BEFORE THE NATIONAL GREEN TRIBUNAL ACT SITTING AT CHENNAI

Original Application No. 143 of 2020

K.K.Muhammed Iqbal : applicant

vs.

Kerala State Pollution Control Board and Others : Respondents

COUNTER AFFIDAVIT FILED BY THE 9TH RESPONDENT IN THE ABOVE CASE

M/s. VIRUKSHAM LEGAL
Advocates for 9th Respondent
Vidya.A (Ms.1226/2008) 9841867224
Mohan Prasad.P (Ms.2120/2011) 9940327619
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Edayar Zinc Limited

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Dated this the 4th day of November 2020

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I, Bismith MohamedAlingal, aged 49years, S/o Late Abdul Rahman, Director, Edayar Zinc Ltd (formerly "Binani Zinc Ltd"), having registered office at 37/2, Chinnar Park, New Town, Rajarhat Main Road, P.O. Hatiara, Kolkatta-700157, do hereby solemnly affirm and state as follows:

1. I am the director of 9th Respondent company and specifically authorised to swear this affidavit on behalf of the company.

2. Edayar zinc Ltd., formerly Binani Zinc Ltd was commissioned in 1967 in collaboration with Cominco Ltd., a Canadian metal conglomerate to produce Electrolytic Zinc as Pioneer Indian industry in this field. Zinc smelter industry is highly power consuming and then surplus electricity and moderate power tariff was the reason to locate the industrial unit in Edayar depending on zinc concentrate ore imported from Australia, South America etc.

3. The company provided direct employment to more than 600 persons and it was managed professionally with set rules and guidelines, compliant of international quality and standards. The company was following state of the art housekeeping and pollution control and mitigation efforts as per Indian and international standards and procedures. Ours is the 1st company who constructed secured landfill for disposing the ETP sludges and industrial waste conforming to the standards and as per the designs of international experts in the field like M/s. Tetra Tech, USA, M/s. C.E Zinc, Canada, while many of the similar industries in Eloor-Edayar industrial belt are still storing the hazardous industrial sludges in open land adjoining to River Periyar.

4. Our company was in constant pursuit for upgrading its production facilities with latest process and technologies. In pursuit of this ideology, Edayar Zinc Ltd had availed the consultancy service from international technology partners of well repute, for integration and upgradation of the production facilities and plants as follows:

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Description of the Plant/Technology/ Proces	Technology Partner	Country
Roaster Plant	M/s. Lurgi	Germany
DCDA Plant	M/s. Lurgi	Germany
Acid Plant expansion	M/s. Kvaerner Chemetics	Canada
Leaching & Purification	M/s. Mechim	Belgium
3 Stage Purification	M/s. KZ Engineering	Korea
Belt Filter	M/s. Filter Philippe	France
Jarofix Plant	M/s. CE Zinc	Canada
Secured Land Fill	M/s. Tetratech	United States of America
Jumbo Cell House	M/s. Lurgi	Germany
Melting Plant	M/s. Ajax and Metpro	United Kingdom
Captive Power Plant	M/s. Niigata	Japan
	M/s. Wartsila	Finland

5. Company had an efficient effluent treatment plant of adequate capacity and had been certified under various international standards such as ISO 14001:2004, ISO 9001:2008, OHSAS 18001:2007, SA 8000:2008 etc. The company consistently maintained excellence in all areas such as Occupational Health, safety, environment and corporate social responsibility, at par with international standards. The modern occupational health centre functioned in company premises enabling free access to neighbouring residents, won many accolades for best occupational health centre.

6. As part of Corporate social responsibility, the company is providing a dedicated piped drinking water scheme to the residents of Edayar whose groundwater zones were reported to be contaminated by the consolidated impact of various industrial operations in the Edayar industrial development area which accommodate about 250 industrial units, through Kerala water authority. In fact, the contamination of ground water

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sources was due to the historical operation prior to formulation of standards for industrial discharge and emission by the state under environmental statutes. Standards for emission and discharge under Rule 3 of Environment Protection Rules were laid down and came into effect during 1990-1994 period. After the controlled industrial operations and efflux of time and the recent two great floods occurred washing out the entire area, the groundwater of the area is reported to have shown fair results.

7. The company has given land and infrastructure to Binani Govt High School, Edayar and the contribution of the company for setting up many public and religious buildings in the area, is acknowledged by the local authority and community by naming Edayar junction and post office as Binanipuram. The company had set up a community hall catering to the gathering and social and familial need of the local public.

8. The policy change of Government of India, in the advent of globalisation providing concessional tariff on imports from specified countries affected intrinsic profitability of the company as tariff protection came down to zero, particularly for ingresses from countries like South Korea which had huge surplus of Zinc metal to be exported. Virtually no duty for import of finished goods at a time the raw materials required for the company suffered much import duty created an inverted duty structure. Notwithstanding this, the increasing cost of raw material as well as hike in power charges and freight, and the fluctuation in INR USD parity rights, eventually the company incurred loss in 2011.

9. As more than 50% of the net worth of the company eroded, we made an application before the Board of Industrial and Financial Restructure (BIFR) for restructuring under the provisions of Sick Industrial Companies Act (SICA) in 2014. The company could operate only till the fag end of the year 2014. The company applied for closure of the factory but which was denied by the state government. The Punjab National Bank, the secured creditor and lender of the company-initiated action against the company under SARFAIESI Act and had taken symbolic possession of the company in July 2016.

10. The averment of the applicant in para 4 of the memorandum of application is not completely correct. We provided free drinking water supply to 525 families of Edayar at our cost was also in discharge of our corporate social responsibility and considering the suggestions of the Supreme Court committee positively, but not as taking whole

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responsibility for the contamination of ground water sources of the area, which is made clear in the agreement executed by the company with Kerala Water Authority for providing free water to the Edayar residents dated 09/03/2005. Even though the Local Area Environment Protection Committee comprised of PCB officers and representatives of the affected public and the company, constituted for preparing the list of beneficiaries and modus operandi for providing free drinking water, the liability on the company was to bear the water charge for monthly consumption of 10 KL water for a family from the list of beneficiaries framed by the committee, as long as the company is operating in Edayar. The company even paid the cost of additional usage of water by the beneficiaries upon the request of the local self-government institution and deposited amount required for providing free drinking water in future. As per the agreement executed between Water Authority and the company, cost for the infrastructural requirement has to be met by the government. But in order to implement the water scheme as early as possible, the company had advanced the said amount, which is to be refunded by the Government with nominal interest as per the agreement, which amount is still remaining with the government. While similar directions for providing drinking water to the affected public in Eloor at the cost of four companies in Eloor, most of the companies, despite they were public sector units challenged the decision. Our company always positively responded to common causes of the land wherein company is situated and never shunned away from its responsibilities.

11. The allegation of the applicant in para 5 of the original application that "the Local Area Environment Committee, constituted by SCMC found that the contaminated surface run off from their industrial premises of this respondent and the leachate from the old Jarosite pond contaminated Edayattuchal and Chakkarachal paddy fields', is not true. The Environment Impact Assessment Reports on Eloor- Edayar of LAEC identifies HIL (Hindustan Insecticides Ltd), Merchem Ltd, Eloor, IRE(Indian Rare Earths Ltd), FACT (UD) Eloor as source of heavy metal and pesticides contamination in Eloor and CMRL (Cochin Minerals and Rutiles Ltd), Sud-Chemie India Private Ltd, Merchem India Private Ltd & Merchem Ltd, Edayar and Leather Tanning Units are found along with our company as the source for heavy metal contamination in groundwater and soil of Edayar.

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12. The applicant only produced selected pages of the report as Annx-A2 which contained the portion about this respondent company and wrongly interpreted that this respondent has been found as only source for contamination in Edayar. A scientific report has to be read in whole and not in piecemeal. The above listed companies in Edayar were referred to in the conclusion part of Annx-A2 report under para 1 of page 29 of the original application that "the major units discussed above have played a greater role in contaminating groundwater in Edayar and the presence of heavy metals in paddy plants speak itself the extent of contamination in soil". True copies of the pages 27- 59 of Environment Impact Assessment Report on Eloor-Edayar submitted by LAEC is produced herewith and marked for reference as **Annexure-R9(a)**.

13. As per the Environment Impact Assessment Report prepared by LAEC, the heavy metals found in groundwater, soil and sediment samples from Edayattuchal and Chakkarachal area in Edayar is Zinc, Iron, Lead, Cadmium Copper, Nickel and Total Chromium. The analysis of sludge from the jarosite pond of this respondent company made by LAEC found only the presence of Zinc, Iron, lead, Cadmium, Copper and Nickel. The presence of total chromium in the ground water, soil and sediment samples of Edayattuchal, which was found absent in our sludge shows that there are other sources for contamination of the paddy fields.

14. The analysis made by LAEC on the soil and sludge accumulated on the CMRL land near to the river on the upstream of *Chakala thodu*, a canal leading to Edayattuchal from the river Periyar, found with presence of heavy metals like Zinc, Iron, Lead, Cadmium, Nickel, Total Chromium and Manganese. The sludge of Sud Chemie was also found with Total chromium, Zinc, Lead, Copper, Nickel and Manganese. The sludge from two units of Merchem found with Zinc, Iron, Lead, Cadmium, Nickel and Total Chromium. The sludge from the 3 leather tanning units located in Edayar area was containing with Zinc, Iron, Lead, Cadmium, Nickel and Total Chromium. Therefore, it can be seen that there are multiple source for the contaminant heavy metals found present in the groundwater soil and sediment of Edayar sites, as per the LAEC report which made the genesis for Annx-A4 DPR and remediation project.

15. LAEC collected samples from different stations of river Periyar from Pathalam bridge to the downstream up to Chittoor Ferry and found maximum concentration of Zinc near CMRL outlet and maximum concentration of Cadmium and Nickel near Sud Chemie and maximum

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concentration of Iron was found at Pathalam bridge just upstream of the CMRL and Leather Units. In the Environment Audit Report of industries In Eloor Edayar, LAEC reported that hazardous waste dumping yard of CMRL is almost full which is in vast area of nearly 1.5 acres of land and a small rainfall would cause overflow from this yard leading to river Periyar.

16. The analysis of the open well near the hazardous waste dumping yard and the test well near the yard reveals contamination from the solid waste with heavy metals, Namely Iron, Manganese, Zinc, Copper, Nickel and Lead. The local area committee recommended that by discharging polluted effluent containing hazardous chemicals into the river, the company has caused irreparable damage to the river and surrounding environment. There is nothing on record for the applicant to allege entire liability for the contamination of sites in Edayar upon the shoulder of this respondent company alone and for praying coercive action against disposal of plant and machineries from the company under orders of constitutional court as well as Debt Recovery Tribunal. The only study available in the public domain is the EIA report and Environmental Audit report made by LAEC with respect to sites in Edayar, but both ERM and KSPCB proceeded with the remedial investigation in oblivious of the said report which is commented by SCMC as “exemplary report with no present parallel”.

17. The allegation of the applicant in paragraph 13 of the application that this respondent is in a hasty move for alienation of industrial property, is absolutely false and made without any reason. The company is having a plan to reorganise and establish an Industrial and Logistics park in the company land with the involvement of new equity partners. Company has already made a one-time settlement (OTS) with Lender banks and also reduced its other liabilities with the Commercial Tax Department, Electricity Board etc. The sale of plants and machineries initiated by the lender bank after obtaining order from Debts Recovery Tribunal, Mumbai in SA No. 13/2016 and the bank has issued Sale Certificate in favour of the successful bidder on 18.03.2020 and the buyer was permitted to remove the goods covered under the said Certificate by Hon’ble High Court of Kerala by order dated 01/10/2020 in W.P. (C) No. 19291/2020. Applicant was aware of the securitisation proceedings initiated by the bank under orders of DRT, canvassing prayer for staying the sale proceedings in a parallel litigation without even impleading the

bank, is sheer abuse of the process of Court, which practice has to be deprecated.

