CENTRAL POLLUTION CONTROL BOARD, DELHI
HAZARDOUS WASTE MANAGEMENT DIVISION

Project on "Remediation of hazardous waste contaminated dumpsites under National Clean Energy Fund (NCEF) Project"

1. MoEF initiated a project on "Remediation of hazardous waste contaminated dumpsites" in the country with Central Pollution Control Board (CPCB) as an executing agency under the National Clean Energy Fund (NCEF).

2. The Inter-Ministerial Group (IMG) of the Ministry of Finance in its meeting on 11/08/2011 has approved the MoEF proposal for remediation of 12 hazardous waste contaminated areas (containing multiple sites) at an initial project outlay of Rs. 805 crore.

3. The funding under NCEF is limited to 40% of the total project cost. The remaining 60% to be borne by the State Governments through polluter pays principle/Public-Private Partnership/State support etc.

4. The representative SPCBs (Kerala, Madhya Pradesh, Orissa, Tamil Nadu, Uttar Pradesh and West Bengal) had agreed in-principle for 60% funding from their states covering 10 contaminated areas out of the 12 initially proposed. SPCBs of Gujarat and Rajasthan have opted out of the NCEF funded project since cases were filed in Courts for remediation.

5. CPCB constituted two committees i.e. Project Steering Committee (PSC) to take necessary decisions pertaining to administrative, technical and financial matters for smooth execution of the project and Technical Expert Committee (TEC) an advisory body on suggesting and recommending technical aspects of the NCEF project.

6. The PSC is headed by Chairperson, CPCB and includes MS, CPCB, MoEF representative and Chairman of the representative SPCBs (Kerala, Madhya Pradesh, Orissa, Tamil Nadu, Uttar Pradesh and West Bengal) as its members.

Objectives of the Project:

This project will be executed in two stages, i.e. preparation of detailed project report (DPR) for remediation of sites in 1st phase followed by environmentally sound remediation of hazardous waste contaminated areas. A consultant will be appointed for preparation of DPR and providing consultancy services for entire period the Project, covering both phases of the work. Later, a contractor will be appointed for execution of actual remediation works.

Phase-I (by appointing Consultant)

(i) Assess the levels and nature of contaminants in surface/sub-surface, ground water and soils in and around the contaminated site;
(ii) Conduct detailed reassessment including risk assessment studies;

(iii) Prepare detailed project report along with technical and engineering designs for remediation /rehabilitation plans;

Phase-II (by Contractor and Consultant)

(iv) Execution of the remediation work on hazardous waste contaminated areas;
(v) Supervision & Validation of remediation works and preparation of post-remediation monitoring plan.

Expected outcomes:

The benefits of remediating these hazardous waste contaminated areas would be reduction of health risk to inhabitants living in identified contaminated areas. The aforesaid project for remediation of contaminated sites also results in a direct economic benefit in re-discovering contaminated land in terms of real estate price stabilization (Increase supply of saleable/leasable land). Although, the proposed project may not necessarily bring direct economic benefits in all cases; it will generate long term environmental and social benefits.

Scope of Work

Phase-I

To prepare a detailed project report in phase-I, which includes identification &assessment of contaminants, delineating the contaminated areas, and areas needing remediation as discussed and agreed with CPCB, detailed site investigation & characterization, risk assessment studies, setting of remediation objectives, outlining remediation options, preparation of detailed remediation plan with technical specifications in steps 1 to 6 as specified below;

Step-1. Reconnaissance and Preliminary Assessment
Step-2. Preliminary investigations of the contaminated site and development of site conceptual plan & sampling protocols
Step-3. Detailed site investigation and characterization
Step-4. Risk Assessment
Step-5. Identification of remediation goals/objectives and preparation of Remediation plans
Step-6. Design of remediation plan (DPR) with technical specification

Phase-II

Step-7. Preparation of bid documents and bid process Management
Step-8. Monitoring and assessment of actual Remediation works
Step-9. Validation of Remediation works

Site Description for 08 contaminated areas selected for remediation under National Clean Energy Fund (NCEF) Project:

1. Mercury contaminated sites at Gunjam, Orissa
2. Chromium contaminated area, Orichem, Talcher, Orissa
3. Chromium contaminated area at Rania, Kanpur Dehat, Uttar Pradesh
4. Pesticide contaminated site near Deva Road, Lucknow, Uttar Pradesh
5. Chromium contaminated Area at Ranipet, Tamil Nadu
6. H-Acid contaminated Sites near Ratlam, Madhya Pradesh
7. Chromium and heavy metals contaminated Area at Nibra, Howrah, WB
8. Pesticides contaminated land and creeks near Eloor-Edayar, Kerala

