WATER IN MINING AREAS

ENVIRONICS TRUST

Contents

PREFACE AND ACKNOWLEDGEMENTS

This paper describes some of debilitating impacts of mining on water resources which have a direct implication on the source, quality and availability of water. The surface drainage patterns are obliterated by every mine and some of the deep opencast and underground mines draw up water up "cognate" waters which have been preserved for centuries or even more. The impacts of mining are so far reaching that the loss of water is often thought as a small price to pay for the resource. What is clear from these studies and assessment is that mining is one of the key sectors causing impact on the source and needs far greater attention than currently bestowed upon. This is only a glimpse of the national scenario and does not include the downstream impacts of destruction of water quality in several rivers and streams.

This paper would have not possible without active inputs from colleagues at Environics Trust and mines minerals and PEOPLE and several community members. I thank them all. I particularly thank Mr Richard Mahapatra who initiated the process and Mr Lourdes Baptista and Mrs Indira Khurana of WaterAid, India for the support as a part of the endeavour to prepare a citizens report on the status of water and sanitation in India.

R.Sreedhar

1. BACKGROUND

1. Mining is vast and expansive. It is one of the major industrial activities impacting the availability and quality of water. The impacts of mining on water occur from small scale quarrying to deep under ground mining and in the new areas of Coal Bed Methane extraction and proposed Underground Coal Gasification. Our task to capture the impacts of Mining on Water Resources and implications to provision of basic needs of water and sanitation to the local communities is indeed daunting. The impacts are far reaching and the governance processes are yet in a state of denial and are indeed apathetic and at best complacent. Mining and allied industries are major guzzlers of water and biggest destroyers of natural storage capacity and the most important cause for deterioration of water quality. The future of water resources is seriously at stake.

2. In an analysis of a cross-section of 123 mining projects which were granted environmental clearance by the Ministry of Environment and Forests in 2007, a startling 136 Million Litres Per Day has been forfeited for Mining that could serve the entire country for a day at the official rural norms for supply. If we were to extrapolate to all the mines in the country, water forfeited to mining operations each year would be atleast a week's national actual consumption.

Water Forfeited to Mining from a part of Clearances Granted in 2007 (123 MINES)	
Total Water Required (L) per day	136305970
	136MLD
ML per yr	40800
MillionPersons@40lpcd	1020
Source: Data from MoEF Website, Analysis by Environics Trust	

3. Considering that this is only consumption for mining operations, if we calculate the needs for downstream beneficiation and industries and at the permanent loss of aquifer storages, natural drainage systems and water rendered unusable by downstream pollution, the damage is colossal.

4. It is clear that intersection of water table by the mining industries must be considered seriously as in several places the major resources lies beneath the water table. The

breaching of the ground water table must be subject to stricter regulation as the very basis of survival of the local communities is sacrificed at this stage. Merely to say that the mine water is put to "gainful" use can lead to unsustainable management of the aquifer. While this may include several uses such as water supply to adjacent area, utilization for dust suppression by the industry, utilization by the mining industry for its different purposes, supplying to local communities, to water supply agencies, utilization for artificial recharge etc, it will be tantamount to ***mining water***.

5. Minerals are not an end product by themselves. They have to go through a channel of processing for an end product depending on the economic value in national and international markets.

6. Bauxite, chromite, iron ore and limestone are extensively being utilized by industry for producing products for indigenous use as well as exports. All kinds of minerals i.e. fuel minerals, metallic minerals and non-metallic minerals have a specific need and requirement as per their different grades and associated downstream industry linkages. Due to strong linkages developing within the country with the producer industry (apart from exports) option to provide captive mines to these industry to ensure regular supply of minerals is an increasing trend.

Impacts of Mining on Water
Open cast mining/quarrying /excavation not intersecting ground water table
Affecting natural surface water regime Affecting ground water recharge regime
Open cast mining/excavation intersecting ground water table
Pumping of ground water Declining of water table Affecting natural surface water regime Affecting ground water recharge regime Affecting natural springs
Underground mining
Affecting ground water recharge regime Shallow aquifers Deep aquifers Affecting ground water flow direction Affecting ground water recharge
CBM/ Underground Coal Gasification
Ground water resource/potentials-drying of upper aquifers

7. There are around 8784 major mineral leases spreading across the country, apart from thousands of minor minerals and quarries. The consolidated area of lease under these major minerals is estimated at 4800 sq. kms. Almost 75% of the total lease area is distributed among 10 minerals listed in descending order of their lease area.

8. Top ten mineral wise leases and lease area is indicated in the table below:

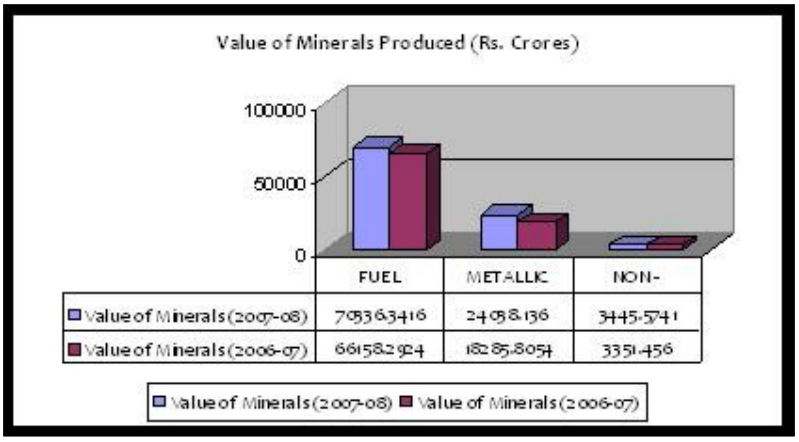
S.No.	Mineral	No. of Leases	Lease Area (Hect.)	Percent lease area distribution#
1	Limestone	1714	126894.59	26.44
2	Iron Ore	577	80962	16.87
3	Bauxite	349	30069.8	6.26
4	Manganese Ore	294	21101.7	4.40
5	Steatite	412	19318.54	4.02
6	Silica Sand	470	17544.65	3.66
7	Fireclay	256	16519.66	3.44
8	China Clay	458	16275.53	3.39
9	Quartz	1311	14950.83	3.11
10	Gypsum	72	14711.61	3.06
Total of above		5913	358348.91	74.66
# of the total mine lease area Source: IBM, Analysis: Environics Trust				

9. Illegal mining far outstrips the number of legitimate mines. A Parliamentary Committee on Illegal Mining identified 14504 illegal mines in the year 2005. A Madras High Court Committee investigating complaints of 14 illegal mines in the Nilgiris District of Tamil Nadu came across 124 of them! The Parliamentary Committee was critical of the outcomes of the Government efforts and stated that the "impact thereof has been far from the satisfactory and the exploration and development of mineral wealth of the country remained unproductive both economically and socially". The report adds, "The conservation as well as systematic and scientific harnessing of mineral resources is bedrock of economic development of a nation. However, unscientific and unlawful mining has been thriving endlessly causing not only immense loss to the national exchequer but destruction of natural environment".

10. It is not that the legal mines have been adhering to the rules. The IBM data indicates that there is a huge number of violations in the operating legal mines. The IBM itself has been able to inspect only a fourth of the legal mines. Nearly 70 percent of these mines had

some on-going violation of the MC Rules yet the prosecution is limited and the penalties very limited.

11. No wonder mining sector is the most lucrative and harbours crime, frauds and "mafias" in the entire chain of operations. The new Mineral Policy and the forthcoming amended Mines Mineral (Development and Regulation) Act are a response to this Parliamentary Oversight.



12. Fuel minerals constituted the majority of minerals value growing at a compounded annual growth rate of 6.31% over the last two year. The intensity of development of metallic minerals is quite evident from the high growth rate of 31.46% and is the fastest growing mineral segment. The value of Non-metallic minerals grew at nearly 2.80% per annum.

13. The rate of growth of solid fuels[1] accounted for 10.54% whereas the gaseous and liquid fuels[2] accounted for 0.80%. The growth rate has been consistent for both solid and liquid/gaseous fuels over the last 7-8 years and has seen an upward trend. Among the fuel minerals, coal is the primary mineral constituting more than 50% of the value in the fuel mineral category followed by petroleum. Coal being the primary mineral meeting the energy requirement of the country is expected to grow at an increased rate. Fuel minerals are the major contributors to the overall mineral value in the country (75.35% in 2007-08).