18. Company is not served with the DPR by the State Board or Central Board. The DPR produced by the applicant along with the application is not complete as the annexures regarding sample analysis and other data is not attached therewith. As per Annx-A4 DPR produced along with the application, the preliminary investigation and completion of DPR has made after the closure of the company and the company was not aware of the findings of the consultant. In the introduction of the DPR, 3 reports of March 2015, August 2016 and September 2016 and the draft DPR dated 31/03/2017 and Remedial Action plan prior to the final DPR has been referred to. Our company is not provided with any of the said reports and left us in dark to make an informed comment upon the DPR.

19. The Applicant, 1st respondent KSPCB, and 4th respondent CPCB grossly erred in wrongly demonizing this respondent before this Tribunal in their pleadings by accusing Zinc from our company is solely responsible for contamination of Edayattuchal and Chakkarachal, without any scientific basis. Ours was a professionally well managed company, operated for five decades contributing much to the industrial revenue of the state and all-round development of Edayar. This respondent company is on the northern end of Edayar Industrial area. Whereas Edayattuchal and Chakkarachal, an interconnected water body of yesteryear paddy field located in the east of industrial area housing 264 industrial units of small, medium, and large-scale industries which includes metallurgical, chemical, tannery, aromatic etc., and lies at the down gradient for receiving all wash out of industrial waste and debris including domestic and sewage wastes.

20. Moreover, these interconnected water bodies are in the estuary of Periyar which is flowing through Idukki and Ernakulam District. The recent report submitted by SLMC Chairman A.V. Ramakrishna Pillai J. in O.A.No.395/2013 before this Tribunal suggest that Periyar is receiving effluent from more than 100 industrial units situated in Ernakulam district alone. In addition, it states that “there was a pipe found discharging red and orange waste from some factory in the irrigation canal connecting Edayattuchal and Periyar, which is also complained by the applicant in the above case and 1st respondent Board affirmed the wide complaint received in its Local office in this regard (Refer Annexure R4 document dated 07.09.2020 produced by the Board) thus:.

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"Board is receiving many public complaints regarding the discharge of effluent in the canal/ drain connecting Periyar River and Edayattuchal Paddy fields. The canal is passing through the Edayar Industrial Area. Since the canal is concealed, the Board officials are not able to verify whether any discharge/unauthorized pipe lines are laid from the industries discharging to the drain/canal".

21. Periyar, 244 KM in length, is the longest river of Kerala flows through area bounded by thousands of acres of farm land. In farming, Zinc Sulphate is the most commonly used micro nutrient in granular fertilizer because of high solubility in water and it is relatively cost effective, which is also a source of Zinc in agricultural lands. It is reported that a single application of 7 to 14 kilogram per acre containing 36 percent Zinc, a micro nutrient, will usually last for 2 to 3 years of crop production only, and Zinc deficiency can also be treated during the growing season by spraying crops with a 0.5 percent Zinc Sulphate solution at a rate of 90 to 130 liter per acre. Edayattuchal and Chakkarachal which is interlinked to the estuary of Periyar must be retaining in its sediment a considerable quantity of containing Zinc wash out from these farm lands.

22. In the summary of key findings shown in Annx-A4 DPR, the potential primary sources for contamination of Edayar Sites were identified to be Jarosite pond of this respondent company and also the unauthorised discharge of effluents from the local industries in Edayar. In the summary of site investigation, it is stated that heavy metals, namely Zinc, Iron, Cadmium and Chromium are identified in the soil exceeding the assessment criteria. The analysis of the solid waste collected in the jarosite pond of the company made by the Local Area Environment Committee showed only the presence of Zinc, Lead, Nickel, Copper and Cadmium. Chromium is not present in the Jarosite; therefore, source for the contamination of the soil cannot be attributed to this respondent alone. Zinc, Iron and Manganese are identified in the groundwater exceeding the assessment criteria. Manganese is not present in the jarosite as per the analysis made by LAEC.

23. It came to our notice in the affidavit submitted by Kerala State Pollution Control Board in the above case that PCB has requested the 5th respondent district collector to include Rs. 47.88 crore (the remediation project cost estimated in Annx-A4 DPR) as liability of our company for Revenue Recovery. We are at loss to understand how entire liability for remediation of the contaminated sites in Edayar has been fixed upon our

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company, that too behind our back and denying principles of natural justice. We were not even supplied with the DPR and its prior report and the decision/order assessing our liability for the same. Without fixing the liability upon primary and secondary sources of pollution in due compliance of principle of natural justice after providing opportunity of hearing to the parties concerned, how such a figure can be arrayed as arrears due to this respondent deeming our company as a defaulter for the said amount. Since our company was closed, entire liability and culpability for the contamination of these sites fastened on this respondent's shoulder for ease by the authorities as well as the applicant.

24. In the letter dated 05/12/2019 issued by the 1st Respondent Board to this Respondent company (produced along with the affidavit filed by KSPCB as Annexure R2) recites that CPCB had identified Edayattuchal & Chakkarachal as contaminated sites with heavy metals due to the industrial operation of this Respondent company. As far as our knowledge CPCB has not conducted any study identifying the source of contamination in paddy fields in Edayar surrounding the industrial area. If there is any such study, copy of the same shall be directed to be served to us.

25. The Genesis of the remediation project for Edayar sites started upon the recommendation of Supreme Court monitoring committee relying on the recommendations made by the Local Area Environment Committee for Eloor Edayar (LAEC) in its Environment Audit Report submitted to SCMC. The recommendation of LAEC was thus:

> *"5. LAEC conducted a survey and took sample from various places such as Edayattuchal, Chakkarachal and other surroundings areas in Edayar and Amanthuruth paddy field and surrounding areas of Kuzhikandam creek in Eloor. These areas are found with persistent organic pollutants, chemicals and heavy metals. Major companies such as Binani Zinc Ltd., Arjuna Natural Extracts, Merchem Ltd., Eloor, Hindustan Insecticides Ltd., Indian Rare Earth and FACT are responsible for contaminating these areas. The lab reports indicate parameters of these companies in the sludge collected from these areas. In the circumstance, LAEC recommends adequate compensation to the landowners and actions to decontaminate the land at the cost of these companies."*

26. This recommendation of LAEC with respect to the contaminated sites in Edayar and its sources are in contradictory to the detailed Environment Impact Assessment Report made by LAEC itself, wherein the source for heavy-metal contamination in Edayar were identified as CMRL, Sud-

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Chemie, 2 Merchem units, Leather industries along with this respondent company. The names of those companies were omitted in the above recommendation and the name of Arjuna Natural Extracts is seen omitted in the EIA report prepared by the LAEC.

27. Based on the SCMC recommendation for remediation of contaminated sites in Eloor and Edayar, PCB commissioned a detailed study by an expert agency like German technical Corporation to verify the findings in recommendation of the LAEC for remediation of Eloor site, before proceedings with action for remediation of Eloor sites. Such preliminary investigation has not been conducted in the case of Edayar sites by the Board. There is nothing on record to show that how 30,0000 m2 area from Edayattuchal paddy fields and 15500m2 area from Chakkarachal paddy fields are identified to be contaminated with zinc ingots and proposed the same for remediation under NCEF project.

28. There is no material available identifying 45,500 m² area of paddy fields are contaminated with Zinc ingots, before selecting the site for the contamination under the project. These sites were included in the NCEF projects by CPCB upon the representation of State Pollution Control Board and the undertaking of the board the state shall contribute 60% person of the project cost. Apart from that CPCB has not conducted any independent study identifying sources of contamination in Edayar sites due to the operation of this Respondent company. and remediation project was tendered with the assumption that the said paddy fields are contaminated with zinc ingots from Jarosite. A true copy of the list of hazardous waste contaminated sites published along with the wistful expression of interest for consulting services under NCEF project published by CPC is produced herewith and marked for reference as **Annexure-R9(b).**

29. Remedial investigation and preparation of DPR made by the ERM identifies primary source of contamination in Edayar sites as unauthorised discharge of effluents by local industries, and historically discharged contaminated effluents along with waste dumping and backfilling from various origins along with our jarosite pond. Moreover, the letter dated 05/2/2019 issued by PCB only informed that company has to contribute towards the remediation project as per the polluter pay principle, and not to defray the entire cost of the project. Before seeking coercive action for realisation of the total project cost estimated in Annx-A4 DPR, no specific demand notice or assessment order was served to us. We will not run away from our liability to contribute our share for

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decontamination which has been duly fixed with notice to us. Two massive floods occurred after the remedial investigation conducted for the project which would have major impact on the soil sediment and groundwater, since entire area was washed out in the flood. As per the inputs from the field, now there is no much contaminants present exceeding the site-specific target level (SSTL) in the area. Therefore, the Board has to conduct a detailed sampling and study by an expert agency before proceeding with implementation of Annx-A4 DPR to fill the data gap occurred during the meantime and the effect of floods on the geophysical nature of the area. In oblivious of the EIA report and Environmental Audit report, without conducting study on the sources for contamination of the paddy files, cherry picked this respondent to bear all the brunt for contamination, keeping aside all the approvals and permissions given by KSPCB from time to time.

30. The soil sampling along the periphery of the closed Jarosite ponds 1, 2 and 3 reported concentration below SSTL values (Refer page No.14 of Annx-A4 DPR). But the technical committee of CPCCB hastily concluded that those ponds are unlined and sources for contamination. Company has spent Crores of Rupees for constructing those huge Ponds (Secured landfill) and to cap it, as per the designs found suitable and approved by the Board. Nonetheless, the stabilization methodology and quantities of chemicals presented by ERM in the DPR is acknowledged to be based on discussions with TSDF", Kerala Enviro Infrastructure Ltd., a private company that will profit from adoption of a different course of action than the disposal method completed by the company with the authorisation of KSPCB and CPCB on jarosite secured land fill. We have been awarded Certificate of Excellence in pollution Control by the 1st respondent Board in 2009. Therefore, the recommendation given in DPR for onsite remediation has to be rejected.

31. B3 is the only zone in DPR, wherein the ground water identified to be impacted. While recommending decontamination procedure and equipment installation, ERM did not consider utilization of the Effluent Treatment Plant of this respondent existing proximate to the site, which is having much superior design and technology with adequate capacity to treat contaminated ground water in the event of such a requirement. This omission added huge amount in the estimate considered in DPR. In fact the Remedial Action Plans in the DPR as selected by the Technical Committee is extending better economic advantage to the private TSDF

operator, upon whose advice stabilisation methodology, disposal of soil and sediment and quantities of chemicals were admittedly put forth by ERM in consultation with the TSDF operator.

32. It is quite interesting to note that the remedial investigation agency, ERM found that no threshold risk and non-threshold risk are identified above the acceptable limits for the exposure scenario at the Binani school ground. Based on this finding, no SSTL is found applicable for Binani School Ground (B4 site). But the expert committee appointed by the CPCB recommended excavation of the soil from the Binani school ground and its disposal at authorised TSDF followed by refilling of amended clay/soil. There is nothing on record in the DPR to show why the technical committee recommended excavation of the soil from the school ground despite no threshold risk is identified in the site by the investigating agency and the same act would extent benefit only to the private player who operates the sole TSDF facility in Kerala at Cochin.

33. The on-site disposal of jarosite stored in the pond were not included in the project and in the scope of DPR. The expert committee of CPCB recommended to include on-site remediation of Jarosite in the DPR. There are 4 jarosite ponds exist in the company premises. The ponds 1 to 3 were constructed in 1990s with 2 layers of LDPE liners and brick lining in the bottom and all sides and these old ponds were capped with 1 m soil on top and HDPE liner above the soil to avoid leachate and seepage. Further 0.5 m soil has been provided above the HDPE liner and monitoring of the ponds are carried out through piezometric wells periodically. The company has spent about Rs. 1 Crore for capping the ponds after obtaining consent for the same from the 1st respondent board. The Board has never reported leakage from the ponds at any point of time during their periodical inspection conducted in the premises.

34. The 4th pond was constructed in compliance of CPCB guidelines and after obtaining consent from KSPCB and satisfying all statutory norms and also taking inputs from USEPA standards. Basic engineering was sourced from M/s.Tetra Tech, a U.S.-based consultancy which has international experience in designing such secured landfills. The construction of the secured landfill was inspected by officials of KSPCB from time to time at the time of construction. The liner system complies with the CPCB guidelines. In fact, more stringent standard as per USEPA guidelines have been adopted for the liner system. The lining system of the pond contains geosynthetic clay at the bottom and above that two layers of geomembrane

and geonet are provided. Leachate collection system has been provided. A geotextile liner is provided on the top of the Geonet. Piezometric wells have been provided around the secured landfills and are being monitored periodically.