1. Mercury contaminated sites in Gunjam, Orissa

Disposal of mercury bearing waste from a caustic soda plant has resulted into contamination of land along the banks of Rushikullya River near Gunjam , Orissa. The unit based on mercury cell process has been in operation between the years 1967–2011. The contaminated sites are partly located in waterlogged area, with a flat morphology along the mouth of Rushikullya River. The distance from the contaminated site to the nearby sea is about 2 to 4 km. Adjacent to existing plant, there are waste lagoons, brine sludge dumpsites, residential houses and offices. The waste disposed herein was estimated with 45,000 m^3. The chlorine manufacturing process generates huge quantities of mercury containing brine sludge and hypo sludge (the later has low mercury content).

Preliminary investigations reveal that sludge was dumped along the banks of the Rushikullya River and in low-lying areas adjacent to plant premises. The following three major hazardous waste dumps adjacent to caustic soda plant;

JCL-I : Out-side the premises of caustic soda plant
JCL-II : Old dumpsites of brine sludge
JCL-III: Dump site along the banks of Rushiklaya River

The dumps along the river were later covered with plastic sheets, which are damaged and became ineffective in preventing seepage of rainwater. Few years back, the waste has been transferred into secure landfills constructed by the industry. Presently the plant has stopped mercury cell process by adopting into membrane cell technology. The dumpsites have mercury concentrations in the range of 30 – 2000 mg/Kg in the studies conducted during 2004–2005.

2. Chromium contaminated area, Orichem, Talcher, Orissa

Orichem contaminated site is a premises of closed chrome salts manufacturing unit (owned by State Government) and its adjoining areas outside the premises. The unit was operational between 1983 to 1998 with installed production capacity of Basic chrome sulphate and sodium dichromate at 3300 TPA. The unit was closed down in year 1998. The site was left abandoned after production stopped. Raw materials, waste, ETP sludge and products, the production facilities and the buildings are left back on site. The site is enclosed by a compound wall and a secured gate. The waste leach residue from this process contains high amounts of hexavalent chromium and highly leachable.

During monsoons, yellow coloured surface run-off flows from the site into natural canal, which ultimately meets the Nandira river. The adjacent land towards the down gradient was contaminated due to seepage of chrome liquor from the premises.

It was reported that chrome sludge containing hexavalent chromium waste was dumped in and outside the factories premises and was also used for the construction of road embankments in the surroundings of the company. The site is located in partly rural area with villages and industries. Immediately south of the factory coal-washing factory is located. The sites morphology is slightly undulating and slopes towards south. Surface water drainage of the area is towards south. From the premises of the factory a small creek is spring that crosses several down gradient villages and the main receptors of hexavalent chromium leachate from the site.

3. Chromium contaminated area at Rania, Kanpur Dehat, UP

The site is open land once used for agriculture, measures approximately 2 Km in length and 1 km in width and is littered with large number of heaps of wastes above the ground level. The waste is reportedly disposed by a small group of Basic Chrome Sulphate (BCS) manufacturing industries. There is no plantation on the contaminated land once used for agricultural. It was reported that main generators of wastes are 6 – 7 nos. of Basic Chrome Sulphate Industries who operated by taking land on lease and thereafter left the premises. These units are no more in operation. Every year during the monsoon, the leachate from scattered dumps with high levels of hexavalent chromium percolates the adjoining soil resulting into soil and groundwater contamination. There is high risk of further contamination of soil and groundwater as long as the source of contamination is not contained. It was estimated that about 45000MT of waste has been dumped in the area.

4. Pesticide contaminated site near Deva Road, Lucknow, UP

A site near Deva Road, Lucknow, UP has been contaminated due to disposal of hazardous waste generated by a pesticide manufacturing industry in the past. The present owners of the land are not yet known. The site was reportedly a closed Brick-kiln (Private Brick-kiln) field which was taken on rent by pesticide industry to dispose their waste (reportedly HCH muck). Preliminary investigations reveal that the contaminated area is spread over 2 acres of land and surface/groundwater is contaminated with pesticides residues. The said pesticide industry (presently closed) located at Deva Road was earlier produced Lindane, formulation of monocrotophos, phosphamidon and carbaryl etc. The contaminated site is situated about 15Km away from Pesticide unit on Deva Road (towards Deva).

It is estimated that about Approx. 36432 tonnes of waste disposed at this site. It was reported that the waste lying at brick-kiln site has been lifted and transferred to SLF at TSDF site. The said brick-kiln site which was used for dumping pesticide waste has been demolished and now the land is being used for Car Parking. It is expected that toxic chemical constituents would remain in contaminated soil beneath the waste dump and ground water. Detailed

investigations are required to assess the levels of residual contamination of soil and ground water beneath and adjoining to the dumpsite.