14. Among the metallic minerals iron ore, chromite, manganese and bauxite are the major minerals contributing to the value of metallic minerals[3]. It must also be noted that

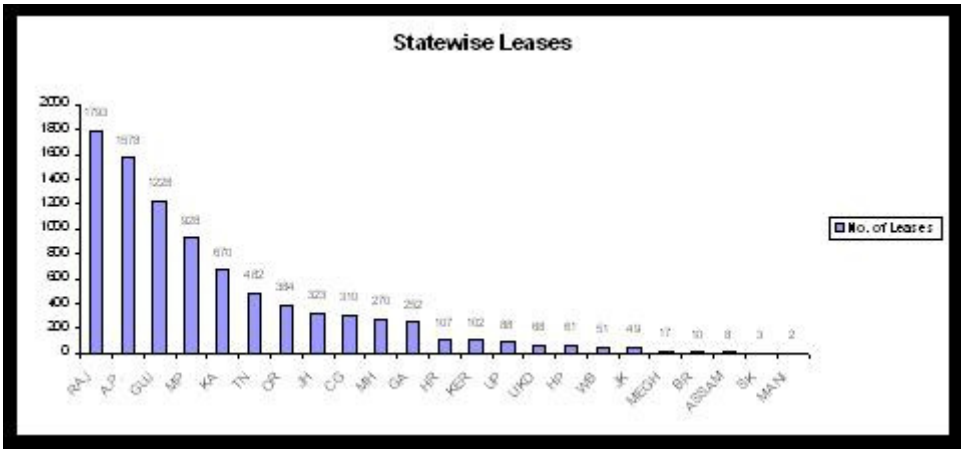
1 Coal and Lignite

2 Natural gas and Petroleum

3 Gold has been left out as its production to value ratio is too high among all the minerals.

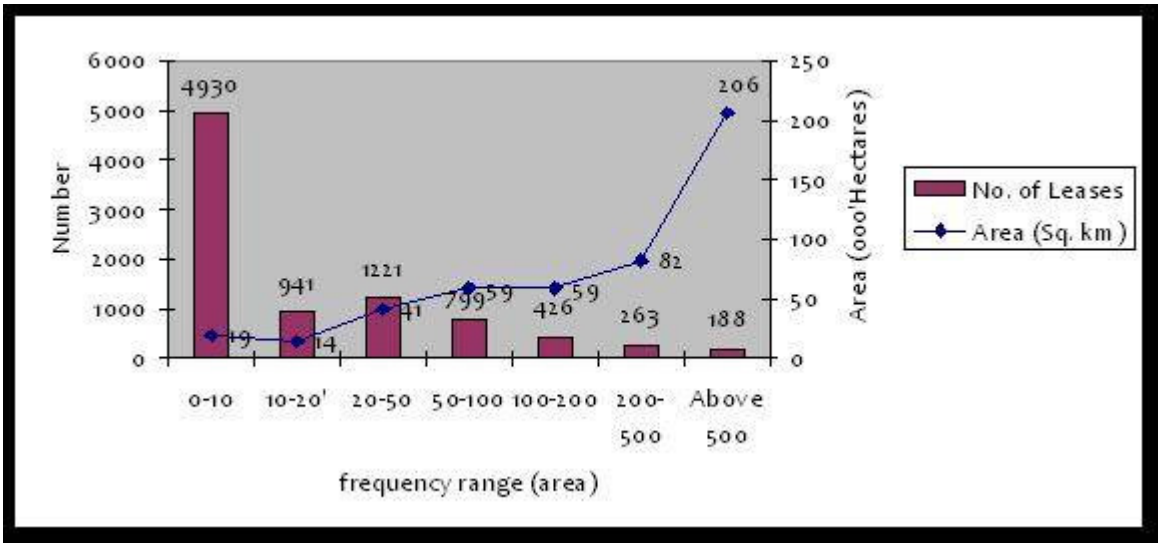
majority of the chromite deposits are in the State of Orissa. Metallic minerals contribute nearly 20-25% of the total mineral value during the past 2-3 years and around 24% of the total reporting mines constitute this category. Aluminium and steel are dependent on bauxite and iron ore deposits and there have been greenfield ventures as well as brown field expansions in these sectors with the growing ancillary & downstream industry.

15. Non-metallic minerals are low value minerals in the whole array of mineral sector of India but these extend through large areas (mining leases in terms of area of lease). Around 56% of the total reporting mines during 2007-08 formed this category. These minerals contribute nearly 3-3.5% to the total value of minerals in the country as estimated by the Indian Bureau of Mines. Limestone is the single largest non-metallic mineral contributing nearly 2/3rd of the total value among this category followed by phosphorite.



16. 94.22% of the total leases are granted/executed in the private sector covering an area of 3270 sq. kms where as rest of 5.77 percent is administered in the public sector. These mines are governed by the MMDR at the central government level and rules and regulations issued under the Mines Act of 1952 from time to time. Rajasthan leads the tally both in terms of number of leases as well as lease area among all the states in the country.

Number of leases and respective lease area under each frequency class gives an overview of size of mining leases and extent of overall area it covers under a particular area range. e:g 188 leases (above 500 hectares) the corresponding area is 2,06,000 hectares (further it can be inferred that 42.91% area is under large leases) whereas for 4930 leases, the corresponding area is 19,000 hectares.



17. We present mineral-wise overview and specific case studies that depict how mining is significantly affecting water resources among the several that we have been studying to underscore the fact that mining per-se is destructive depending upon the nature of the surface and ground water regime. It is therefore important to recognise limits to mining from the perspective of long-term water availability even while `mining for water'. It must be emphasised that in the name of Corporate Social Responsibility or otherwise the mining sector should be sensitive enough alteast to ensure clean drinking water to the very people involved in mining – those whose lands have been acquired and those who work in the mines.

A. ASBESTOS AND ASSOCIATED MINERALS: A LETHAL LEGACY OF SINGHBHUM

18. Around 40 countries have banned or set in motion steps to phase out the use of asbestos, a deadly carcinogenic mineral, yet India is trying to move in reverse gear. Unmindful of the health and environment concerns, attempts are being made to lift a 20-year-old ban on asbestos mining. In 1986, the Government had directed all states to stop granting new mining leases for asbestos (including chrysotile) in view of the deleterious effect on the health of mine workers. In 1993, the government also stopped renewing existing mining leases. India is a major importer of asbestos. 311705 tonnes valued at Rs 590 Million was imported in the year 2007-08. Russia, Canada and Brazil export the most of the asbestos to India.

19. The Chotanagpur Division of Bengal Presidency was an area well explored even before independence by the Geological Survey of India. It is a virtual storehouse of metallic and non-metallic minerals along with the contiguous part of Orissa. The only asbestos mine of Jharkhand was in Roro. Asbestos and chromites are present together in the peridotite host-rock. The long stretch of asbestos and chromite are found in different parts of the West & East Singhbhum & Seraikella-Kharswan districts of Jharkhand and Asthapahar of Sukinda of Jajpur, Keonjhar and Dhenkanal districts.

20. The region has had an active history of mining operations for about seven decades starting with the mining of magnetite. The first major mining operation by Tata Steel began in early of the first decade of 1900 AD in Mayurbhanj & Keonjhar districts of Orissa where mining was done by conventional open pit benching and the mining activities were extended in rich iron and chromites reserve areas of West Singhbhum. Also the commissioning of IISCO in the first decade of 20th century opened up the mining activities in Chiria iron ore mines area of the west part of Singhbhum. Thus these areas were transferred into a hub of mining activities. Roro hills range is contiguous to Jojohatu hills, which is also mineralized with chromite

Abandoned Open Cast Chromite Mining Pits of Tisco

and asbestos and magnetite. The Roro hill is under the Anjadbera protected forest area and highest elevation is approximately 600 meters above the level of the plains where the settlements of Roro and Tilasud village are located. The entire hill range is well wooded. Roro hills were mined for chromite and asbestos by major industrial houses like Tatas and Birlas respectively. Roro witnessed the open cast Chromite mining by TISCO (Tata Steel) up to 1959 and asbestos by Hyderabad Asbestos Cement Products Ltd (Hyderabad Industries Ltd) of Birla Group from 1963 to 1983. Since then the area abandoned by the miners and is a now perhaps an "orphaned" mine – a term unique to India. Such surrendered mines are identified as orphaned mines like Roro (abandoned chromite and asbestos mines) and mechanism to reclaim and rehabilitate the orphaned sites is yet to be developed[4].

The aerial view of mine waste deposit

21. The waste dumped of chromites and asbestos, which covers a large portion of the Roro hills area, washes down the agriculture field, forest, and river and near by areas of closed mines and now it has become a regular phenomenon in rainy season. Due to this the growth of the forest has stopped and 20 acres of land have been submerged with the asbestos and chromite dust and now these wastes have been contaminating the main source of drinking water of Roro River. In this case, health risks to human beings and the environment are far greater because asbestos and chromium are known carcinogens. Moreover, many more people have already died in the past due to asbestosis and mesothelema. The impact of abandoned waste of chromites and asbestos as lethal legacy of mining, on Anjedbera protected forest and Roro hills areas are clearly visible. The mine wastes have been increasing barren areas and have been destroying the options of livelihood,


Farmer shows his affected land

4 Photo credit and Inputs:Samit Kumar Carr:Contaminated by Orphaned Mine Waste – The Sorrow Of Roro

forest, environment, water ways and human health & lives due to water borne erosion of the same in rainy season and flying during storm in summer.

Photographs shows the deposit of mine waste in the agricultural fields and on the motorable road

In the last 23 years, nobody - the local administration, the mines and safety department, State Pollution Control Board nor the mining company - initiated to assess the situation caused by dumping of waste improperly and in a irresponsible way on top of the Roro hills.

22. Roro hills and mine waste affected adjoining areas falls under both the Protected and Reserved forest areas of Anjedbera. The tribal people residing here were earning their livelihood from agriculture and minor forest produce. In absence of any mechanized irrigation systems they had to depend upon monsoons. The Forest (Conservation) Act 1980 and its enactment in the form of ban on collection of minor forest produce came as a shock and thus deprived them badly. In this situation mining was started without providing any alternative scope of income earning to the habitants of this area in spite of being in the V Schedule area. The opening up of mining activities did not give them any extra source of income earning rather their role was confined to the daily wage earner and that too to a limited number. The presence of mine waste posing another threat to their livelihood and this time in a more dangerous lethal waste contaminating river and pond water.

23. The asbestos and chromites remains out of this mine waste settled thick on their agricultural fields and mixed up with the only source of water ie Roro River. At large the actual owner of the forests is alienated and deprived of their rights to the common natural resources. Displacement from their land and livelihood, environmental degradation, change in food pattern and life style, threat to their culture and religion and the post mining phenomenon especially by the toxic and hazardous mine waste make

their lives more miserable and put them in traumatic disorder and ultimately to untimely death.

24. The impacted population would be around in several thousand as there are several villages are settled across the river and in and around mines areas. The villages are Anjedbera, Jojohatu, Hesabandh, Pasubera, Barkela, Baralagia, Bardor, Kabragutu, Jugidaru, Tilasud, Roro (mundasai), Birsinghatu, Purnapani, Perbol, Bandijari,, Gundiposi, Garahatu, Hatimanda and Harira.