35. In Annx-A4 DPR under the 'limitation of the study', it is stated that no samples were collected from Binani zinc Ltd due to lack of access since the company was stopped in 2015. Rs.28.95 crore is estimated for disposal of jarosite from the capped Pond into open pond and disposal at TSDF. The estimation is based on the discussion with TSDF agency, a private entity who is an interested party who would get financial benefit from the implementation of the project. The secured landfill wherein the jarosite excavated from the company premises is to be disposed is also constructed as per the CPCB guidelines under the consent of 1st Respondent board. The capped jarosite ponds (secured landfill) in the company premises were also constructed and capped as per the CPCB guideline under the authorisation of State Pollution Control Board. Decontamination/remediation is not meant transportation of waste from one place to another place, but waste minimisation and its environmentally sound disposal is the ideal concept.

36. Moreover, 2016 HW Rules excluded jarosite from the category of hazardous wastes and separate guidelines on the management of these waste is proposed to be framed. CPCB has not issued guidelines for management and disposal of jarosite yet. CPCB framed guidelines for pre-processing and co-processing of hazardous waste in cement plants as per 2016 HW Rules in July 2017. In that guidelines, utilisation of Jarosite in cement mills are permitted.

37. As an effort to reduce carbon footprint, this respondent company closely worked with National Council for Cement and Building Materials (NCCBM) for the coprocessing of jarosite in cement industry as AFR (alternate fuel and raw materials). Cement Industry accounts for around 5% of global carbon emissions. NCCBM concluded that 1.5% jarosite was found suitable to be used as raw material and 3% dose of jarosite was found suitable as set controller in place of mineral gypsum in cement manufacturing.

38. Huge quantity of soil is being used for road construction process. Sand and Soil mining causes considerable environmental damage. The study conducted by us in association with Division of Civil Engineering, Cochin University of Science and Technology identified Jarofix as suitable

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for road embankment and subgrade process. The study also found that Jarosite/Jarofix can be used in manufacturing of concrete blocks, concrete pavement tiles and sand interlock bricks. Preliminary studies were also done with Institute of Minerals and Materials Technology, Bhubhaneswar for the utilisation of Jarosite in manufacture of cold setting building bricks. We were also working closely with National Institute for Interdisciplinary Science and Technology, Thiruvananthapuram for utilisation of the jarosite/jarofix in Polymer tiles, concrete ties and other building materials. While this study was under progress, the company was closed due to financial distress. Photographs showing the bricks and tiles built by using jarosite/jarofix is produced herewith and marked for reference as Annexure-R9(C).

39. The on-site jarosite excavation and its disposal was included in the DPR upon the recommendation of the CPCB expert committee based on the assumption that the capped jarosite pond is subject to leakage. The consultant who prepared the DPR says that they have not conducted sampling in company premises as company was closed in 2015. It also states that the information provided in the DPR is not to be construed as a legal advice. This honourable Tribunal may direct the State Pollution Control Board to conduct sampling in the company premises within the presence of our representatives to test whether Jarosite pond is prone to leakage and if there is leakage only necessary actions need to be initiated.

40. It is evident from the DPR as well as the reports submitted by LAEC before the Supreme Court monitoring committee, the source for heavy-metal contamination in Edayar sites are multiple, apart from our company. Therefore, this Honourable Tribunal may be pleased to direct the official respondents in the above case to not initiate any coercive action against our company for realisation of the project cost estimated in the DPR, before fixing the sources liable for contamination and the extent of liability for each source for remediation project, in due process with notice to all parties.

41. There is a writ petition within the same subject matter is pending before the Division Bench of Honourable High Court of Kerala by W.P.(C) No.22772 of 2018 filed through the same counsel appearing for the applicant in this case. This original application has been filed with suppression of the writ petition pending before the Honourable High Court of Kerala. Canvassing same relief in a parallel litigation before this Tribunal is nothing but Forum shopping and abuse of the process of court,

which has to be dissuaded. Therefore, this application is to be dismissed in the interest of justice.

42. This respondent humbly prays before this honourable Tribunal to allow the following relief:

1) Direct KSPCB to conduct an expert study for assessing the source of contamination of sites in Edayar and to ascertain the areas which require remediation in the background of washing out of chemicals of concern due to the floods occurred consecutively in the area in the last 2 years and to fix the liability of each sources for remediation, with opportunity to place objection to the parties concerned;
2) Direct KSPCB to conduct sampling in company premises with in the presence of our representatives to identify whether the jarosite ponds exist in the company is susceptible to leakage;
3) Direct the Respondents 1 to 8 to not initiate any coercive action for realisation of the project cost estimated in the Annx-A4 DPR, before assessing the sources for contamination and their liability for remediation in due course complying with natural justice;
4) Direct the KSPCB as well as CPCB to furnish the final DPR of January 2019 and preliminary reports of March 2015, August 2016, September 2016, the draft DPR of March 2017 and Remedial Action Plan submitted to CPCB by the consultant in December 2016 with all supporting documents and annexures to this respondent;
5) Pleased to give opportunity for this respondent to file additional counter affidavit in the above case after perusing all those documents furnished by the State and Centra Boards;

All the facts stated above are true and correct.

Dated this the 4th day of November 2020

Deponent: Mohamed Bismith Alingal

Solemnly affirmed and signed by the literate deponent who is personally known to me on this 4th day of November 2020 at my office at Chennai.

Adv Vidya

Partner, Viruksham Legal

ENVIRONMENT IMPACT ASSESSMENT REPORT ON ELOOR - EDAYAR 2004 - 2006

Submitted to
Supreme Court Monitoring Committee
by
Local Area Environment Committee - Kochi

Edayar Zinc Limited

1. Analytical results of well water samples from Eloor area.

The maximum and minimum concentration of pollutants present in the well water samples collected from Eloor area are given in Table No: 1.The results show that the maximum concentration of Iron, Zinc and Lead are 2.94mg/l,6.0mg/l and 0.44mg/l respectively against the limits 0.3mg/l 5mg/l and 0.1mg/l (IS:10500 1983). Other parameters like Copper, Cadmium, Nickel is below detectable level.

Table No:1

SI: No.	Determinant	Unit	Concentration (range)	Limit(As per IS:10500-1983)
1	pH		5.7-8.3	6.5-8.5
2	Zinc	mg/kg	BDL-6.0	5.0
3	Iron	mg/kg	0.02-2.94	0.3
4	Lead	mg/kg	BDL-0.44	0.1

2. Analytical Result of Soil samples collected from Eloor Area.

Soil samples were collected from Industrial premises, Ammanthuruthu paddy field, and Surrounding area of Kuzhi kandam thodu including the residential places. The maximum and minimum concentration of pollutants present in the soil samples collected are given in Table No: 2.

Table No: 2

Sl:No:	Determinant	Concentration (Range) in mg/kg	Limits(mg/kg)*
1	Zinc	42.0 - 3271.0	300
2	Iron	6385.0 - 80075.0	---
3	Lead	48.0 - 578.0	---
4	Cadmium	3.0 - 21.0	2.0
5	Copper	8.0 - 1012.0	30.00
6	Nickel	21.0 - 111.0	500
7	Chromium (VI)	2.0 - 18.0	--
8	Total chromium	56.0 - 421.0	100.00

*Limits according to the norms under the United States Public Health Standards (USPHS1997).

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Moving along the Kuzhikandomthodu for sampling

Amanthuruthu Paddy Field of Eloor

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3. Analytical results of sediment samples from Eloor Area

Sediment samples were collected from the different stretches of Kuzhikandam thodu, Panachithodu , Unthi thodu and surrounding low lying land.

The minimum and maximum conc entration of pollutants present in the sediment samples collected are given in Table No: 3.

Table No:3.

Sl:No:	Determinant	Concentration obtained (Range) in mg/kg	Limits(mg/kg)*
1	Zinc	116.0 - 1449.0	300
2	Iron	18900.0 - 50260.0	--
3	Lead	180.0 - 598.0	--
4	Cadmium	6.0 - 19.0	2.0
5	Copper	56.0 - 186.0	30.00
6	Nickel	31.0 56.0	500
7	Chromium (VI)	9.0 79.0	--
8	Total chromium	206.0 406.0	100.00
9	DDT	315.0(max:)	--
10	BHC	20.0(max:)	--
11	Endosulphan	60.0(max:)	--
12	Organic Halogen	250.0(max:)	--

*Limits according to the norms under the United States Public Health Standards (USPHS1997).

4. Analytical results of well water samples from Edayar area

The minimum and maximum concentration of pollutants present in the well water samples collected from Edayar area are given in Table No. 4.The results show that the maximum concentration of Zinc and Iron are 7.5 mg/l and 2.2mg/l respectively against the limits 5mg/l and 0.3mg/l (IS: 10500 1983). Other parameters like Lead, Copper, Cadmium, Nickel are below detectable level.

Table No: 4

SI: No.	Determinant	Unit	Concentration (range)	Limit(As per IS:10500-1983)
1	pH		5.4 - 8.2	6.5-8.5
2	Zinc	mg/kg	BDL - 7.5	5.0
3	Iron	mg/kg	0.03 - 2.2	0.3
4	Fluorides	mg/kg	BDL - 0.3	1.2

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RESIDENTIAL AREA FLOODED WITH TOXIC WATER
NEAR THE BANK OF KUZHIKANDAM THODU

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Amanthuruth Pady Field

5. Analytical results of soil samples from the surrounding area of Edayattuchal.

The minimum and maximum concentration of pollutants present in the soil samples collected from the surrounding area of Edayattuchal is given in Table No:5

Table No:5

Sl:No:	Determinant	Concentration (Range) in mg/kg	Limits as per USPHS(mg/kg)*
1	Zinc	72.0 - 1577.0	300
2	Iron	8600.0 - 93925.0	___
3	Lead	94.0 - 424.0	___
4	Cadmium	2.4 - 66.0	2.0
5	Copper	20.4 - 148.0	30.00
6	Nickel	28.0 - 64.0	500
7	Chromium (VI)	2.2 - 19.2	
8	Total chromium	28.0 - 350.0	100.00

*Limits according to the norms under the United States Public Health Standards (USPHS1997)

6. Analytical results of soil samples from the surrounding area of Chakkarachal.

The minimum and maximum concentration of pollutants present in the soil samples collected from the surrounding area of Chakkarachal is given in Table No:6

Table No:6

Sl:No:	Determinant	Concentration (Range) in mg/kg	Limits as per USPHS(mg/kg)*
1	Zinc	280.0 - 19810.0	300
2	Iron	11775.0 - 139640.0	___
3	Lead	90.0 - 218.0	___
4	Cadmium	3.0 - 175.0	2.0
5	Copper	25.0 - 160.0	30.00
6	Nickel	32.0 - 53.0	500
7	Chromium (VI)	2.8 - 7.0	
8	Total chromium	29.4 - 85.8	100.00

*Limits according to the norms under the United States Public Health Standards (USPHS1997).

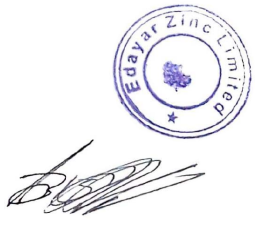
7. Analysis Report of Soil Sample and Paddy Plant taken from Chakkarachal Paddy Field – Edayar.