5. Chromium contaminated area at Ranipet, Tamil Nadu

TNPCB (Tamil Nadu Pollution Control Board) has identified this dump site located within the premises of a Tamil Nadu Chromates and Chemicals Limited (TCCL) located in SIPCOT industrial complex, Vellore. TCCL has generated and disposed huge quantities of hexavalent chromium bearing waste on the open land during its 25 years of operation from 1975 to 1995. This unit has manufactured sodium dichromate, basic chromium sulphate and sodium sulphate. The generation of hazardous waste containing hexavalent chromium was about 50 Metric Tonnes per day.

Preliminary findings indicate haphazard disposal of the waste (2.27 lakh tones) over a 20 year period has resulted in piling of waste up to 3-5m height over 2-4 hectare area. During monsoon, yellow coloured leachate containing of hexavalent chromium flows on the ground level and also percolates through subsurface resulting into widespread contamination of soil and groundwater. Samples from the dump revealed the presence of hexavalent chromium in the range of 5753 mg/kg to 25,510 mg/kg. The groundwater samples collected downstream of the site indicated up to 214 mg/l concentration of hexavalent chromium. The dump site is spread in an area of 2 hectares containing about 2.2 lakh tons of sludge

At present, the site is abandoned and the industry is not carrying out the manufacturing since 1995.

A study was conducted by the Geological Survey of India in 1996, which has reported that hexavalent chromium contamination was spread down south upto karai village located at 1.5 km away from the unit. Tamilnadu Pollution Control Board (TNPCB) has conducted studies through National Environmental Engineering Research Institute (NEERI) and National Geographical Research Institute (NGRI). The study conducted by NEERI states that the groundwater is contaminated in an area of 1.125 km X 0.965 km to a depth of 20 meters to 40 meters in the south, south-east direction. The study conducted by NGRI during 2005 and 2007 states that ground water flow is from north to south, where the major surface drain of river Palar exists at 4.5 km. The Central Pollution Control Board (CPCB) through Indian Institute of Technology-Chennai has carried out on site bioremediation of the dump site on pilot scale, which has not been scoped up for real time remediation. The prolonged storage of hazardous waste at the site has already had its impact with certain migratory pattern on land and groundwater. Hence, not only the insitu dumpsite, but also the whole of the impact area shall be taken as the potential source of contamination.

6. H-Acid Contaminated Sites near Ratlam, Madhya Pradesh

The Madhya Pradesh Pollution Control Board (MPPCB) has identified four contaminated site arising out of illegal/unauthorized dumping/storage of hazardous waste at Ratlam. These contaminated sites were located at Plot no. 54-E & 61-B of Dosiga on Industrial Area, Khandarwasa Mines, near Namali

village, the premises of a pharmaceutical industry and Khandarwasa Mines near Ratlam.

Preliminary investigations revealed that the industries manufacturing of H-Acid (1-amino, 8-naptho l,3,6-disulfonic acid) and G-Acid have disposed gypsum sludge, iron sludge and incinerator ash at the contaminated sites. Sludges from incinerator It is estimated that for every tonne of H-acid, 11-12 tonnes of gypsum sludge and 3-3.5 tonnes of iron sludge are produced. The closed H-Acid plant premises is reportedly sold to new industrial unit, however. Old sludge is stored in 3 lagoons/storage pits within Industrial area. Even now, dark reddish brown leachate is generated from storage lagoon during monsoon period.

Industrial waste is dumped in low lying near Khandarwasa Mines, Namli village, about 16 km away from the Dosigaon Industrial Area. It was reported about 1410 MT of waste (gypsum and iron sludge) dumped in inactive mines in open. The near by soil of the dump site was taken for road construction work.

The pharmaceutical industry was closed since the year 1997. The waste containing ETP sludge, Nickel oxide, activated carbon are stored in the premises since then posing risk of contamination. As per MPPCB estimation, the waste accumulated at the site contains about 5 MT of sodium sulphate stored in cement platform, 20 MT of activated carbon and 5 MT of nickel oxide.