25. Modalities to address the issues and their legal enforceability within the mining and environmental legislation is the only way to protect post mining environment, lives and livelihoods. However there seems to be a concerted effort among the promoters of the industry to further expand use of this disastrous mineral.

Aerial Image of Polluted Roro & Jojohatu Hill Streches & Agricultural Fields

B. BAUXITE MINING AND ALUMINIUM PRODUCTION

26. Bauxite Mining and Aluminium production are by far among the most destructive of the source and sink. Bauxite occurs as plateau deposits along the Eastern and Western Ghats. Here they are the highest aquifer systems in several watersheds.

27. Bauxite by nature is a combination of minerals with hydroxides, much similar to the water that our recent "Moon Mission"[5] is claiming. Further bauxites are concretionary with oolitic and pissolitic structures that enable water storage. In all the plateaus where bauxite is found invariably the springs raise at the bottom of the bauxite layers.

28. The Eastern Ghats particularly is under threat of wide-spread impact on water resources from a chain of bauxite mines, alumina refineries and aluminium smelters, some of which are operational and several on the anvil.

29. The Damanjodi region of Koraput and the Angul Region in Angul District have been severely affected by mining and allied activities. Many streams and springs have been obliterated and in Angul the Brahmini River has been so polluted to warrant a separate Parliamentary Appraisal. The damages caused by the ash-pond breach of the NALCO are still to be mitigated and no solution is seen for the return of the land to farming conditions.

30. In Kashipur and Lanjigarh there is an ongoing struggle of the communities to protect their water sources from the impact of bauxite mining and refineries. The OMC Mine and

[5] India's Moon mission Chandrayan has become famous for its claim of finding water but this water is in the form of hydrated minerals.

the Vedanta's Lanjigarh Refinery will use up the local water resources as well as tap huge a quantum (56 MCM) from the drought prone Bolangir's Tel River Basin.

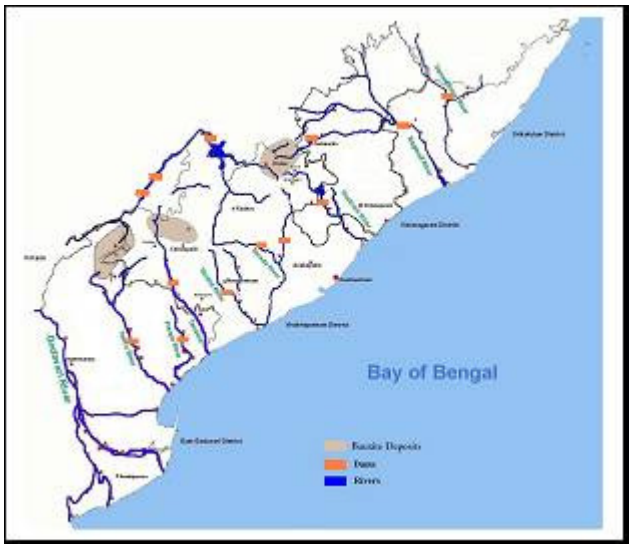
31. The deposits that are actively being sought for development in Andhra Pradesh are

Name of Deposit	**Ore (Million Tonnes)**	Water per Year Cu M
Galikonda	14.50	51,830
Raktakonda	8.50	38,690
Chittamgondi	28.00	67,890
Sapparla	186.25	4,74,500
Gudem	38.41	93,075
Jerrela	246.04	5,93,125
Gurtedu	42.63	1,00,375
		14,19,485
Source: Samata, 2009		

32. A detailed analysis of the proposed projects and the implications to water sources have been undertaken by SAMATHA[6] indicates that the water resources meant for drinking water and irrigation have been already pledged to the companies. Natural and locally available water bodies - Mudasarlova, Gambhiram, Gosthani, Thatipudi, Meghadrigedda, Raiwada and Yeleru have already shrunk from their original capacity of 39 MGD to 12 MGD due to encroachments, obstructions, constructions. Citizens in Visakhapatnamwill be forced to depend on additional quantity of 27MGD of more expensive water from Godavari. Even with the additional quantity of water from Godavari, the total water availability in the Visakhapatnam- Vizianagaram region works out to 219 MGD. As against this, the water requirements of the committed and yet-to-be committed industrial units add up to 256 MGD. Vishakaptnam Urban Development Authority (VUDA) is planning deficit of 37MGD by 2020 and Greater Vishakapatnam Metropolitan Corporation (GVMC) is planning for a deficit of 83 MGD by 2020. Further, without taking into account the irrigation and drinking water requirements of other rural & urban areas in this region, Irrigation and drinking water needs of the region add up to 145MGD.

Annual Water requirements for the Proposed Bauxite Mining, Refinery and Smelter in Andhra Pradesh
For seven bauxite mines 14.20 Lakh cu meters!
For just one Refinery 146 Lakh cu meters!!
For just one Smelter 32.50 Lakh cu meters!!
For 7 mines + 1 Refinery + 1 Smelter
Total 192.70 Lakh cu meters per year
Source: Samata, 2009

[6] Health Of The Hills Is wealth of the Plains



33. In response to RTI Aplication 2005 on the water supply commitment to Jindals, the State Irrigation Department has furnished some details that are truly disturbing. In the past, in order to earmark 1.58 TMC of water from Raiwada to meet the drinking water needs of Vishakapatnam, the Governement "suppressed" 6000 acres of irrigation under Raiwada. Hence the first charge on Godavari waters would be to compensate for the suppressed ayacut. Commitment of Godavari water to Jindals is an unwise step, as it cuts into the legitimate water needs of Vishakapatnam, at the expense of the citizens. In spite of the sane advice given by the Irrigation Department., the Government directed GVMC, to commit Godavari water to Jindals! Evidently, even after taking into account the additional water availability from Godavari, no new industrial unit can be allowed in the region, without adversely affecting the interests of the citizens. A serious water crisis, totally man-made, is brewing, unless the authorities introspect and take urgent corrective steps.

COAL & LIGNITE

34. **Coal and Lignite** is of the most important fuel minerals mined in the country. The major proportion of our coal and lignite resources go into the production of power and has a huge impact on surface and ground water resources and the quality. There were about 600 coal mines in 2006-07 and if we look at the projected demand for coal at the end of the XII Plan, there is a need for a three-fold increase in mining that is necessary.

Sl. No.	Coalfield	Company
1.	Singrauli	NCL
2.	Karanpura & Bokaro	CCL
3.	Jharia	BCCL
4.	Assam & Meghalaya	NEC
5.	Raniganj	ECL
6.	Ib & Talcher	MCL
7.	Central India	SECL
8.	Pench & Kanhan	WCL
9.	Chanda & Wardha	WCL
10.	Godavari Valley	SCCL
11.	Lignite (TN)	NLC
12.	Lignite, Gujarat & Rajasthan	**GMDC** **RSMDC**

Coal mining companies in the country

Coal Production and Estimated Demand by Task Force (Million Tonnes)					
Sector	**Anticipated**	**Assessed**	**CAGR**	**Projected**	**CAGR(%)**
	X Plan 2006-07	**XI Plan 2011-12**	**(%)**	**XII Plan 2016-17**	
Power Utilities	310.00	483.00	9.27	750.00	9.20
Power Captive	31.50	57.06	12.62	85.00	8.30
Cement	25.00	31.90	5.00	50.00	9.40
Sponge Iron & Others	50.50	90.64	12.41	135.00	8.29
Total Non-coking	417.00	662.60	9.70	1020.00	9.01
Coking-Steel	43.00	68.50	9.76	105.00	8.92
Total	**460.00**	**731.10**	**9.71**	**1125.00**	**9.00**
Source: Planning Commission, GOI					

35. Water is used in coalmines for several functions including washing, spraying, in tailing - ponds and for coal preparation. This can cause a conflict with other water users and environmental requirement. Mines can dewater groundwater aquifers some distance from shafts or pits, which reduce the water table in the area adversely affecting other activities including agriculture. The major source of water pollution due to mining include pumped out mine water, spent water from coal handling plants, dust extraction and dust suppression systems, wash offs from overburden dumps, workshops and domestic effluents and effluents from washery. Chronic leaks from waste dumps or direct disposal of waste in the water bodies result in severe pollution of ground and surface water. Water pollution can affect the area even after the closure of the mine if the pits are not filled properly. Water in contact with the left over coal in the pits becomes toxic and unfit for any use. Also run off from abandoned waste dumps and pits, becomes acidic resulting in soil erosion, and contamination in the water bodies. Several examples of such pervasive impacts are seen in coalfields of Jharkhand, Orissa, West Bengal, Maharashtra, Uttar Pradesh, Madhya Pradesh, Maharashtra and Andhra Pradesh.

36. In East Parej Open Cast Coal Mines operated by Coal India's Central Coalfields Limited, which had the distinction of receiving World Bank Funds for Environmental and Social Mitigation, the land which used to be an agriculture land providing income and livelihood to people is now turned into a huge pile of dumps and pit holes. Such unkempt dumping without any proper topsoil conservation plan and regeneration action plan, leads to greater devastation of surrounding areas. Along with destroying the scenic beauty of the area, these huge piles of dump are destroying the regeneration capacity of Parej. The Environmental Management Plan has a provision of providing guarding sump around the over burden dump, so that any accumulation in these guarding sump can check waste or soil erosion from these dumps. In reality, CCL has not invested money or attention on these aspect. Mine waste collected during overburden removal is simply strewn and allowed to seep into underground water aquifers. Since mining started in the region, malaria incidence has increased. Water resources in the region and wells provided to PAPs in Pindra and Premnagar blocks are found to be highly contaminated and unhygienic for drinking, and scarcity has aggravated the problem for them. People in Parej are left with no other option but to use these contaminated and unhygienic water sources for drinking and water collected in mine pits for bathing, resulting in higher rate

of skin diseases in the region. Mining operations in the region, apart from affecting the general surface structure of the region by means of huge overburden dumps and pit holes like lunar craters, is also disturbing the underground as well as stream flow in the region. This disturbance results into collection of water in mine sump or pit holes created by abandoned open cast mines instead of flowing into natural ponds or streams. It is difficult even to access drinking water as Shohadri Devi from Agariatola[7] says this poignantly;

" Aab pani aur Mahua leney bhi 7 km dur jana padta hai aur baki jan boltey hain , tumnay apna ghar aur jamin bech di tumhay pani nahi milega "

Now we need to go 7 km to get drinking water and when we go to get drinking water from others well or mahua from forest, people say, you sold your mother (land) to the company you either don't deserve it or will get the last drop.