Sl. No.	Determinant	Unit	Concentration		
			Soil – Paddy Field – Chakkarachal	Paddy Plant - Chakkarachal	Limits as per (USPHS)*
1	Zinc	mg/kg	19810	1596	300
2	Iron	”	139640	16160	--
3	Lead	”	224	142	35 @
4	Cadmium	”	113.6	3.0	2
5	Copper	”	24.4	7.0	30
6	Nickel	”	47.00	22.2	500
7	Chlorides	”	230	420	--
8	Cyanides		BDL	BDL	--
9	Magnesium	”	388	291.6	--
10	Hexavalent Chromium	”	3.0	2.1	--
11	Total Chromium	„	55.8	46.8	100
12	Vanadium	„	BDL	BDL	--
13	Titanium	„	BDL	BDL	--

*Limits according to the norms under the United States Public Health Standards (USPHS1997)

@ Canadian Sediment Quality Guidelines

Even though the crops raised in the paddy field shows very disturbing results. Presence of metals in the soil as well as in the paddy plants depicts a very sad state environmental and soil quality. Too extensive paddy field, which raised substantial paddy, has now been rendered completely and absolutely useless. A recent photograph taken from Chakkarachal paddy field speaks itself its present status indicating the findings of the Committee. It is a standing testimony speaks the harrowing picture of the farmers.



Edayattuchal - A sampling spot at Edayar

Chakkarachal Paddy Field a seen of agricultural operation - futile effort

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8. Analytical results of soil samples from Southern side of Edayar area

The minimum and maximum concentration of pollutants present in the soil samples collected from the Southern side of Edayar area are given in Table No:8.

Table No:8

Sl:No:	Determinant	Concentration (Range) in mg/kg	Limits as per USPHS (mg/kg)*
1	Zinc	72.0 - 1577.0	300
2	Iron	8600.0 - 93925.0	___
3	Lead	90.0 - 424.0	___
4	Cadmium	3.0 - 66.0	2.0
5	Copper	20.0 - 804.0	30.00
6	Nickel	32.0 - 262.0	500
7	Chromium (VI)	2.0 - 36.0	
8	Total chromium	29.0 - 1100.0	100.00

*Limits according to the norms under the United States Public Health Standards (USPHS1997)

9. Analytical results of sediment samples from Edayattuchal in Edayar area

The minimum and maximum concentration of pollutants present in the sediment samples collected from Edayattuchal in Edayar area are given below (Table No: 9).

Table No:9

SI: NO.	Determinant	Concentration (Range) in mg/kg.	Limits as per USPHS (mg/kg)*
1	Zinc	151880.0 - 188060.0	300.0
2	Iron	9320.0 - 30440.0	
3	Lead	46.0 - 324.0	
4	Cadmium	286.0 - 568.0	2.0
5	Copper	23.0 - 77.0	30.0
6	Nickel	18.0 - 26.0	500.0
7	Total Chromium	13.0 - 54.0	100.0

*Limits according to the norms under the United States Public Health Standards (USPHS1997)

10. Analytical results of sediment samples from Chakarachal in Edayar area

The minimum and maximum concentration of pollutants present in the sediment samples collected from Chakarachal in Edayar area are given below (Table No. 10).

Table No.10

Sl:No:	Determinant	Concentration (Range) in mg/kg	Limits as per USPHS(mg/kg)*
1	Zinc	3362.0 -- 33050.0	300
2	Iron	19300.0 -- 21620.0	____
3	Lead	58.0– 134.0	___
4	Cadmium	79.0 -- 140.0	2.0
5	Copper	24.0 -- 25.0	30.0
6	Nickel	15.0 -- 24.0	500.0
7	Total Chromium	60.00 -- 95.0	100.0

*Limits according to the norms under the United States Public Health Standards (USPHS1997).

11. Analytical results of river water samples.

Samples were collected from different stations from Pathalam to Chitoor Ferry. The minimum and maximum concentration of pollutants present in the river water samples collected during the river survey conducted on 4/12 /2004 and 2/4/2005 are given in Table No : 11.

Table No: 11

Parameter	Stations where min: and max: conc: obtained. (Unit mg/l)	Concentration (range)	Lmits in mg/l (IS:10500-1983)
PH	Chittoor ferry Chiran thuruth	4.1 7.5	6.5 - 8.5
Zinc	Near Njavally Near CMRL outlet	0.22 2.0	15.0
Iron	Near CMRL outlet Pathalam bridge	0.6 224.0	0.3
Cadmium	Near Sud chemie	0.07	0.01
Copper	Near Abco Near Njavally	0.03 0.08	1.5
Nickel	Near FACT Outlet Near Sud chemie	0.04 0.39	---

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12. Analytical results of river sediment samples.

The minimum and maximum concentration of pollutants present in the river sediment samples collected during the river survey conducted on 4/12 /2004 and 2/4/2005 are given in Table No: 12

Table No:12

Sl:No:	Determinant	Concentration, (Range) in mg/kg	Limits (mg/kg)*
1	Zinc	89.0 - 13270	<100
2	Iron	1993.0 - 223750	---
3	Lead	24.0 - 323 .0	35.0 **
4	Cadmium	1.0 - 98.0	2.0
5	Copper	3.0 - 343.0	50.0
6	Nickel	11 .0 - 126.0	65.0
7	Total chromium	21.0 - 1054.0	500.0

*Limits according to the norms under the United States Public Health Standards (USPHS1997).

** Canadian Environmental Quality Guidelines (1999).

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MAIN INDUSTRIES GENERATING HEAVY METALS AND PESTICIDES

1 HINDUSTHAN INSECTICIDES LIMITED, ELOOR.

Name of the Product/s :

DDT(Tech)	- 3.73 MT/day
DDT 50%WDP	- 7.47 MT/day
Endosulfan (Tech)	- 4.43 MT/day
Hildan 35 EC	- 5.33 KL/day
Dicofol (Tech)	- 0.417 MT/day
Hilfol 18.5 EC	- 2 KL/day
Mancozeb 75 WP	- 3.15 MT/day
Recovered Sulphuric Acid	- 5 MT/day
Recovered Hydrochloric Acid	- 4.42 MT/day

Raw materials :

Name	Consumption in MT/day
MCB	4.1
Chloral	1.85
Alcohol	1.4
Oleum	7
Chlorine	4.7
CTC	0.75
Na OH Flakes	0.075
HCCP	3.5
BD	1.15
Toluene	0.45
Thionyl Chloride	1.55
EPH	0.07
Ivamol	0.07
Tech.DDT	3.8
China Clay	2.7
Hydrated Calcium Silicate	0.38
Soda Ash	0.2
Surfactants	0.63
Tech.Endosulfan	2
Emulsifier	0.28
Stabilizer	0.075
Solvent	3.5
Carbon di Sulfide	1.9
Ethylene Diamine	0.7
Caustic Soda lye	0.92
Manganese sulphate	1.9
Zinc Sulphate	0.35
Hexamine	0.065
Furnace oil	4.0
HDO	0.2

Edayar Zinc Limited

Production Process:

1. DDT

DDT is a insecticide used to control agricultural pests and Malaria Vectors such as mosquitoes. Alcohol is chlorinated to produce Chloral alcoholate, which is then distilled in presence of oleum to produce Chloral. Chloral and monochlorobenzene are condensed in the presence of oleum to produce DDT. The Technical grade DDT is further processed into water dispersible powder by particle size reduction after mixing with materials like chinaclay and wetting and dispersing agents.

2. Endosulfan

The company is not producing Endosulfan at present after the fire accident occurred in July 6th 2004. Endosulfan is an insecticide/acaricide used against all kinds of pests. Production started in 1980's.

Manufacturing process consists of two stages. In the first step an intermediate product Het diol is produced by the condensation of Hexachlorocyclopentadiene (HCCP) with Butenediol in the presence of solvent toluene and an acid scavenger Epichlorohydrin. The slurry is centrifuged to separate Het diol powder. Excess Hexachlorocyclopentadiene and toluene are recovered by distillation and reused.

In the second step Het diol is condensed with thionyl chloride in presence of solvent toluene to get endosulfan. The Hydrochloric acid formed during the reaction is absorbed in water to get 30% Hydrochloric acid as a byproduct. The brand name of Endosulfan EC produced in HIL is Hildan.

3. Dicofol

Dicofol is an insecticide used in controlling mites and lices and is widely used as an acaricide in tea plantation and vegetable garden. Production started in 1996.Dichloro Diphenyl Dichloro Ethylene (DDE) is produced by hydro chlorination of DDT.

DDT is converted into DDE with the elimination of one molecule of HCl by Sodium hydroxide in Ethanol medium at 90^0 C. In the second step DDE is chlorinated to produce Tetrachloro compound (Tetramer). The tetramer is hydrolysed using sulphuric acid at 130^0 C to produce Dicofol. Technical product is formulated as 18.5%EC for use in agriculture.

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4. Mancozeb

Mancozeb is a fungicide introduced in the production list of HIL recently. This has an inorganic base of $MgSO_4$ and $ZnSO_4$ complex. Mancozeb is manufactured from Carbon disulfide, ethylene diamine, manganese and zinc salts.

Manufacturing process consists of the following steps.

1. Naham is produced by reacting ethylene diamine and Carbon disulphide with sodiumhydroxide.
2. Naham is reacted with manganese sulphate to produce Maneb.
3. Maneb slurry is reacted with zinc sulphate to form mancozeb.
4. Mancozeb slurry is dried in a spray drier to get Technical grade mancozeb.

1800 tpa mancozeb formulation is also made . Different liquid formulations are made by dissolving the technical grade product in suitable solvent and adding emulsifier and stabilizer. Active ingredient content is made to adjust the requirement.

Waste:

Sources of hazardous waste are ETP sludge, pesticide residue from settling tanks, floor sweepings, HCCP residue and spent /used oil.

The analytical data of sludge is given in Table No: 13

Table No:13

Sl.No	Determinant	Unit	Sludge from Lagoon
1	Zinc	mg/kg	4560
2	Iron		30720
3	Lead		1500
4	Cadmium		8.0
5	Copper		65.4
6	Nickel		160.2
7	Arsenic		BDL
8	Magnesium		13000

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The analytical data of solid waste from effluent settling tank is given in Table No:14

Table No:14

Sl. No	Determinant	Unit	Settling tank meant for Dicofol and Mancozeb effluent.	
1	p^H		3.4	
2	SS	mg/l	136	
3	TDS	„	5540	
4	Chlorides	„	3300	
5	Sulphate	„	1250	
6	Phenolic Compounds	„	0.04	
7	Oil & grease	„	ND	
8 9	DDT BHC	microgram/l „	8.319 1017.68	
10	Endo Sulphan	„	ND	

Sediment samples collected and analyzed from the down stream of HIL outlet contained compounds of DDT and its metabolites, BHC and Endosulfan and other organic halogens.

DDT and its metabolites were present and are detectable in those samples analyzed in the wetlands surrounding the Kuzhikandam thodu , Ammanthuruth paddy fields and Unthithodu area. There are wide spread protests from the local people living around Kuzhikandam thodu regarding the odour of pesticides and deposits of pesticide residues especially during monsoon. During rainy days the level of water rises in thodu and the surrounding land is flooded with contaminated water. When the flood water is drained the entire hazardous materials carried by it get deposited in the residential area. The analysis report of the soil sample collected from the low lying residential plot close to the thodu shows high concentration of heavy metals and halogenated compounds. The determination of the compounds and their effects on the surrounding environment demands more investigation. The study clearly indicates that the complaints raised by the public are found to be genuine.

2 MERCHEM LIMITED, ELOOR.

Products:

	Name	Quantity
1.	Accelerators	: 3.8 TPD
2.	Antioxidant	: 2.0 TPD
3.	Sodium Sulphide	: 0.67 TPD

Raw materials :

	Name	Quantity
1.	Aniline	: 385 MT/Yr
2.	Acetone	: 176 „
3.	Carbon disulphide	:275 „
4.	Industrial Methylated Spirit	:83 KL
5.	Caustic Soda Lye	: 385 MT/Yr
6.	Sulphuric Acid	: 110 „
7.	Hydrochloric Acid	: 20 „
8.	Toluene	: 22 „
9.	Soda Ash	: 10 „
10.	Trichloroethylene	: 25 „
11.	Chlorine	: 66 „
12.	Hydrogen peroxide	: 40 „
13.	Hexachlorobenzene	: 45 „
14.	Sodium Sulphide	: 35 „
15.	Sulphur	: 110 „
16.	Elasto 245 oil	: 2 „
17.	Sodium Sulphite	: 6 „
18.	Ferric Chloride	: 4 „

Merchem Limited Eloor is an industry dealing with hazardous chemicals and generating hazardous waste. The main products are MBT,MBTS,NAMBT,CBS,MBS,DCBS,TQ etc.