The contaminated sites are located in flat terrain and the drainage of the area is towards southwest and meets the Dosigaon drain, which leads to Kukrel river, a tributary of Malani River. The groundwater in part of Ratlam town and about 10 villages namely Dosigaon, Borwana, Sejavata, Ghatla, Bhatuni, Bajan Khedi, Jadwasa Kala, Jadwasa Khurd, Kalolo Kala and Shimla Vada has become red in colour due to seepage of leachate from the wastes. Preliminary investigations also reveal that the water was observed reddish in colour in many dug wells from Dosigaon, Ghatla, Jadwasa and up to Kukrel river due to discharge of industrial effluent in Dosigaon nallah. The surface water near the Dosigaon Industrial Area and adjoining areas has been found to be contaminated and the contamination of groundwater in about 10 villages is visibly evident owing to its stark red color. As per CGWB (Central Ground Water Board) report 'Impact of Industrial Pollution on the Quality of Groundwater in and around Ratlam City', Madhya Pradesh', about 30 sq. km of area is reportedly contaminated. The waste dumping has also led to contamination of agricultural soil and has rendered it infertile and non-productive due to high salt loadings.

7. Chromium and heavy metals contaminated area at Nibra, Howrah, WB

The site near Nibra village in Howrah district of West Bengal was identified as a contaminated site and a preliminary investigation carried out in the year 2006 by West Bengal Pollution Control Board. A field measuring about 30m x 50m, a portion of the road leading to the village and some immediately adjacent area were found to be filled with waste likely to have been dumped by various industries around the site. It was reported that the dumping had probably

occurred between 1998 and 2000 and the impacted area was ascertained to be close to one hectare.
The waste was visible in certain areas at the time of the investigation but presently very little is visible because of recent road development and construction of some new houses. The wastes are granular in nature and have got compacted at the place of dumping. The WBPCB identified chromium (both hexavalent and trivalent) as the main contaminant and also indicated its high leaching potential. The dumped waste quantity was roughly estimated to be about 4400 MT. Residential houses are located near or on the contaminated area and there are two ponds in the immediate vicinity. However no one has complained about or reported any adverse impacts till now and the local public are apparently not aware of the potential risks. Groundwater drawn from existing deep tube wells in the village and surface water collected from the ponds in the vicinity were found to be free of contamination. This site is perceived as high risk site since people living village are exposed directly to the contaminated soil.

8. Pesticides contaminated land and creeks near Eloor-Edayar, Kerala

4 sites located in Eloor-Edayar area are identified as contaminated sites and preliminary investigations have been conducted by Kerala State Pollution Control Board in the year 2009. Contamination at these sites was attributed to discharge of untreated wastewater and disposal of hazardous waste by various industry located in Eloor – Edayar industrial zone. Preliminary findings indicate that these sites are polluted with POSs and heavy metals. The identified contaminated sites are;

EE-1 :Kuzhikandom thodu – creek and adjoining land & agriculture fields
EE-2 :Ammenthuruth-Karipadam agricultural fields
EE-3 :Edayattuchal agricultural fields
EE-4 :Chakkarchal agricultural fields

Kuzhikandom Thodu is a narrow creek of about 1.5 km length in Eloor-Edayar area which flows through the premises of various industries, joined by Panachi Thodu to form Unthi Thodu. Unthi Thodu flows south from Amman Thuruth Bridge to join Periyar. ('Thodu' – means a 'canal/creek' in local language).

The area around Kuzhikandom Thodu is predominantly flat and slightly inclined towards east direction. The premises of the polluting sources are in slightly elevated lands compared to the agricultural land around the villages. The Leachate/spill-over from industrial dumpsites reaches the Kozhikandom thodu. The sediments in Kuzhikandom Thodu reportedly contain hazardous constituents of wastes relevant to adjoining industries. During high tide, reverse surface water flows to contaminated dumpsites leading to transport of contaminated surface water to settlements near Panachi Thodu and into the paddy fields along Panachi Thodu.

Groundwater at some locations is at surface level forming water patches and swamps. The groundwater table in parts of the area is approx. 1.5 m deep below the ground level. Many of the dug wells in the area that were earlier used for water have been abandoned due to contamination. The sediments in the creek are contaminated with organo-chlorine pesticides and heavy metals

due to industrial effluents discharge and dumping of hazardous waste. Contaminated sediments are constant sources for contamination of ground and surface waste and are distributed over agricultural areas during the monsoon period.

It was reported that the paddy fields at Ammanthuruthu and Karipadam have been contaminated with flow of leachate and spill over from industrial waste dump sites, gradually making the land unsuitable for cultivation, which are now in abandoned condition.

Apart from above, two nearby sites Edayattuchal and Chakkarchal having total size of 30,000 sq. m and 15,500 sq. m respectively and are reported to have been contaminated with having heavy metals and mixed waste respectively affecting the paddy fields like Edayattuchal and Chakkarchal. The receptors at risk are population along the Periyar River and in the Udyogamandal industrial estate.

****