This statement itself shows the reality behind company's claim of providing all necessary amenities to PAPs. The social and communal isolation people of Parej because of CCL 's acquisition of their lands are real and unfortunate.

37. Fortunately many of these are not associated with pyrite and acid mine drainage is not a severe problem. However, there are a few mines with acid mine drainage problems, a significant example being the coal mines in Meghalaya. The Jaintia Hills District of Meghalaya is a major coal producing area with an estimated coal reserve of about 40 million tonnes. Sutnga, Lakadong, Musiang-Lamare, Khliehriat, Loksi, Ladrymbai, Rymbai, Byrwai, Chyrmang, Bapung, Jarain, Shkentalang, Lumshnong, Sakynphor are the main coal bearing areas of the District. The coal, in the area is found imbedded in sedimentary rocks, sandstones and shale of the Eocene age. The three coal seams vary from 30 to 212 cm in thickness. The main characteristics of the coal found in Jaintia Hills are its low ash content, high volatile matter, high calorific value and comparatively high sulphur content. Large scale denudation of forest cover, scarcity of water, pollution of air, water and soil and degradation of agricultural lands are some of the conspicuous environmental implications of coal mining. Besides, caving in of the ground and subsidence of land and haphazard dumping of coal and overburden has deteriorated the aesthetic beauty of the landscape. The water in coal mining areas has been found highly acidic. The pH of streams and rivers varies between 2.31 to 4.01. This indicates serious condition of the water bodies of the area that hardly can support any aquatic life such as fish, amphibians

[7] Environics Trust: Situation Analysis and Claim Status of World Bank Funded East Parej OCP, 2006

and insects. Contamination of Acid Mine Drainage (AMD) leads to acidity or low pH of the affected water bodies. Acidic water is a matter of primary concern since it can directly be injurious to aquatic organisms. It also facilitates leaching of toxic metals into the water that could be hazardous to aquatic life, directly or can disturb the habitat after precipitation. Most of the water bodies in the coal mining area of Jaintia Hills have been found containing high concentration of various metals. Many metals, though common, can be toxic to fish and other aquatic organisms thus reducing the overall fish population. Besides, water was also found turbid and coloured due to suspended precipitates of iron hydroxides. Silt, fine sand, mud, coal dust and similar materials form a covering over the bottom and disrupt the benthic habitat. In addition they reduce the availability of oxygen and light for aquatic life. Dissolved oxygen is essential for sustaining higher life forms in water. It is an important parameter to assess water quality. Dissolved oxygen was found to be low in water bodies of coal mining areas, the lowest being 4.24 mg/L in river *Rawaka* and stream *Metyngka* of Rymbai. [8]

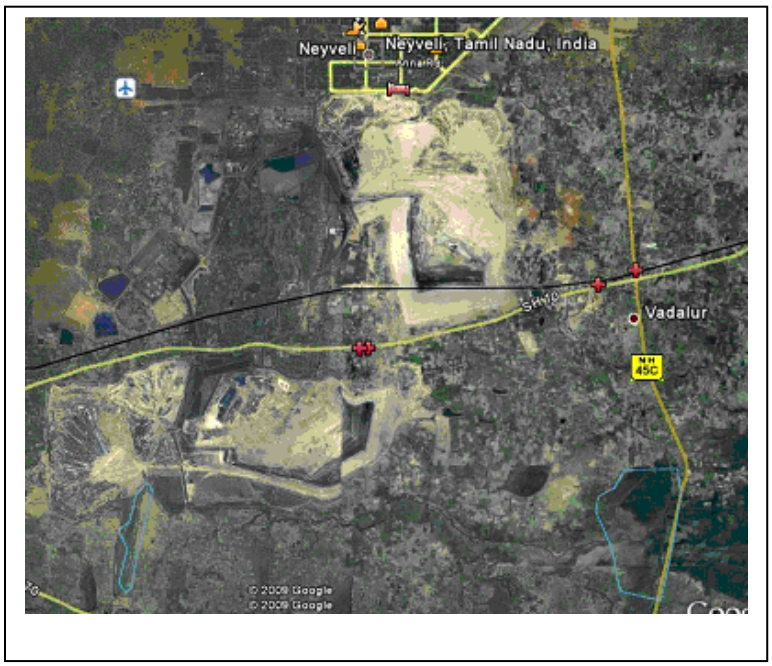
38. Lignite is principally used for power generation at pit head power plants. The percentage of lignite actually used for power generation has varied from 80% to 86% since 2001-02 (more than 98% of lignite consumed in Tamil Nadu was for power generation during this period). Demand for lignite is thus governed mainly by lignite based generating capacity actually/planned to be installed.

39. Lignite Mining in Neyveli is an epitome of how mining impacts water resources. Here, mining for Lignite situated above artesian aquifers has actually led to destruction of the aquifers above and beneath the lignite and has also prompted mining of water in an unprecedented scale. The threat of sea-water incursion is alarming.

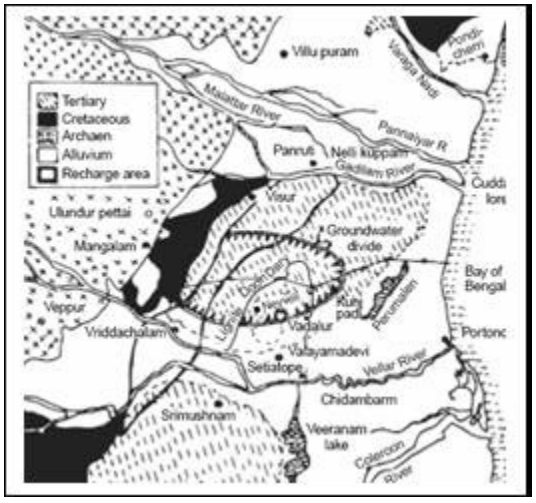
40. Several other lignite deposits in India, particularly in coastal Kutch also have artesian conditions and the continued expansion and deepening of lignite mines will eventually lead to a massive destruction of the storage potentials, loss of groundwater utilizable without expending energy and obliteration of the recharge systems.

8 Sumarlin Swer & Singh O.P:Proceedings of the National Seminar on Environmental Engineering with special emphasis on Mining Environment, NSEEME-2004, 19-20, March 2004; Eds. Indra N. Sinha, Mrinal K. Ghose & Gurdeep Singh

MINING OF LIGNITE IN NEYVELI: EPITOME OF WATER DESTRUCTION



Lignite was first discovered in the Neyveli region in 1934. Detailed exploration during 1943-46 by the Geological Survey of India led to the establishment of sizeable reserves and the rationale for the formation of the Neyveli Lignite Corporation. Neyveli Lignite Corporation was registered as a company on 14th November 1956. The Mining operations in Mine-I were formally inaugurated on 20th May 1957 by the then Prime Minister Pandit Jawahar Lal Nehru

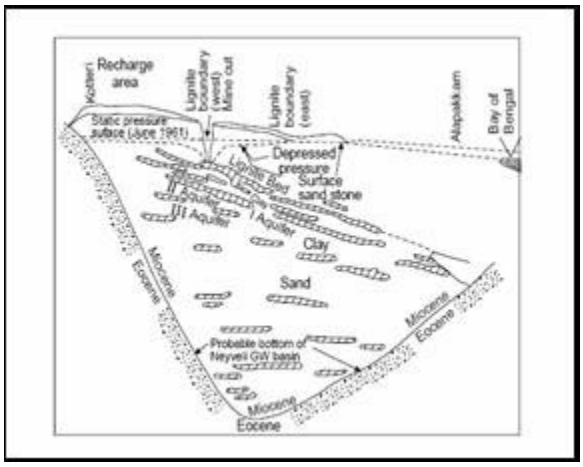


Currently Neyveli Lignite Corporation Ltd. (NLC) is India's largest lignite mining company, and a leading power generation company. The company operates three open cast mines in Neyveli, producing some 24 million tons of high-grade lignite per year.

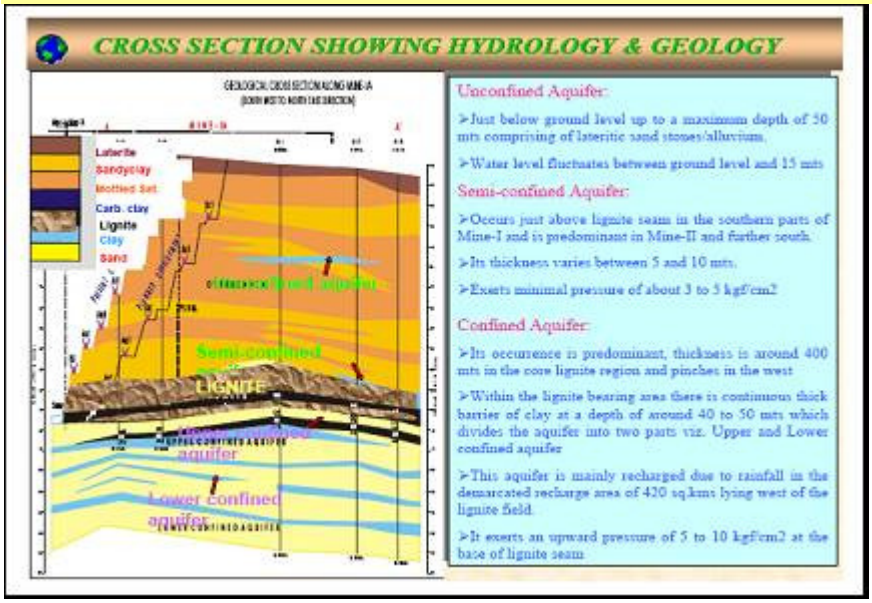
Mine I (Northern in the image), the company's original mine, is operated over an area of nearly 17 square kilometers and offers a reserve of nearly 300 million tons. Mine II, first tapped in early 1984 and expanded in the early 1990s, features a reserve of nearly 400 million tons. The total reserves in the Neyveli field are estimated at more than two billion tons.