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The analytical data of sludge from the storage tank is given in Table No:15

Table No:15

Sl. No	Determinant	Unit	Sludge from hazardous waste storage tank
1	Zinc	mg/kg	578.5
2	Iron		57750
3	Lead		128
4	Cadmium		8.2
5	Copper		99.1
6	Nickel		46.6
7	Arsenic		ND
8	Total Chromium		173.3
9	Manganese		457

The location of the industry is surrounded by low-lying wet marshy lands through which the Kuzhikandam thodu is flowing. On investigation the quantity of sludge accumulation in the thodu was found to be up to a depth of three feet.. As the thodu in the location of reference is near to its origin their will be only very little flow especially during dry season. During the period, if any industry discharges untreated effluent to the thodu the quality of water flowing will be similar to that of the effluent as the possibilities of the dilution is nil. Since the flow path of the thodu is through an area where many residential houses are existing, the impact on the thodu due to industrial discharge in fact directly affected the local population. During rainy days the level of water rises in thodu and the surrounding land is flooded with contaminated water. When the flood water is drained the entire waste materials carried by it get deposited in the residential area. The analysis report of the soil sample collected from the low lying residential plot close to the thodu shows high concentration of heavy metals and halogenated compounds. The determination of these compounds and their effects on the surrounding environment demands more investigation. There are recurrent complaints from the local people and the study clearly indicates that the complaints raised by the public is found to be genuine.

The unit was established in 1997. Right from the day of its trial, there had been complaints from the public. The committee recommended closure of this unit after detecting the deceptive system of effluent discharge mechanism. The complaints still persist though the unit has been compelled to install modern treatment system. In the

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circumstance Supreme Court Monitoring Committee issued directions to the Board to direct the company for installing appropriate meters to ensure the operation of treatment plant. The Board is yet to implement this direction.

3. INDIAN RARE EARTHS LIMITED

Raw materials :	Monozite	: 7.94t/day
	Caustic soda	: 4077t/day
	Hydrochloric acid	: 4t/day
	Oxalic acid	: 0.6t/day
	Sulphuric acid	: 0.13t/day
	Soda ash	: 0.25t/day
	Sodium hyphochlorite	: 3.55t/day
	Hydro Fluric acid	: 140l/day
	Process water	: 83kl/day
	Magnesium sulphate	: 10kg/day
	Barium carbonate	: 19kg/day
	Sodium sulphide	: 65kg/day
	Furnace oil	: 7.0t/day
	Diesel	: 135l/day
	Kerosene	: 16l/day
Products :	Rare Earths Chloride(Composite)	: 11t/day
	Tri Sodium Phosphate	: 13t/day
	Rare Earths Fluoride	: 0.3t/day
	Cerium oxides	: 1.0t/day
	Thorium Oxalate	: 2.0t/day
	Evaporated Lye	: 1.5t/day

Production Process

The industry is engaged in the processing of Monozite sand ,which is a phosphate mineral of Rare Earths and Thorium This sand constitutes about 4 to 5% of the beach sands of Kerala and Tamil Nadu at certain locations towards the tip of peninsula, the other constituents being Ilmenite, Zircon, Sillimanite, Garnite, Rutile etc.

Monozite contains about 60% of Rare Earths expressed as M_2O_3, 8-9% Thorium expressed as ThO_2, and 27-29% Phosphate expressed as P_2O_5. Raw monozite sand after being ground to a very fine size is mixed with Caustic Soda in the form of Lye, and digested at about 140 to160^0 C for a few hours when insoluble hydroxides of Rare Earths and Thorium and soluble Sodium Phosphate are formed.

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The top solution is decanted, clarified by filtration and cooled by adiabatic vaporation in a vaccum crystallize. This crystallized slurry is centrifuged and the crystals are dried in a hot air pneumatic conveyor drier and the dry Tri sodium Phosphate having a P_2O_5 content of 17.5% is packed in bags.

The mother liquor from centrifuge is a weak Caustic Soda solution of about 10% concentrtion. This is concentrated by evaporation and re-used for reaction with monozite.

The slurry of insoluble hydroxides is filtered and washed in rotary drum vaccum filter to free it of soluble Phosphate and Lye. The washed hydroxides are then treated with commercial Hydrochloric Acid under controlled conditions to dissolve the Rare Earths preferentially leaving thorium hydroxide undissolved. The slurry is allowed to settle and clear RE Chloride solution is decanted.

The Crude thorium hydroxide slurry is dissolved in HCL and subjected to a solvent extraction process to separate and recover Uranium and produce high purity Thorium Oxalate.

Waste

The company is generating hazardous waste as detailed below.

1. 745 kg/day Insoluble waste separated as undigested sand from raw material is stored and disposed in RCC trenches /silos.

2. 465kg/day Sludge separated while deactivation of rare earth chloride is Stored and disposed in underground FRP lined RCC trenches.

3. 460kg/day dried sludge generated from the effluent treatment plant is disposed in trenches in open land at the disposal site .

<u>On analysis of the sludge generated from the ETP it is noticed that Zinc, Lead, Iron, Cadmium, Copper, Nickel, Chromium etc are present.</u>

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Analytical data of the solid waste is given in Table No:21

Table No:21

SL No:	Determinant	Unit in mg/kg	Concentration
1	Zinc	„	115
2	Iron	„	2372
3	Lead	„	636
4	Cadmium	„	6.0
5	copper	„	20.4
6	Nickel	„	50.8
7	Hexavalent Chromium	„	2.0
8	Total Chromium	„	52.4
9	Manganese	„	42.0
10	Titanium	„	BDL
11	Vanadium	„	BDL

The other concern of LAEC is the radiation from Indian Rare Earth. The radiation effect from this unit range between 24 to 82 micro Sv at the points starting from Gypsm yard of FACT and along the route at FACT junction, HIL, North gate of FACT, reaching at IRE southern closed gate. The maximum reading of the radiation was recorded at the southern closed gate of IRE itself. The radiation exceeds the limit and pose great health hazard. This is a matter call for immediate attention.

4. BINANI ZINC LTD, EDAYAR

BZL located in Edayar is manufacturing zinc , cadmium &sulfuric acid. The production rate is as follows.

Zinc - 30000MT/Y
Cadmium - 65MT/Y
Sulfuric acid - 51000MT/Y

Raw material is imported Zinc concentrate. The approximate consumption is 66000MT/Y.

During the manufacturing process Zinc concentrate is roasted, concentrated and purified . The solid waste generated during the process is called Jerosite which is collected in the jerosite pond. Analytical data of solid waste is given in Table No:11.

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Table No:11

Sl. No	Determinant	Unit	Sludge from Jerosite pond No. IV (Hazardous waste)
1	p^H		6.3
2	Zinc	mg/kg	587.5
3	Iron		89400
4	Lead		2950
5	Mercury		0.02
6	Cadmium		355.3
7	Copper		114.1
8	Nickel		22.4

On analysis of the Jerosite , it was found that Iron, Zinc Lead, Nickel, Copper& Cadmium are present. The industry discharges 550000l/d effluent after treatment. The sludge from the effluent treatment plant is also stored in the jerosite pond.

On interaction with the local people and on inspection of the ground water sources it is found that the water sources at about 1.5Km distance from the unit is contaminated. Results of the well water samples collected and analyzed confirmed the suspicion. There are wide spread complaints from the general public regarding environmental problems due to the lechate from the old jerosite ponds. The contaminated surface run off from the industrial premises, especially in the paddy fields surrounding Chakkarachal and Edayattuchal due to the impact of lechate, is clearly visible.

5. COCHIN MINERALS AND RUTILES LTD, EDAYAR

Cochin Minerals and Rutiles Ltd is located in Edayar and established in the year 1991.

Products.

	Max.t/d
Synthetic Rutile	88
Ferric Chloride	92
Ferrous Chloride	91

Raw materials

lmenite	125 t/d
Coke	13 t/d
Hydrochloric Acid	175 l/d
FuelOil	10 KL/d
Chlorine	3.5 t/d

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Waste:

In the effluent treatment plant, recovery tanks are provided for the recovery of titanium from ferrous chloride solution. The raw effluent after the recovery of titanium is taken to equalization tank and treated with lime in flash mixer. After chemical treatment the effluent is taken to slurry collection tank from where it is pumped to high rate thickener for solid separation. The overflow from the high rate thickener is settled in ageing tanks and taken to final polishing tank after pH correction. From the final polishing tank effluent is pumped into River Periyar through underground pipeline

The sludge from the high rate thickener is taken to Solids Collection Yard from where the supernatant is returned to the ageing tank.

34000 kg/day of sludge generated from the thickener and ageing tanks constitute the hazardous waste and is disposed in solids collection yard as slurry. Lime sludge generated from the lime preparation unit comes to 658 kg/day and is disposed in sludge drying beds near ageing tanks of Effluent Treatment Plant (ETP).

On analysis of the soil sample collected from the premises of CMRL and the sludge accumulated on land near the Solid Collection Yard indicate the presence of heavy metals like Zinc(70.2 mg/kg & 322.5 mg/kg) Iron (2336.1 & 2895.5), Lead (67.0 & 133.0), Cadmium (1.5 & 1.8),Copper (10.0 & 124.0), Nickel (24.3 & 53.6), Total Chromium (408.6 & 94.9) and Manganese (62.2 mg/kg & 71.4 mg/kg).

The concentration of Hexavalant Chromium in the soil sample collected near river side and solid collection yard were found to be 80.5 mg/kg and 185.60 mg/kg. respectively exceeding the concentration limit of 50 mg/kg specified in class A, schedule 2 of the Hazardous Waste(Management and Handling) Rules 1989.

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The analysis details of solid waste is given in Table No: 12
Table No: 12

Sl. No.	Determinant	Unit	Hazardous waste from CMRL used for brick Making	Hazardous waste mixed with clay for making brick
1	p^H		5.1	4.1
2	Zinc	mg/kg	493.1	176
3	Iron		352250	548.1
4	Lead		190	142
5	Mercury		0.03	0.02
6	Cadmium		8.3	5.6
7	Copper		56.4	48.1
8	Nickel		61.1	48.9
9	Total chromium		277.9	152
10	Manganese		714	328

There are wide spread complaints from the local people regarding the discoloration of river Periyar. An analysis of the river sediment from these stretches reveals that the concentration of iron and other heavy metals are higher than the permissible levels. This unit was found discharging raw effluent directly into river periyar and the committee had more than one occasion recommended closure.

6. SUD-CHEMIE INDIA (pvt) LTD., EDAYAR

The industry is located in Edayar. The unit produces the following products.

HT shift catalyst- 60 t/ month
LT shift catalyst- 20t/ month
Zinc oxide catalyst- 25 t/month
Dechlorination catalyst or Hydrodesulphurization catalyst—20 t

Raw Materials:

Name of materials	Process where used	Consumption in t/day(Max)
1. Ferrous Sulphate	HT Shift catalyst	8.0 MT
2. Sulphuric Acid	HT Shift catalyst and ETP	4.8 MT
3. Caustic soda	HT Shift catalyst	2.5 MT
4. Sodium bicarbonate	HT Shift catalyst	0.5 MT
5. Zinc	LT Shift+zinc oxide catalyst	1.5 MT
6. Copper	HT+ LT Shift catalyst	1.5 MT
7. Alumina	LT Shift catalyst	0.5 MT
8. Ammonia	LT Shift catalyst	1.0 MT
9. Carbon dioxide	LT Shift catalyst	2.5 MT
10. Magnesium oxide	LT Shift catalyst	0.1 MT

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11.	Soda ash	Zinc oxide catalyst	1.6 MT
12.	Commercial Zinc oxide	Zinc oxide catalyst	1.6 MT
13.	Ammonium molybdate	Hydro desulphurisation catalyst	1.0 MT
14.	China Clay	Zinc oxide / dechlorination catalyst	0.1 MT
15.	Lime Powder	Dechlorination catalyst	0.2 MT
16.	Graphite	HT+ LT Shift catalyst	0.2 MT
17.	Ammonium bicarbonate	Dechlorination catalyst	0.2 MT
18.	Barium Hydroxide	Dechlorination catalyst	0.08 MT
19.	Furnace oil	HT+ LT Shift catalyst	3000 litre/day
20.	MTO	HT+ LT Shift catalyst	2800 litre/day

Process.

