 5 = 29.875

WATER
WBPCB

Estimation A

Pollutants	Category	Score	Remark
Hg	C	4	(Penalty)
COD	A	1.75	
Phenolic Compounds	C	4	
A1 =9.75 Assuming			
R17	2-10	2.5	per 10 sq.km.
R54	10-154		
A2 = 2.5			
A = A1 x A2 =9.75x 2.5 = 24.375			

Estimation B

Pollutants	Average Concentration*	Exceedence Factor	B1 score
Hg**	0.0015	1.5	3
COD*	283.5	1.13	3
Phenolic* Compounds	0.54	0.27	1

** Hg : CPCB calculation

* Water Quality moritoring results for eleven stations of Green belt Canal over last 18th month period

B1 = 7

B2 = 0 (No reliable evidence of exposure on People)

B3 = 3 (Symptoms of exposure on Eco-geological features)

B=B1+B2+B3

B = 10

Note: Although no such report is available in WBPCB, however, considering the score 3 from CPCB CEPI calculation for B3 it is assumed such report exists and is assigned a score of 3 for the present study

Estimation C

Population Exposed: ~ 100,000

C1 = 3

Pollutants	Samples Exceeded / total no. of samples x EF	SNLF	C3 Score
Hg**	1/2x1.5	0.75	3
COD*	50/181x1.13	0.312	2
Phenolic* Compounds	7/136x0.533	0.0274	0

C2 = 5

C3 = 0 (Risk to sensitive receptors = Yes)

C = C1 x C2 + C3 = 3 x 5 + 0 = 15

Estimation D

D = 5

Considering the score table for additional hiigh risk element Factor D and definition of inadequate facilities, the score is assigned as 5, as during past two years the emission has been monitored thrice and the common facility complied two times (66%)

Estimation Water EPI

Water EPI = A +B + C + D =24.375 +10+15+5 = 54.375

Estimation C

Population Exposed: ~ 100,000

C1=3

Pollutants	Samples Exceeded / total no. of samples x EF	SNLF	Score
BOD	0/10x0.23	0	1
F-	0/5x0.11	0	1
Phenolic Compounds	1/2x1.25	0.62	2

C2 = 4

C3 = 0 (Risk to sensitive receptors =

No)

C = C1 x C2 + C3 = 3 x 4 + 0 = 12

Estimation D

D = 5

Considering the score table for additional hiigh risk element Factor D and definition of inadequate facilities, the score is assigned as 5, as the common facility is complying regularly.

Estimation Land EPI

Land EPI = A +B + C + D =15 +10+12+5 = 42

Calculation of CEPI for Haldia using EPI for Air, Water, Haldia:

Air EPI for Haldia	**29.875**
Water EPI for Haldia	**54.375**
Land EPI* for Haldia	**42**
CEPI	**60**

*** Assuming Land EPI calculated by CPCB**