As is obvious, a huge area has been opened up totally transforming the surface water flow regimes. Today it would be impossible to decipher the original topography. The map shows how the region between the Gedlam and Vellar Rivers has completely transformed.

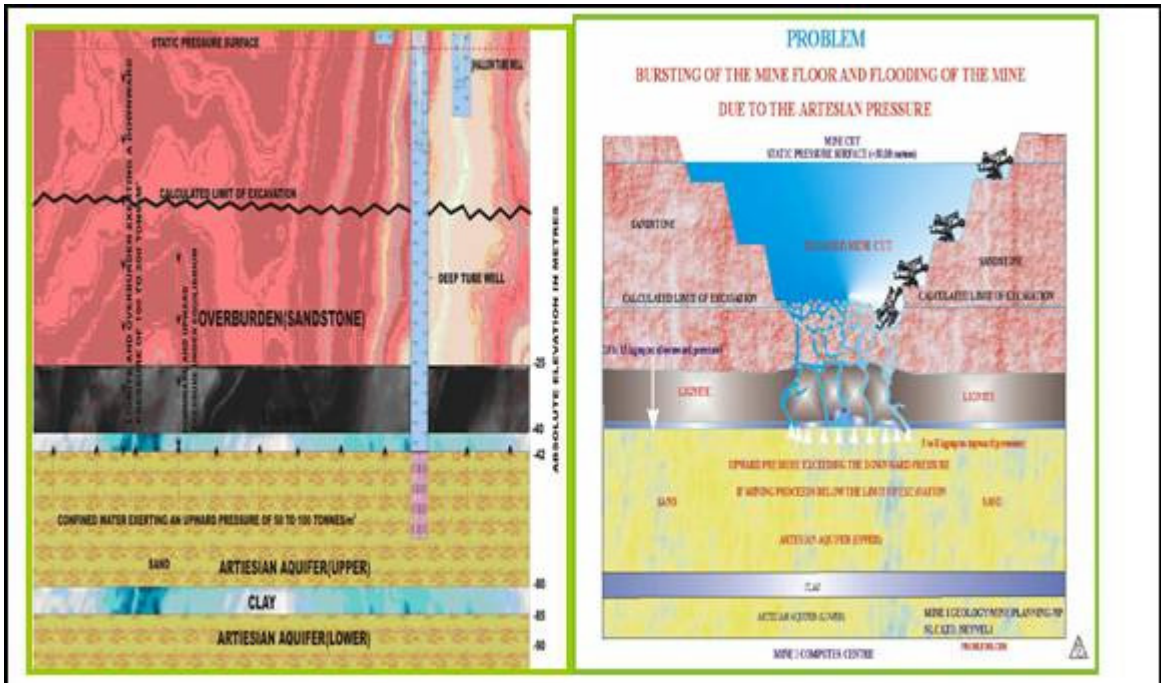
Thus, the first and the foremost impact of a large scale opencast mine is the destruction of the surface topography and thereby loosing the potential for surface storages and recharge. These changes are irreversible and the rapid expansion envisages further irreversible changes in the surface flow and recharge regimes.



The impact of Lignite mining in Neyveli on the water regime is particularly severe because of the unique hydrogeological conditions of the region. Ground water occurs in unconfined and semi-confined aquifers in the upper layers and artesian conditions in the layers below the lignite deposit. This means that in order to reach the Lignite, the aquifers be totally destroyed as these layers are the `over burden' for the miner. Thus, second irreversible impact is that the shallow aquifers that would be replenished cease to exist and that renewable storage capacity of the ground water is lost. The sand and sandy-clay layers above the lignite which is about 50 meters would mean this would be a volume of over 80000 ham of such natural storage capacity.

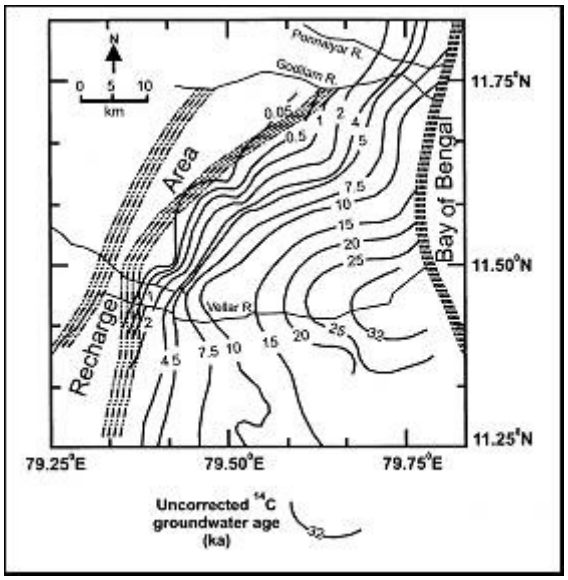


The artesian conditions of the layers below the lignite makes it complex for the mining and it must commended that the pioneers evolved methods with little external assistance in dealing with such a complex problem. The artesian conditions meant that when drilled the waters from this aquifer could gush 35 meters above ground. Under such conditions the mine could be burst open by the sheer pressure of water underneath, While excavating the open cast mine it was calculated that the critical depth was 42.68 m below which it was dangerous to proceed unless the aquifer pressure was depressed and 'Ground Water Control Operations' of NLC began in 1961. In the early stages, about 28 pumps were installed in a rectangular array to give a total discharge of about 114 m3/min. As the mine was deepened and lignite removed, more water had to be pumped to keep the mine floor from bursting.



Cross-Section shows how huge reservoirs above and below has to be sacrificed for Lignite.

During the peak period of pumping (1962-64), the pumping rate was nearly 235 m3/ min by installing a circular array of 30 more wells. Thus, a huge amount of water had to be pumped out from a deep aquifer which by nature would have provided water above the surface without expending any energy.



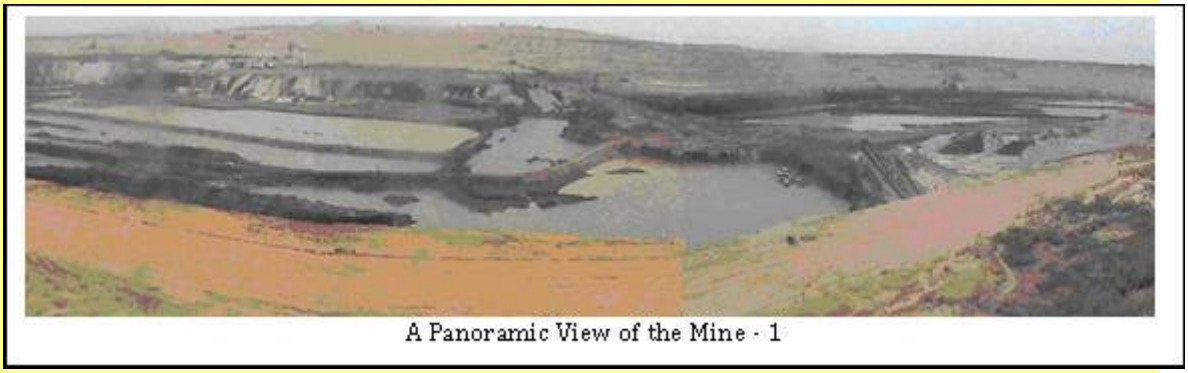
Although artesian wells are quite prevalent, large-scale development will lower the piezometric head and free flow condition would cease. For example, a decade ago there were many flowing wells in and around Neyveli. Now, the piezometric head has been lowered and many flowing wells have become sub-artesian wells.

The real threat to the sustenance of life in the region was recognised in 1969 when it was recognised that continued pumping of water at the rates would inevitably lead to a situation where it the pressure in the groundwater reservoir will be negative leading to the intrusion of sea-water into the shallow aquifers. The pumping rate which was 253 m^3 /minute as reduced to 137 m^3. This required that the pumping had to be shifted to the deepest portions of the mine. Actually this was a boon for the company as the lowering of the

pumping activities meant a huge saving on the power needed to pump providing it with a saving of nearly 80,000 KwH a day. The NLC now pumps about 180000 to 205000 m^3/day of water and the free flowing agricultural wells account for another 160000-180000 m^3/day giving a total 'abstraction from aquifer of about 140 M m^3/yr.

Neyveli's current water needs are close to about 200 M m^3/yr. It is estimated that the recharge would not exceed 120 M m^3/yr. Thus, there is a precarious balance compared to annual recharge, and steady state conditions. Thus after sacrificing a huge source of water, Neyveli is looking for other sources to meet its need. The Ministry of Water Resources already records sea-water ingress in the coastal aquifers east of the mines. Worst still is the knowledge of the fact that some of the aquifers destroyed are actually waters stored over geological times[9] and recent Carbon dating of the aquifer waters indicate that the age of the groundwater 32000 to 500 years.

Water woes of Neyveli does not end here with the concurrent extraction of groundwater which would



A Panoramic View of the Mine - 1

have arrived by itself to the surface, but the pollution of the surface streams from the pumped out water and effluents from the stock yards and from the thermal power plants. The stream between the mine and the power plant is so polluted that it is unfit for any human use.