Metal carbonates and hydroxides on support like alumina are made through metal amine carbonate complex .These metal carbonates are calcined to form oxides ,which are formed into extrudates or tablets.

Waste

The quantity of effluent discharge is 150 to 200 m^3 per day is discharged in to the Periyar River after treatment.

The sludge generated from the effluent treatment plant containing Chromium, Zinc, Lead, Copper etc are the hazardous wastes. Waste generation per 100 tone product is 600 kg and the maximum waste generation is 50 kg /day. The company have recently constructed secured land fill as per CPCB norms for storing the hazardous waste. A roofed concrete tank is used for storing the hazardous waste. Before constructing this new tank, sludge was being disposed in open pits in the premises of effluent treatment plant by the riverside.

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The analytical data of the sludge sample is given in Table No: 13

Table No: 13

Sl. No.	Determinant	Unit	Hazardous Waste
1.	PH		6.7
2	Zinc	mg/kg	14812.5
3	Lead		180
4	Mercury		BDL
5	Cadmium		6.8
6	Copper		6460
7	Nickel		201
8	Arsenic		BDL
9	Chlorides		800
10	Nitrates (as N)		1000
11	Sulphate		6390
12	Cynide		BDL
13	Sulphide		BDL
14	Free ammonia		0.36
15	Ammoniacal Nitrogen		45
16	Phenolic Compounds		BDL
17	Total Chromium		9812
18	Manganese		1030

7. MERCHEM (INDIA) Pvt LTD & MERCHEM LTD, EDAYAR.

a) Merchem India pvt ltd.

Products : Name

	Quantity(kg/day) Average.	Maximum
TMT	1300	1700
ZMBT/Mertard	800	1500
Mertiser	250	700
SDMDC/PDMDC	350	1500
SP	100	400
TBBS	---	---

Raw materials : Name — Quantity (Avg. t/day)

Di methyl lamine (40 %)	2.35
Caustic Soda lye,	0.81
Carbon disulphide,	1.53
Chlorine .	0.77
Process oil	0.03
Sodium bicarbonate	0.036
NaMBT	1.006
Zinc Chloride	0.463
Teritary Butyl Amine	0.077

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Sulphuric Acid	0.123
Sodium hypochlorite	0.061
Sodium sulphite	0.095
Hexa Chloro benzene	0.217
Sodium sulphide	0.179
Methylated spirit	0.158
China clay	0.256
Stearic acid	0.035
Phenol	0.050
Styrene	0.117
Fatty acid	0.030
Caustic potash	0.013
Boroquat	0.036
Ammonium Chloride	0.009
Iso Propyl Alcohol	0.0006
Di Ethanol Amine	0.0001
Styrenated Phenol	0.031
Sulphur	0.024
Xylene	0.002
Iron P. Cyanine	0.006

Process:

1. **Mercure TMT:**

Di methyla mine, caustic soda lye and carbon disulphide are reacted in the first reactor to give sodium salt solution. The solution is then oxidized with the mixture of Chlorine & Air in the second reactor and gives the slurry of product and water. The resultant slurry is filtered and washed in a centrifuge to give wet product. This wet product is then dried in a drier and milled in a pulveriser to get dry and powered product. This product is then weighed and packed in specified packing bags.

2. **Mercure ZMBT**

NaMBT solution is taken in the reactor . the zinc chloride solution is used for the precipitation of product in this reactor. The required product will be in slurry from with water, which is then is filtered and washed in a centrifuge to give wet product. This wet product is then dried and milled in a pulveriser to get dry& powdered product. This product is then weighed and packed in specified packing bags.

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3. Mercure TBBS.

NaMBT solution , TBA, sulphuric acid and hypo are reacted in the reactor. After the addition of caustic solution, the product containing slurry is filtered in a centrifuge to get wet product. This wet product is then dried in drier and milled in a pulveriser to get dry & powdered product. This product is then weighed and packed in specified packing bags.

4. Mertiser

Hexa Chloro benzene and sodium sulphide is reacted in first reactor to give sodium salt of PCT solution. This solution is then oxidized with Chlorine in the second reactor and gives the slurry of product and water. The resultant slurry is filtered and washed in a centrifuge to give wet powder. This wet powder is then dried in a drier and milled in a mill to get dry & powdered PCTS. This product is then mixed in Nauta mixer along with China clay, Stearic acid and iron Pthalao cyanine to get a mixer. This mixed powder is then milled in a pulveriser and this product is weighed and packed in specific packing bags.

5. Mernox SP

Styrene monomer is reacted with phenol in a reactor at controlled temperature under stirring for around eight hours. This liquid product is cooled and filled / packed in suitable containers.

6. Mernox SP(E)

Styrenated Phenol and hot water is agitated in an emulsifier at controlled temperature. This liquid product is then cooled and filled / packed in suitable containers.

7. Merstabfs

Ammonium chloride and Boroquat is reacted in a reactor at room temperature by stirring for around 5 hours. This liquid product is filled / packed in suitable containers.

8. Antitack Agent VC

Fatty acid and caustic soda lye is reacted in a reactor at controlled temperature by stirring for 8 hours. This liquid product is filled / packed in suitable containers.

9. SDMDC

Raw materials are; Di methylamine, Caustic soda lye , Carbon disulphide.

Di methylamine, Caustic soda lye , Carbon disulphide are reacted in the reactor to give SDMDC solution. This liquid product is filled / packed in suitable containers.

b) Merchem Limited, Edayar

The company is producing rubber chemicals of anti oxidants and accelerators.

Name of the Products :

Name	Quantity(kg /day) Average	Maximum
F	400 kg	900 kg
ZDC	600 kg	1500 kg
ZDBC	200 kg	700 kg
ZBEC	30 kg	500kg

Raw materials :

Name		Quantity(kg/day)
Carbon di sulphide	-	345
Zinc Oxide	-	143
Zinc Chloride	-	62
Di ethyl Amine	-	256
Di n Butyl Amine	-	113
Di Benzyl Amine	-	19
Caustic Soda	-	38
Hexamine	-	56
DPG	-	56
MBTS	-	288

Process:

1. **F** is manufactured by formulation of MBTS with DPG and hexamine. The raw materials are pulverized, mixed and again pulverized.

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2. **ZDC** is manufactured by reacting diethylamine and zinc oxide with carbon disulphide with C_1 as catalyst .the resultant solution is filtered, washed dried and pulverized to get ZDC.

3. **ZDBC** is manufactured in two steps.In step-1 SBDC is manufactured by reacting Di-n- butylamine and caustic with carbon disulphide.In step-2, ZDBC is manufactured by precipitation with SBDC and Zinc chloride along with dispersal-F. The resultant solution is filtered, washed, dried and pulverized.

4. **ZBEC**. sodium dibenzyle dithio carbonate(SDBC) is manufactured by reacting DBEA (di benzyl amine)and caustic with carbon disulphide. The SDBC formed is reacted with Zinc chloride along with dispersal F to Precipitate ZBEC.

Waste:

The effluent generated from the above factories is taken to the Effluent treatment plant in the premises of M/s Merchem Limited , Edayar for treatment . The combined effluent after treatment is discharged into periyar river.

A temporary facility of concrete tank with lining of HDPE provided in the premises of Merchem Limited Edayar is used for storing the hazardous waste of Effluent treatment plant sludge generated from sludge drying beds.

Sample of ETP sludge collected from the above plant has been analyzed and found that Zinc, Iron, Lead , Cadmium, Chromium etc are present.

Analytical data of the sludge is given in Table No:15

Table No:15

Sl. No.	Determinant	Unit	Sludge from drying bed
1	Zinc	mg/kg	607.4
2	Iron		5240
3	Lead		127
4	Mercury		0.08
5	Cadmium		10.7
6	Nickel		37.9
7	Total Chromium		46.4

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This is a unit, which has absolutely no efficient treatment system despite the fact that its effluent is highly toxic. The committee has recommended closure of the unit after finding itself that the unit has failed to take efficient pollution control measures despite giving warning of closure. The result shows alarming high concentration of heavy metals.

8. TRAVANCORE COCHIN CHEMICALS Ltd., ELOOR

The industry is located in the Eloor industrial area .

Name of the Product/s

Caustic Soda (Lye & Flakes)	125 t/d
Chlorine	72 „
Hydrochloric Acid (commercial)	290 „
Soda Bleach	45 „

Raw Materials

:Name	Quantity
Raw Salt	212.5 t/day
L.S.H.S	7.00 kl/day

Process:

Electrolysis of brine by Membrane cell technology produces Chlorine and Caustic Soda. Part of Chlorine is converted to Hydrochloric acid, remaining is liquefied and sold in cylinders.

Waste:

Slurry of chemical sludge formed during the precipitation of impurities in brine is disposed in earthern sludge yard near to the riverbed. The quantity of brine sludge is reported as 25 kg/tone of NaOH produced. Hazardous waste containing mercury is reportedly disposed in capped hazardous waste storage yard .The ETP sludge containing lead is dumped in a separate yard in company premises. The treated effluent is discharged into the down stream of Pathalam Bund in Periyar River. In waste chlorine deposit plant, waste chlorine gas is passed through caustic soda to produce sodium hypochlorite and sold as by product. The company has already stopped the Mercury cell plants with effect from 31 /07 /2004.

The analytical data of sludge sample is given in Table No: 16

Table No:16

Sl. No.	Determinant	Unit	Sludge Dumping yard
1.	p^H		9.27
2	Lead	mg/kg	46
3	Chlorides		150000
4	Sulphate		1769
5	Cyanide		BDL
6	Manganesium		1215
7	Hexa chromium		BDL
8	Total Chromium		BDL
9	Manganese		121.2

9 LEATHER TANNING UNITS.

There are three leather tanning units located in Edayar area.

1) M/s.Cochin Leathers Pvt ltd.

2) M/s.T.M.S Leathers.

3) M/s.Kairaly Leather Industries.

All the above three units are having similar production ,approximately 4 tones of wet blue leather per day capacity.

Raw materials : Wet salted raw hides,
Lime,
Sodium sulphide,
Enzyme,
Ammonium sulphate,
Bate Enzyme,
Sodium Chloride,
Sulphuric Acid,
Chromium Sulphate,
Magnesium Oxide

Process:

The salted raw hides are soaked in water (to remove salt and dirt). After washing liming is carried out to remove hair using lime and sodium sulphide solution. Thereafter flesh in the skin is removed through a peeling process. The peeled skin is then washed and tanned in drum by adding chromium sulphate. The final product is the semi-finished leather, also known as wet blue hide, which is allowed to dry in stacks.

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Waste:

The above units generate approx: 1500 kg/month of sludge containing chromium. Chromium bearing sludge is hazardous waste. M/s.Cochin leathers and M/s.TMS leathers have installed Chromium recovery plant which is under operation now under the initiative of Local Area Environment Committee. Similar plant is under instillation at M/s.Kairaly leathers.

The analytical reports of sludge sample is given in Table No :14

Table No:14

Sl. No.	Determinant	Unit	Sludge from Soil	Sludge from HW storage tank
1	Zinc	mg/kg	86.3	189.6
2	Iron		4300	2665
3	Lead		189	154
4	Mercury		0.05	0.03
5	Cadmium		6.3	ND
6	Nickel		47.9	55.8
7	Total Chromium		3200	3300

10. **LEAD HANDLING UNITS**

There are 3 small scale units in Edayar Area handling lead or lead scrap. Among these two units are manufacturing lead acid batteries and one unit manufacturing lead plates for lead acid batteries.

1. Power Controls:

Raw Materials:- Lead ingots – 3000 Kg. per month

Lead oxide – 2000 Kg. ”

Products: Tubular Battery Plates – 330 Nos. per day

Production process:

Lead ingot is melted in an open lead-melting furnace heated by LPG burner and casted into positive and negative grid. Lead oxide pasting is applied to negative plate, pressed and cured at room temperature. The positive grids are filled with lead oxide in a separate chamber, dipped in sulphuric acid and cured. The cured positive and negative plates are charged by dipping in sulphuric acid. Plates are then washed in distilled water, dried in air and assembled.