Recent studies using R-mode factor analysis evaluates the variables belonging to a specific chemical process and identifies the dominance and contribution of the major elements. This study reveals that both in the premonsoon and postmonsoon Na+ was found to have high correlation with Cl– and both the alkaline earth metal ions were found to have high correlation with SO42+ and Ca2+ and Mg2+ were found to have high positive correlation with bicarbonates especially Mg2+. Seasonal effect is very

[9] Gupta & Deshpande: Current Science, Vol. 89, No. 5, 10 September 2005

much seen in the case of factor 1 as it shows significant changes in the loading of variables in both the periods. The seasonal effect is found to be significant in the case of factor 2 also. The pre monsoon is explicitly a nitrate factor along with high loadings on other major ions but in the case of post monsoon it does not have any significant loading with regard to any of the major ions but the trace metals were found to acquire some significance. The aerial distribution map on this factor also shows significant

changes during both the monsoon periods. Factor 3 is found to be a heavy metal factor in both the pre and post monsoon periods. From the areal distribution pattern, it is found that the wells lying in the southern part of the study area shows high positive scores with regard to the heavy metals. Factor 4 is explicitly a fluoride factor for both the seasons especially in the post monsoon. Thus water quality is being continuously compromised. The combination of the mine and the power plant impact the environment so severely that a recent study on samples of cow and buffalo at five different locations along the banks of the Paravanaru river in and around Neyveli area indicates that the trace elements in milk significantly higher levels than samples from unexposed areas[10]. Obviously, the milk samples are contaminated with these metals due to dump wash and plant effluents and emissions such as fly ash released in such environment.

The irony of Lignite Based power development, particularly for the local people, is the community blessed not only to have surface sources but also groundwater sources which would be available at

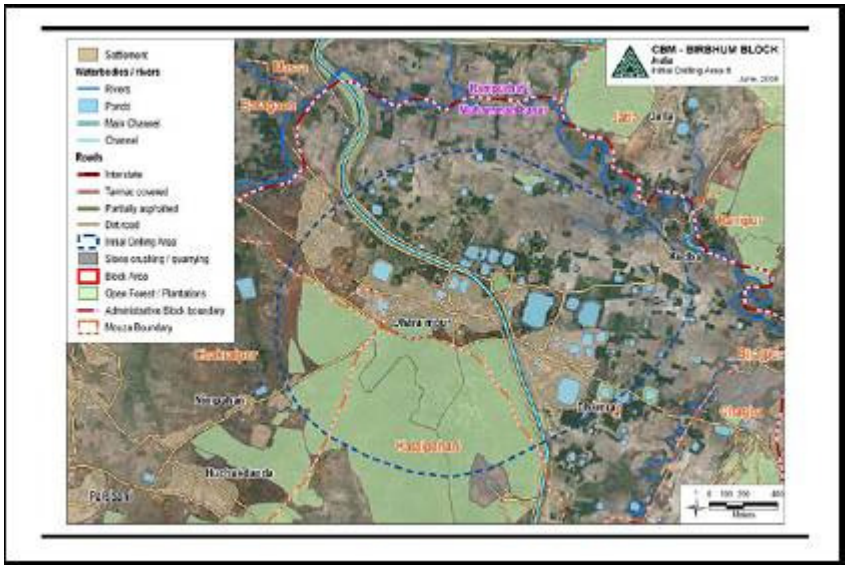
10 Ramamurthi et al J Environ Sci Engng, 47(1)(2005), 53-58

the source without use of external energy have to dig pits to receive their water as the supply is at such low-pressures.

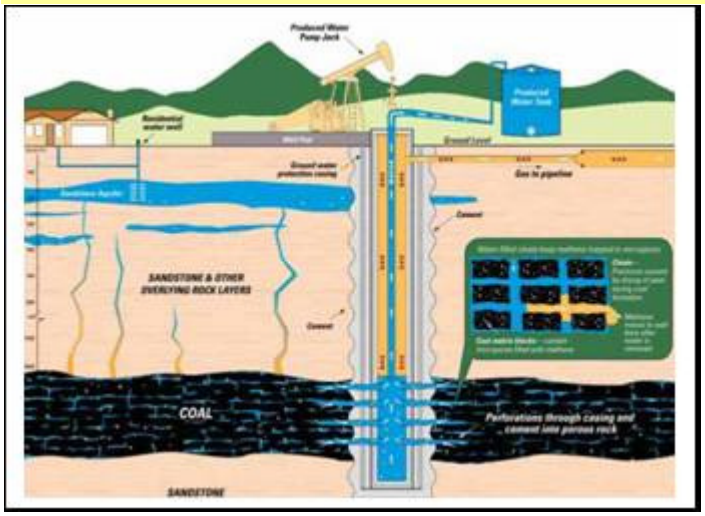
41. Extraction of Coal Bed Methane is touted as a climate friendly way of generating fossil fuel. India has got into the act late and several caol bed methane prospects have been given for exploration and development. The Director General for Hydrocarbon states "Coal bed Methane (CBM), is an eco-friendly natural gas, stored in coal seams, generated during the process of the coalification. CBM exploration and exploitation has an important bearing on reducing the green house effect and earning carbon credit in preventing the direct emission of methane gas from operating mines to the atmosphere further, extraction of the CBM through degassing of the coal seams prior to mining of coal is a cost effective means of boosting coal production and maintaining safe methane level in working mines. Having the third largest proven coal reserves and being the fourth largest coal producer in the world, India holds significant prospects for commercial recovery of CBM.

Prognosticated Reserves of Coal Bed Methane			
State	Area of block (Sq. KM)	Prognosticated CBM Resource (Billion Cu M)	Remarks
West Bengal	982	109.87	Marginal resource may be in Jharkhand
Jharkhand	503.11	174.93	
Madhya Pradesh	1495	114.11	
Gujarat	2400-3218*	311*-549.39	May not be immediately available because ONGC has active conventional Oil & Gas operations.
Grand Total	2980.11-3798.11	710.39-948.73	
Additional resource is available in block located in South west Raniganj (approximately 200 Sq.Km) allotted to M/S GEECL by FIPB for which data is not available. Coalmine methane resource is not yet accounted. *As per Advanced Resources Inc.			

IMPACT ON WATER OF COAL BED METHANE EXTRACTION



Water from the coal horizons will be extracted to liberate the coal bed methane. It is estimated that the extracted water known as "Produced Water" may be approximately 30 - 80 m3/day/well. Five testwells are planned during Phase I and up to 15 test wells in Phase II. Thus in the exploration phase itself which is likely to last for 2.5 years (850 days) the deep acquifer waters that will be removed will be about 1.2 million cubic meters for just one initial project for which a preliminary EIA exists in public domain for a CBM project in the Birbhum district of West Bengal.



Block Sohagpur, District Shahdol (MP)

Sohagpur (east and west blocks) has huge deposits of methane gas reserves and about 3.6 trillion cubic feet of these reserves are estimated in Shahdol block that would be sold to industries around Sohangpur. Sohagpur forms the first round of CBM blocks allocation which covers an area of approximately 1000 sq. kms. CBM is advocated as a potential venture to extract methane from the coal seams by accessing deep seams ranging from 700-1700 mts and attempt to safely recover gas from these regions ahead of any mining potential. But CBM exists in adsorbed state in coal seams underground and is released upon dewatering of coal seams. As per estimates one tonne of coal can hold 5-15 cu.m. of CBM. Most of the water sources in this region suffer from insufficient quantity (ground water being the major source and is depleting) and this being a drought prone region brings in more concerns over meeting the basic needs of drinking water. CBM extraction involves enormous amount of production water – in

case of Sohagpur, it is estimated that around 50,000-70,000 BPD [7.5– 10.5 M.Cu.m.] of good quality water would be pumped out through the wells.

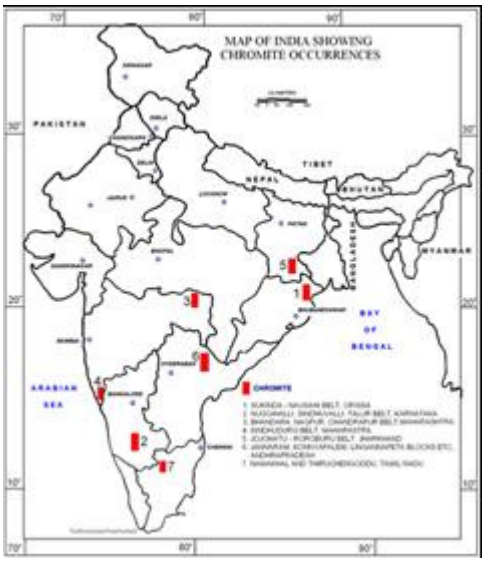
The aquifers directly feeding streams and making up pockets of ground water will have a direct impact on the water regime of the region as the pumped out water will either flow down and may further aggravate the inadequate water availability through existing sources. Already the villages are dependent on wells or handpumps which are also saturated in numbers and quantity of water. Mining has already intersected the water table and pumped out water from the mine pits is being used by villagers for washing and bathing purposes with an increasing impact on already depleting ground water resources.

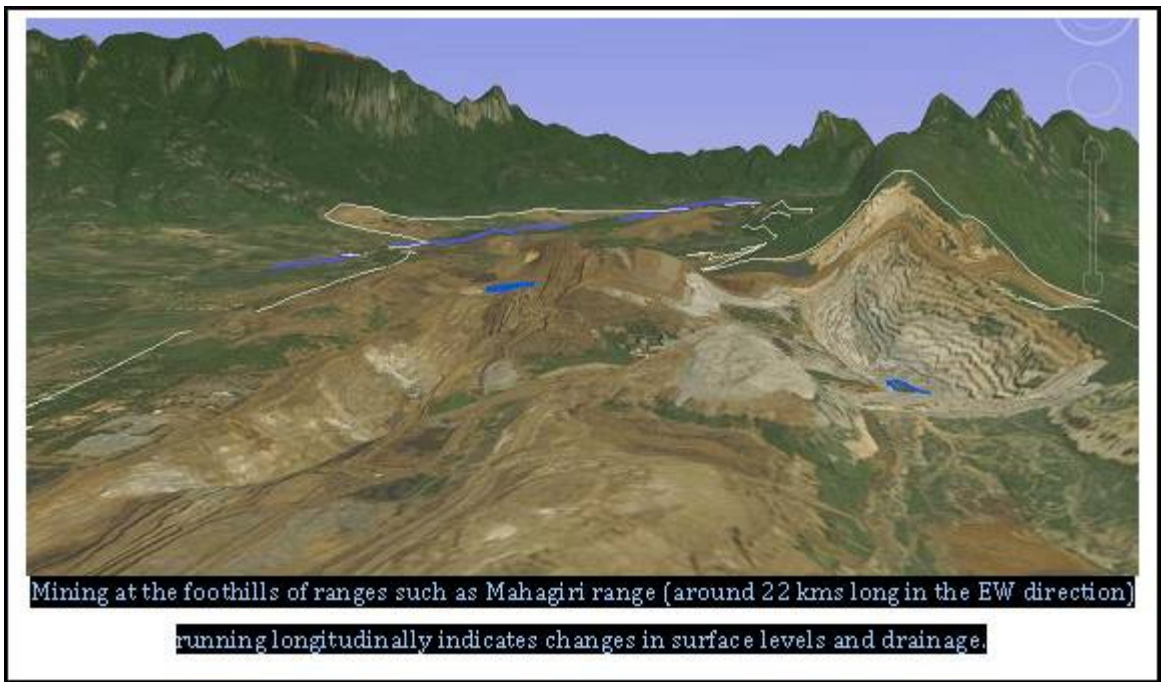
42. Underground Coal Gasification which is proposed in several blocks will have the increased impact of leaching of organics from gasifier , e.g., Phenols, Increased concentration of inorganic salts, Dissolution of hazardous gases (H_2,CH_4,CO_2,H_2S,NH_3) in groundwater and leaching of heavy metals (Hg,As,Pb,Cr,Cd) all of which will add to the already critical condition of water in these regions.

43. Planning Commission recommended that a fee of Rs.10 per tonne of coal mined as Mine-restoration levy and this should be collected annually and remitted into a fund managed by the Regulator. The Regulator would release as grants or soft loans, funds which are requested by the state government or forest department to improve the conditions of the completed mines in order to bring the area to fruitful uses such as agricultural or horticultural use or as real-estate uses or for recreational uses including creating water-bodies.

CHROMITE MINING AND ITS IMPACT

44. Orissa chromite ore deposits account for nearly 97% of the country's deposits, the rest 3% deposits are located in the state of Bihar, Maharashtra, Andhra Pradesh, Tamil Nadu, Karnataka and Jharkhand. Though water is a basic requirement for setting up of industry but this region being the central hub of chromite ore, most of the mines are captive mines having presence of downstream industries like chrome ore beneficiation plants – Tata Steel (Bamnipal), OMC[11] (Sukinda), FACOR (Ballasore) and IMFA to





name a few. These increase pressure on either surface or ground water for captive use in the mining operations as well as industrial processes. The chromite ore in Orissa lies in a compact geography the disadvantage being the use of water resources from the same region as well as pollution becomes prevalent – i.e. abstraction of ground water sources

[11] Orissa Mining Corporation

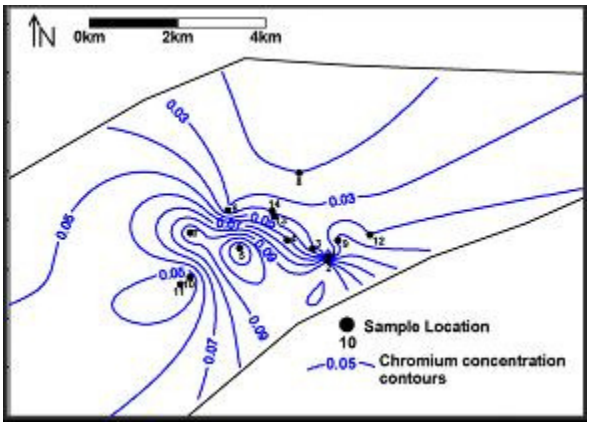
to use in mining and not so very cost effective technologies to combat carcinogenic nature of Cr+6 (air and water pollution).

45. The Sukinda ultramafic field is confined to an east-west trending valley lying between the Daitari hill range in the north and Mahagiri range in the south. The ultramafic rocks of Sukinda valley are emplaced within a sedimentary sequence of Iron Ore Supergroup. The occurrence of reserves under different bands varies from 200-250 m bgl[12]. The Mahagiri ore seam has a lumpy deposit of 15.63 million tones whereas rest of the deposit is of fine grade i.e. approximately 112 million tones. A total of 145.022 million tonnes of chromite reserve of all grades have been established in Sukinda valley. As per UNFC system, total resources of chromite in the country as on 1.4.2000 are 179 m.tons comprising 47 m.tons of insitu reserves (26%) and the remaining 132 m.tons of resources (74%).

Reporting Mines in Jajpur, Keonjhar and Dhenkanal Districts					
S.No	Mine	Start Year	Present Production (mT/annum)	Lease Area (Ha)	
				Forest	Total
1	Kamarda	1968	0.00828	101.850	107.240
2	Ostapal (FACOR)	1986	0.0739	68.424	72.843
3	Tallangi (IDCOL)	2004	0.0128	20.882	65.683
4	Chingudipal (IMFA)	1997	0.0040	26.620	26.620
5	Sukinda (IMFA)	1999	0.2550	0	116.760
6	Kaliapani (Balasore Alloys)	2000	0.1020	0	64.463
7	Kaliapani (Jindal)	2002	0.1002	24.241	89
8	Saruabil (ML Mines)	1954	0.0500	224.633	246.858
9	S Kaliapani# (OMC)	1980	0.5000	416.499	552.457
10	Sukrangi (OMC)$	1980	0.0120	177.760	382.709
11	Sukinda (TISCO)	1960	0.95	73.698	406
12	Sukinda (OMC)	1980	0.0120	177.760	382.709
13	Kathapal (FACOR)	1973	0.0300	113.312	113.312
***** TARR – Total Annual Replenishable Recharge # 180% increase in production; 2320 m^3/day (increase in water by 29%) Total GW drawal – 5.075 Mm^3/year [29.67% of estimated TARR***** of watershed] $ Increase in production > 900%; 306 (26% GW) [43% of estimated TARR of watershed]					

12 Geological Survey of India, Report No.

46. The hydrogeological conditions are regulated by fissured formation where ground water is restricted to weathered residuum and fracture zones. The weathered ultramafics, orthopyroxenite as well as underlying semi weathered and fractured country rocks from the source of ground water and its occurrence depends on the nature and extent of weathering characteristics of the rock formation. The groundwater in the area is generally under semi-confined to confined condition. Based on the mathematical modelling[13] of the regions' aquifers, the potential aquifers (laterite-limonite chert) occur till 25m bgl and these remain in phreatic conditions or unconfined whereas confined conditions occur at depths greater than 25m. The most common aquifer pattern seen where water table ranges between 20-25m in phreatic conditions but the confined aquifer also remains in hydraulic continuity with top aquifer.



Reporting Period	Industrial Water Used	Domestic Water Used	Specific Water used
	(million m^3)		(cu.m./tonne)
2003-04	1.18	0.56	2.52
2004-05	1.6 (35.59)	0.624 (11.43)	2.5
2005-06	1.36 (-15.00)	0.6 (-3.85)	2.48
2006-07	1.38 (1.47)	0.58 (-3.33)	2.46

The water requirement as reported for Kaliapani mines indicates that the specific water requirement for producing one tonne of chromite ore is around 2.5 m^3. Considering the annual production of chromite over the 2006-07 period (4.08MT) in all the operational mines, the specific use of water would range around 10.22 Mm^3/annum.

47. The fault system intersects the ore bodies and run almost linearly for long lengths. In the region where aquifers intersperse, there are more likely chances of pollutant to enter into the water system and maintain its path alongwith the groundwater flow and surface drainage that are likely to be modified given the resource available for extraction in the future. Generally, the flow forms a pattern based on topographic features and the resultant restrictions or anomaly with respect to the micro watersheds for which no detailed analysis has been done. The Cr^{+6} which travels along the water flow path could

13 Dhakate R, Singh V.S., Hodlur G.K.

penetrate further for longer distances once the mining activities become intense and reach till the ore depth which should be a cause of concern.

48. However with the available reserves of around 127 million tonnes and expansion of mines, a comprehensive insight into the regions' water regime as well as pollution potential shall be drawn on two accounts, one is to make a realistic estimation of total annual replenishable recharge to plan and phase for water requirements which is largely based on the static models but with mining in progress, the land impacts will become more prominent and surface topography will be altered , secondly the sources for potable water supply should be enhanced to reduce the hexavalent chromium concentrations (as interpreted by Dhakate and others, some values in monitored wells, ground water, surface water showed exceeding values or nearing to the allowable values) as well as imposing realistic pricing of water which now ranges between 10 – 30 paise per kilolitre of water and reduces the ability to create systems to protect the water resources or treat them for potable water supplies.

49. Sukinda area has become notorious, as the Blacksmith Institute has notified it as one among the ten most polluted sites in the world in a worldwide ranking of polluted sites.