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Waste:

The wastewater generated from plate washing is highly acidic and is discharged into a pit where it is reportedly treated with lime. The treated effluent is collected in a collection tank. Lead oxide powder is seen spread all over the processing area.

2. National Battery Industries

Raw material:-	Scrap lead acid battery – 20 tone per year
Products:-	Lead acid battery – 900 Nos. per year
	Battery plates – 36000 Nos. per year

Process:

Lead is melted in melting furnace and casted to produce Lead grid. Lead oxide coating is provided and air-dried. Battery containers are brought from outside and filled with Acidic water (Sulphuric Acid and water) and charged.

Waste:

Lead residue from melting furnace 200 kg/month (category 9.1) and waste plastic containers are reported to be disposed to re-processing units. The waste water generated is discharged into land without any treatment. Lead slag contained in polythene bags is kept in the factory premises.

3. Abco Accumulators

Raw materials	:Scrap battery – 5500 kg /month.
Product	:Lead – 3000 kg/month.

Process:

Lead is made from lead plates for lead acid batteries from dry scrap batteries. Process consists of heating the dry scrap battery plates with charcoal in a furnace. Battery plates consists of free lead and lead oxide. Lead oxide is reduced with charcoal to form lead. This is fed into the furnace again. The fumes evolved from this is collected through a duct and passed through water in a closed chamber for scrubbing the fumes and released through a chimney.

Waste

The industry is generating lead containing slag, which is disposed of as waste.

In order to assess the impact of these units, soil samples were collected from the surrounding area. Concentration of lead in the sample was found high (424 mg./kg.)

12. FACT (UD), ELOOR

Raw material	:Naphtha	673 t/day
	:Rock Phosphate	325 t/day
	:Furnace oil	135 t/day
	Sulphur	194 t/day
Products	: Sulphuric Acid	600t/day Sulphuric acid and 550tonnes/day combined capacity SO_2 /acid
	: Ammonia	900t/day
	: Phosphoric acid	100t/day
	: Ammonium Sulphate	682t/day
	: Ammonium Phosphate	450 t/day
	: Carbon dioxide	1007t/day
	: Gypsum	500 t/day

PRODUCTION PROCESS:

1. Sulphuric Acid.

The process consists of Sulphur melting, Combustion of sulphur-to-sulphur dioxide, Catalytic conversion of sulphur dioxide to get sulphur trioxide, Intermediate absorption of Sulphur tri oxide in concentrated Sulphuric acid to produce Sulphuric Acid, Final conversion of unreacted Sulphur dioxide to Sulphur trioxide and final absorption of Sulphur trioxide in concentrated Sulfuric acid

2. Ammonia

Process involved in the production of ammonia are: Desulphurisation of Naphtha, reforming of the desulphurised hydrocarbon ,gas purification,conversion in to ammonia by catalytic reaction .

3. Phosphoric Acid

Phosphoric acid is manufactured by wet process by the reaction of rock phosphate with sulphuric acid.

4. Ammonium Phosphate

Phosphoric acid, Sulphuric acid and gaseous ammonia are fed to a saturator and agitated. Further addition of ammonia is done in the second saturator. The neutralized product is a thick slurry and flows to a blunger where it is mixed with undersized granules;

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crashed granules and recovered dust, along with some urea. The granulation takes place in the blunger. Liquid ammonia is injected to the blunger. The granulated wet product is dried.

5. Ammonium Sulphate

The Ammonium sulphate solution fed to the unit consisting of two separate streams from the Caprolactum Plant of Petrochemical Division .One feed stream is Lactum ammonium sulphate solution and the other feed stream is Oxime ammonium sulphate solution. The process includes Concentration and crystallization, dewatering and drying& cooling

Waste

Hazardous wastes generated from the factory are spent catalyst from sulphuric acid plant and ammonia complex, sulphur muck from sulphuric acid plant, gypsum from phosphoric acid, and sludge from effluent treatment plant.

The analytical data of Gypsum sample is given in Table No: 17

Table No :17

Determinant	Unit mg/kg	Concentration
Zinc	„	16.64
Iron	„	634
Lead	„	34
Cadmium	„	6.4
Copper	„	6.2
Nickel	„	13.4
Arsenic	„	BDL
Flouride	„	368
Phosphates	„	391
Cyanides	„	BDL
Sulphides	„	BDL
Phenolic compounds	„	BDL
Hexavalent Chromium	„	BDL
Total Chromium	„	BDL
Titanium	„	BDL

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CONCLUSION

The current study was conducted to asses the effect of heavy metal and pesticide in environment of Eloor –Edayar area. Results of the samples collected from Eloor-Edaar and Kuzhikkandam thodu indicates the presence of heavy metals and diverse mixture of organochlorine compounds. The effluent from the industries like HIL, Merchem Limited, Eloor and partially from FACT (UD) are directly discharged in to Kuzhikandam thodu. The discharge from Kuzhikandam thodu is reaching Edamula branch of periyar, which ultimately merges in to river Periyar at Eloor ferry. The diversity of chemicals in the thodu is of complex nature. It require in depth study to identify the individual compounds. In the absence of such a study, the true and actual extend of damage to the thodu and surrounding area by the release of hazardous chemicals to the environment is practically difficult. These units have therefore major roles in polluting river periyar along with other units such as CMRL and Binani. The major units discussed above have played a greater role in contaminating ground water in Eloor-Edayar. Even the soil has been rendered totally useless for any agricultural operations. The presence of heavy metals in paddy plants speak itself the extent of contamination of the soil and its reaches. These disturbing results do have its impact on the health of the people and animals.

The people mostly from the lower strata of society depending agriculture and fishing have lost their very means of livelihood not to speak of the basic elements to sustain life such as drinking water, air and shelter. The overall environmental impact as indicated by this limited study has rendered the Eloor-Edayar industrial belt unfit for habitation for it has impaired irreversibly the quality of environment. The polluters however remain deaf and dumb and the regulatory body cannot afford to be any longer indifferent.

The indiscriminate and inhuman approach from the side of industries perhaps cannot find any parallel despite the earnest effort taken by the Supreme Court Monitoring Committee for enforcing the directives of the apex court. The major industries and the Pollution Control Board owes an explanation to the people for the presence of metals like Iron (224mg/l), Cadmium (0.01mg/l), Manganese (0.3mg/l), Nickel(0.01mg/l)and copper(0.03mg/l) in the river water, with the accumulation of Zinc(13270mg/kg), Nickel(126mg/kg), Iron(223750mg/kg), Cadmium(98mg/kg), Copper(343mg/kg), Lead

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(323mg/kg) and Total Chromium (1054mg/kg) in the river sediment, despite the environmental laws which has been enacted to prevent the environmental deterioration.

People in Eloor-Edayar crave for justice. They want air to breath. They want water to sustain life. They want land for agriculture operation to make a living. They were there even before the industries. The industries flourished and the people perished. People lost not only their property but also even their health, future, and even the future of their off springs. Thanks to the system that systematically failed the law.

Adv. P.K. Ibrahim Chairman, LAEC	A. Farook Sait Convener	Jacob V. Lazer Member

Purushan Eloor Member	V. Satheesan Member	K.A. Joseph Member	S. Jayathilakan Member	M. Ashokan Member

Edayar Zinc Limited

CENTRAL POLLUTION CONTROL BOARD
'Parivesh Bhawan', East Arjun Nagar
Shahdara, Delhi - 110032

REQUEST FOR EXPRESSION OF INTEREST (EoI)
NCEF Project on Remediation of Hazardous Waste Contaminated Dump Sites
Consulting Services

1. The Central Pollution Control Board (CPCB), Ministry of Environment & Forests (MoEF), Government of India has received a grant under the National Clean Energy Fund (NCEF) from the Ministry of Finance, Department of Expenditure and intends to apply part of the proceeds of this fund for payment under the contract for the following work:

   i. Preparation of detailed project report (DPR) for remediation of 10 priority contaminated areas (containing multiple sites) spread across 6 states in India based on detailed site investigation studies and assessment.

2. The study is a single assignment for a period of one year. Consultancy firms are required to submit Expression of Interest (EoI) for the above assignment, which will be thoroughly evaluated and shortlisted.

3. The CPCB now invites competent national/international consultants to indicate their interest in providing quality consultancy services (preferably certified) in remediation of contaminated sites. Interested consultants must provide information indicating that they are qualified to perform the services (brochures, description of similar assignments, experience in similar conditions and availability of appropriate skills among staff etc.). Consultants may associate to enhance their qualification. The association may take the form of a joint venture (with joint and several liability) or at a sub-consultancy.

4. Consultant will be selected in accordance with the procedures laid down by the Project Steering Committee of CPCB.

5. Interested consultants may obtain further information from CPCB website www.cpcb.nic.in.

6. Expression of Interest must reach this office not later than 40 days from the date of publication (in case it falls on holiday, then the next working day shall be applicable as the last date of submission). The document must be clearly superscripted as 'Expression of Interest' for the above mentioned consultancy in sealed covers and addressed to The Incharge, Hazardous Waste Management Division, Central Pollution Control Board, Parivesh Bhawan, East Arjun Nagar, Shahdara, Delhi – 110032

Sd/-
Member Secretary
Central Pollution Control Board
Email: 'skam_otra.c_pb_@nic.in / bvbabu.c_pb_@nic.in

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NCEF PROJECT ON REMEDIATION OF HAZARDOUS WASTE CONTAMINATED DUMP SITES IN INDIA

(Phase - I: Preparation of Detailed Project Report)

1. Project Description

The Central Pollution Control Board (CPCB) an autonomous agency under Ministry of Environment & Forests (MoEF), Government of India is the implementing agency for the project for remediation of 10 priority hazardous waste contaminated areas (some are having multiple sites in the vicinity) spread across 6 States in the country which pose severe risks to human health and the environment. This project is designed to provide a detailed site investigation, design of appropriate engineering solutions for remediation and also to implement actual remediation of those contaminated sites. This project is envisaged in two phases i.e. preparation of detailed project report (DPR)for remediation of each contaminated area in the first phase and subsequently undertaking environmentally sound remediation of these sites in the second phase of the project.

2. Background

There are several hazardous waste contaminated dump sites in various parts of India where hazardous wastes was dumped by several industrial units during their industrial operations, resulted in contamination of soil and ground/surface water thereby posing severe health and environmental risks. These contaminated dump sites need to be remediated on priority and restored in an environmentally sound manner through appropriate remediation technologies and safeguard human health and environment. Most of these sites were polluted when there was no regulation in the country for safe disposal of hazardous wastes. In some instances, industries responsible for contamination have been either closed down or the cost of remediation is beyond the capacity of the polluter, thus the sites remain polluting. These sites were also created due to illegal and clandestine ways of dumping and disposal of industrial waste.

Though there may be numerous contaminated sites in the country, the priority areas have been selected only from the sites identified by State Pollution Control Boards. The sites selected for remediation are prioritized for remediation based on hazardous constituents identified in preliminary site investigation studies on each sites carried out by respective State Pollution Control Boards.

Remediation of the sites will minimize the environment and health risks by containing the migration of the chemicals and pollutants from contaminated soiland groundwater to acceptable and safe levels. This project shall derive best practicable remediation solutions by adopting a cost effective sustainable remediation option.

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3. Objective

Site specific implementable remediation plans shall be prepared for the following 10 contaminated areas (containing multiple sites) identified by CPCB as priority sites, the details of the sites are given at Annexure –I.

i. Eloor-Edyar area, Cochin, Kerala
ii. RanipetChromium Contaminated area, TN
iii. RatlamIndustrial area, Ratlam, MP
iv. Chromium Contaminated area, Sundergarh, Orissa
v. Talcher Chromium contaminated area, Talcher, Orissa
vi. Gunjam Mercury contaminated area, Gunjam Orissa
vii. JuhiRakhiMandi, Kanpur, UP
viii. Rania, Kanpur Dehat, UP
ix. Nibra Village, WB
x. POPs contaminated area, Lucknow, UP

The result of detailed project report for remediation 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; it will generate long term environmental and social benefits. These benefits will be mainly associated with a reduction in air, water and soil pollution and hence an improvement in human health and quality of life of the Indian citizens.

4. Scope of Work

The scope of work for preparation of detailed project report (DPR) for remediation of hazardous waste contaminated dump sites shall be as below;

i. To prepare a detailed project report for the 10 priority hazardous waste contaminated areas as per the methodology envisaged in Annexure – II.

ii. The project outcome will focus on the systematic contaminated site investigation and assessment and remediation methodology to be followed for remediation of selected hazardous waste contaminated sites.

iii. The project envisages identification &assessment of contaminants, outlining the contaminated areas, detailed site investigation and characterization, risk assessment studies, selection of remediation criteria, outlining remediation options, preparation of detailed technical specifications for the selected remediation options, preparation of bid document and engineering drawings for each contaminated areas over a period of 12 months.

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iv. The detailed site investigation report should provide all relevant information of the contaminants prevalent at the site, initial site characteristics, drilling test wells, hydro-geological surveys, contaminated soil / groundwater profile studies, ecological and social impact and detailed site characterization results etc.. as per Annexure-II.

v. The consultant may choose to prepare DPRs for one or more sites as per their technical skills or competence.

vi. The agency may require submitting2-3 alternate remediation options for each site with techno-economic feasibility and also in conformity to remediation criteria approved by Technical Expert Committee (TEC) constituted by CPCB. Detailed engineering design shall be prepared only for the remediation option approved by Project Steering Committee (PSC).

vii. The final remediation plan should provide detailed remediation options with complete engineering solution that can be implementable in the country.

viii. The report can then be subject to more detailed review as and when appropriate, to allow decisions to be made on the interventions and possible remediation goals.

ix. The executing agency shall work in association with project team of Central Pollution Control Board and report its progress of work regularly to Project Steering Committee.

5. Consultant Qualifications and Team

The Consultant should be able to demonstrate experience and qualifications in the following areas:

- Identification, assessment, site analysis and characterization of a range of hazardous pollutants at contaminated sites.
- Knowledge on use of latest tools for site assessment both for preliminary and detailed investigation studies so as to reduce monitoring costs.
- Experience in site sampling and testing design for large contaminated sites.
- Risk assessment and priority setting methodologies for hazardous or polluted areas.
- Development of programmes for remediation of contaminated areas and/or redevelopment of Brownfield's areas. Social, political and economic aspects of pollution control and waste management schemes.

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The consultants will be evaluated based on the following criteria

S.No.	Component	Weightage
1.	Technical skills/expertise of consultant	60%
2.	Turnover of the company	10%
3.	Number of projects executed especially in the remediation of sites contaminated with POPs/Heavy metals (experience in the investigation characterization and remediation of contaminated sites including risk assessment).	20%
4.	Consultants having local establishments/joint ventures in India.	10%

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ANNEXURE – I

LIST OF HAZARDOUS WASTE CONTAMINATED DUMP SITES

S. No	Location of the area	Name of the Polluter	Number of Sites	Product manufactured	Type of Waste Generated	Quantity/Area of the Waste/Contamination	Primary Contaminant
				KERALA			
1.	Eloor – Edayar, Cochin	Large Scale Chemical and Pesticide industries and a Zinc smelter	1	DDT, Endosulfan, Dicofol, thiozoles, sulphamides, Zinc ingots	Jarosite, POPs	200000 (Kuzhikandomthodu), 206200 (Ammenthuruth-Karipadam), 30000 (Edayattuchal) & 15500 (Chakkarchal) m^2 area of contamination.	POPs, heavy metals
				MADHYA PRADESH			
2.	Ratlam	H-Acid and Pharmaceutical industries.	4	Vitamin C & Sorbitol and H-Acid & G-Acid	ETP sludge; Iron Sludge/ Gypsum sludge/Sodium Sulphate/ Incinerated	30 MT of waste and 20906 MT/1166 MT/1410 MT of waste at 3 locations	Heavy metals, Iron salts and organic compounds
				ORISSA			
3.	Ganjam	Caustic Soda Plant.	3	Alkali, HCl, Chlorine	Brine Sludge, Mercury waste	5000 MT/33000 MT/18000 MT at three locations	Mercury
4.	Talcher	Closed Chrome Salt manufacturing unit	1	Sodium Dichromate	Leached Residue	60000 tonnes of waste	Chromium
5.	Sundargarh	Closed /operational Chrome Salt manufacturing units.	4	Sodium Dichromate	Leached Residue dumped in premises and isolated land.	11250 MT/16500 MT/1500 MT/15000 MT	Chromium
				TAMILNADU			
6.	Ranipet	Closed Chrome Salt manufacturing unit	1	Sodium Dichromate, BCS.	Chromium leach residue	7.41 acres of contaminated site, 2-4 m height. Chrome bearing waste. Apprx. 2.2 lakh tones of waste.	Chromium

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S. No	Location of the Site	Name of the Polluter	Number of Sites	Product manufactured	Type of Waste Generated	Quantity/Area of the Waste/Contamination	Primary Contaminant
				UTTAR PRADESH			
7.	Lucknow	India Pesticides Ltd.	1	Lindane	HCH (Hexachlorocyclo hexane) muck wasteg	Apprx. 36432 tonnes of waste.	HCH
8.	Kanpur,Juhi Baburaiya, (RakhiMandi)	Kanpur Chemicals (Factory dismantled long back).	1	Chrome salts	Waste containing chromium.	Area of 5-6 acres apprx. Owners not known. Area is densely populated with slum settlement. Apprx. 10000 tonnes of waste. dumped	GW / Soil contaminated with Hexavalent Chromium
9.	KhanpurVillage, Kanpur Dehat	Cluster of BCS manufacturing units	1	Chrome salts	Waste containing chromium.	Area 2 sq. km. Private land. Apprx. 45000 tonnes of waste.	GW / Soil contaminated with Hexavalent Chromium
				WEST BENGAL			
10.	Village Nibra, Dist. Howrah	Not Known	1	-	Waste containing chromium	4440 tonnes of waste	Chromium

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ANNEXURE - II

METHODOLOGY

The sequence of steps, for undertaking contaminated site investigation, assessment, characterization, proposing remediation options for contaminated sites (soil and surface/groundwater) and preparation of detailed project reports for the selected remediation option to be carried out in a phased manner based on the methodology as proposed below

Initial Phase

1) Outlining the contaminated site

- Identification and delineation of the contaminated site - Physical inspection
- Formation of site assessment team/experts
- Collection of history/background information of the contaminated site
- Basic features of the site i.e. collection of information on the site like site maps (topographical, geological),information from local authorities, information on the type of industries (storage and disposal of raw materials, by-products and wastes)
- Nature, location, type and characteristics of the site
- Site photographs
- Identification of previous and current land use pattern of the site (past 10 years)
- Identification of parameters causing immediate threat to the ecology and environment

2) Survey of the contaminated site

- Selection of the observation wells(BW/DW) in the watershed covering the site, for monitoring water level and quality monitoring at appropriate locations, & Inventory details like total depth of the well, Water column; Frequency of sampling (Pre monsoon/ Post monsoon or Bimonthly)
- Preparation of groundwater level contour maps w.r.t. msl; ascertaining groundwater flow direction
- Analysis for soil, surface water, ground water for major ions and heavy metals, organic constituents, pesticides and other relevant parameters related to the contaminated site.
- Identification of Benchmark /Background samples
- Use of rapid assessment tools / methods (for Field & Laboratory analysis)
- Outlining the extent of contaminant plume through surfer maps during pre &post monsoon periods

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3) **Reporting on the status of soil and surface water/groundwater quality in a preliminary assessment report**

- Submission of report based on preliminary findings on the need for actual remediation

Secondary Phase

4) **Detailed site investigation and characterization**

- Delineating the aquifer geometry though geophysical methods and ascertaining lithology of formations
- Drilling of bore-holes in grid manner in and around contaminated sites
- Water quality Assessment, geochemical analysis - analysis of heavy metals, specification of heavy metals, isotopic signatures etc.
- Geological, hydrogeological and hydrological features of the contaminated site - Hydraulic conductivity, permeability, porosity, groundwater flow, lineaments, tracer tests if required & pump tests.
- Development of conceptual – groundwater flow processes & contaminant transport processes to visualize the contaminant plume in groundwater
- Development of groundwater flow and mass transport models

5) **Risk assessment of contaminated site**

- Socio - economic and environmental assessment of the contaminated area
- Environmental, ecological and health related effects of the identified contaminants
- Pathways of contaminant transport and exposure
- Assessment of toxicity, bioavailability, biodegradability and mobility of contaminants
- Identification of significant receptors and establishing trigger values
- Interaction with local groups. Reporting of meetings/opinions

6) **Identification of remediation goals/objectives**

- Summarizing various remediation technologies for each site for soil and groundwater remediation
- Apprising on possible remediation options (atleast 3 alternate options for each site) to the Technical Expert Committee
- Estimation of economic feasibility of the each proposed remediation technology

7) **Preparation of Detailed Project Report**

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- Preparation of detailed project reports & cost estimates and draft bid documents
- Time targeted application of the remediation plan
- Submission of detailed project report (DPR)

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1. Utilizations of **Jarosite** and **Jarofix**

1. **Cement:** As an effort to reduce carbon footprint, BZL is working closely with National Council for Cement and Building Materials for the co-processing of Jarosite in cement industry as AFR (alternate fuel and raw materials). Cement industry accounts for around 5% of global carbon dioxide (CO2) emissions. Binani zinc ltd has engaged National council for cement and building materials (NCCBM) for the studies and based on the studies, it is concluded that (a) 1.5% Jarosite was found suitable to be used as raw material and (b) 3% dose of Jarosite was found suitable as set controller in place of mineral gypsum in cement manufacturing.
2. **Road.** Huge quantity of soil is being used for road construction process. Sand and soil mining can cause considerable environmental damage. In view of the conservation of these natural resources, BZL with the help of Division of civil Engg. Cochin University of science and technology has studied the use of Jarofix in road embankment and subgrade process. Based on these studies Public Work Department, Government of Kerala is planning to conduct trials in road construction by identifying few test tracks.
3. **Building materials:**
   a. As a part of conservation of natural resources through waste management solutions, BZL has always keen in developing alternate materials for the natural resources. BZL has studied the use of Jarosite / Jarofix in the manufacture of building materials and observed encouraging results. BZL has proved with the assistances from CUSAT, that Jarosite / Jarofix can be used in manufacturing of concrete blocks, concrete pavement tiles and sand-interlock bricks.
   Demo walls with Jarofix-Concrete bricks were built inside the company and paving is planned with Jarofix-concrete pavement tiles
   b. BZL is working closely with **National Institute for Interdisciplinary Science and Technology (CSIR),** Thiruvananthapuram for the utilization of jarosite /jarofix in polymer tiles, concrete tiles and other building materials
   c. Preliminary studies were also done with Institute of Minerals and Materials Technology, Bhubaneswar for the utilization of jarosite in manufacture of cold setting building bricks.

1. Jarofix-Concrete solid blocks

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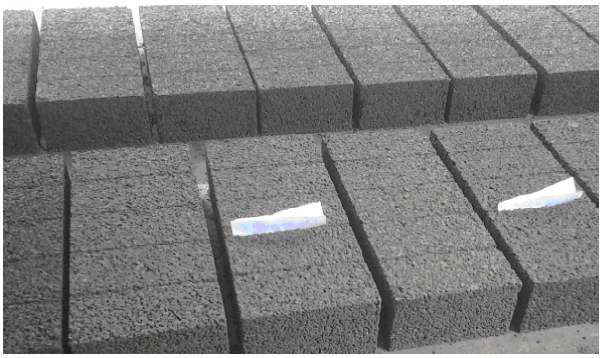

2. Concrete pavement tiles:

3. Jarofix-Sand Interlock bricks

4. Polymer tiles (with NIIST)

5. Jarosite Concrete tiles (with NIIST)

Trial walkway is planned to construct with these tiles

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