Limestone and Marble Mining

Impacts of Milliolite the Coastal Zone

50. The coastal region of Gujarat stretching from Kutcch to Bhavnagar District contains large deposits of limestones, which are geologically known as Miliolite. These stones act as barrier between seawater and the underground Sweetwater of the land. In recent past the Government of Gujarat has granted mining lease and license to several mining companies for quarrying miliolite limestones. The rock can be called as sandstone, in general, as the size of the granules is that of sand. But geologically it is called Miliolite Limestones, as it mainly contain lime calcium. It is soft and used for construction. Somnath Temple is entirely made up of these stones. It is one of the finest limestones found in India, popularly known as "Porbandar Stone". By nature these stones are porous, like a sponge and holds sweet water inside it, thus forming very good aquifers. These are the main source of fresh water for settlements along the coastal belt.

51. The impact of mining miliolite limestones on environment is that once these stones are removed, there is ingress of seawater into the land. As a result, the ground water of the main land, which is sweet, turns salty. Secondly, the entire land turns saline affecting agriculture adversely.The upper laterite soil in this process is lost and it ultimately results in increase runoff thereby reducing the retention time of water into the ground.

Sughala mine[14] is an opencast limestone mine located in Kodinar Tehsil of District Junagarh. Groundwater is the main source for this mine as there is no other substantial source of water in this part. During the field visits, it was realized that water sourced for the mine is from the farmers who have irrigation pumps for drawing water at a subsidized rates.

52. As such, no formal agreements exist but there have been some informal arrangements made by the proponent. It is quite a glaring example where subsidy is provided by the government to help farmers irrigate their fields and the same water is turned into a commodity. For the miner it is still at much cheaper rates as the use is not quantified but relied on daily hours of operation.

Limestone Mining in the Himalayas

53. Jaiprakash Associates Limited has proposed to produce 2.54 mtpa of cement plant with integrated facilities of limestone mine and blending plant. The MOU was signed on 09.07.2004.

54. The project is spread in two Tehsils of District Solan viz. Arki and Bageri. The cement plant and limestone mine are located in Arki, the blending plant is proposed at Bageri, in proximity to the limestone deposit of Baga-Bhalag located at a

[14] The zig zag image as seen in the figure above is not by design but due to the local resistance of several farmers to not allow mining in their lands, the proponent got lands under its lease of farmers falling into the trap. One can notice lush green fields in the surroundings.

distance of about 0.3 km. The limestone requirement of the plant is estimated to be about 3.1 Mtpa[15] with daily requirement of 9840 tonnes for an installed production capacity of 6500 tpd[16]. The total land of cement plant and colony is about 166.01 ha.

55. JPAL cement plant is currently in the construction phase and mine preparation is underway. There are 42 families displaced from the village of Baga and 22 families from Balag village. The Resettlement and Rehabilitation task is the responsibility of the company and forms a part of the Memorandum of Understanding (MOU) signed between the government and the company. The land identified for resettlement of PAPs is a compact terrace surrounded by eroded hillsides. Fourteen sites have been developed so far. There is a barren patch where some families have been moved in make-shift tin sheds. This land has been taken on lease by the company and was common grazing land of adjoining villages.

56. The adjoining land is sacred to the local community as it is the home of their deity and people to keep it isolated from the human settlements. As a result of choosing this resettlement site, the local deity has close to the settlement reducing the number of people opting for plots in the resettlement site. Seventeen families have accepted cash in lieu of plots and constructed houses. However it is found these sites are vulnerable to blasting and cracks have also developed due to differential movements.

57. In the month of August, 2007 a sudden slush[17] from the mining

15 Mtpa:Million Tonnes per Annum
16 tpd:Tones per day
17 Express News Service, Saturday , October 27, 2007 & Field Visits

site flooded the houses, public buildings and fields with muck thereby damaging land and structures. People are demanding compensation on loss of their property and resources from the company and the district administration. Though the administration and company officials have announced a compensation of Rs. 36000 for the damages done, the worries are far from over. The villages affected by this flash flood are Samtiyari, Sunali and Balag.

58. The R&R policy indicates that infrastructure facilities will be provided to the families only if a minimum number of 20 families to move to the site. This is unlikely given the religious and social concerns about the site. The company holds that it is mandatory for the minimum number move to the resettlement site for providing electricity. The company through tankers supplies water. While the compensation amount of Rs 180,000 for constructing houses in plots provided or Rs 210,000 for people opting to find their own plots is reasonable, without adequate investment in infrastructure this amount may not be available to build homes to suit their need. The morphology of rural habitation is such that a clear relationship is established with the open surroundings where as offering them space in tin sheds and tightly packed areas would mean a clear departure from their earlier lifestyles. Lack of access to common grazing lands is a matter of concern to the displaced. The access to schools has become difficult and facilities are yet to be created.

59. While Limestone mining in Doon Valley was stopped and Doon valley designated "ecologically sensitive" more fragile areas in the Himalayas and in the Coast are in peril.

Marble Mining in Makrana

60. Marble mining in Makrana is a classic example of unscientific mining and improper waste disposal regardless of aesthetics, proper land use practices etc. Mining muck, over burden dumps and slurry dumps are not segregated in the area. Slurry disposal is done on contract basis due to which contractors dispose of the marble slurry in open lands, agricultural land, ponds and even on road side near the processing plants without giving due regard to aesthetics and pollution aspects.

	Mining ranges / ridges from west to east Western most ← Borawar Kumhari					→Eastern most	
	Bora war	Kumhari	Makrana-Matabhar Kumhari	Makrana Pink	Dungri	Devi - Gunavati	
Characteristics	BK-II	BK-I	MK	MP	Cd	N	Kala Nada
							Ulodi
						↑	Chausira
							Gunavati
							Pahad kuva
						↓	Bhont
							Kolha Dungri
						S	Bilu - Mored
							Kolha Dungri
Position of mines with respect to water table	Water table 33-45 m Quarrying above water table in most of the mines, near Hanuman temple on bye pass road quarrying is below water table.		Approaching water table Depth to water table 45 m.	Fast approaching water table*	Close to water table in most of the mines. Mining 10-15 m below water table	Below water table in most of the mines water level 30 m - 40 m in Kala Nada area deeper in other mines. Mining pits vary in depth from 60 m - 70 m	

1. Designated sites for marble slurry (Pandu) disposal are not properly sited and are insufficient.
2. Afforestation and compensatory forestry has not been undertaken in the mining area.
3. No effort has been made for stabilisation of waste dumps. Waste dumps have developed rills and Gullys. Washouts from waste dumps and slurry dumps are contaminating soil and ground water resources in the immediate vicinity of waste dumps. Soil samples show slight increase in Ca, SO_4, Na, TiO_2 and Mg content of soils in the immediate vicinity of dumps. Ground water samples show appreciable increase in Ca, SO_4, NO_3, Mg, TDS and SiO_2 values of the water samples of mine pit water and slurry laden water.

Kala Nada is a point source of ground water contamination in the area and poses severe threat for the health and hygiene of people living in Makrana and adjoining villages.

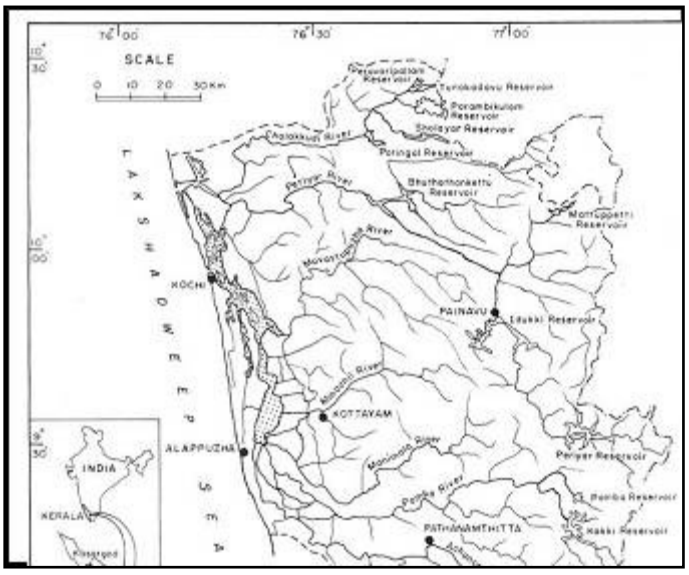
Mining and waste disposal practices prevalent in the area need to be reviewed. Processing waste can be disposed of in abandoned pits and gully erosion areas

northeast of Jusri and east of Bidiyad railway station. Segregation of overburden, mine muck, marble slurry and municipal waste dumps is suggested to prevent contamination of ground water and land reclamation and restoration.

MINOR MINERAL MINING WITH MAJOR CONSEQUENCES

61. River Sand mining is one of the most politically volatile subjects and a good part is known to occur illegally. Several States have either tried to impose regulations (eg Himachal Pradesh, Kerala) that have actually not been effective or have tried to nationalise the activity (Tamil Nadu, Uttarakhand).

62. Kerala, particularly has been facing the threat. The high cost of sand lures illegal traders who engage labourers to collect it from the river during night and complete the process by dawn. Truckloads are removed daily, which at selling points fetch high prices ranging from Rs 2,500 to Rs 3,000. Consumers pay exorbitant rates for a truckload, which ranges from Rs 3,500 to Rs 4,000. Riverbeds have dried up. Pits and holes are visible on the banks. Every year, on an average, 4,66,400 cubic metres of sand are removed from the riverbeds against a replenishment of 14,160 cubic metres annually, according to the Centre for Earth Science Studies. Due to endless sand mining, the depth of the rivers enhances and the mud walls on either side collapse posing a major threat to nearby houses and farms. Trees on the banks are also uprooted[18].



Here we present a case of Vembanad lake catchment and the challenge of miner against the regulations laid down by the geologist on the mining that will impact groundwater and the considered view of the court which alludes to the Precautionary Principle and Polluter Pays Principle. A more recent judgement says that the expert committee should not allow mining without sand-audit.

18 www.thehindu.com/2009/09/08/.../2009090850590200.htm

The Vembanad lake, the largest coastal lagoon (~250 km^2) in the west coast of India with a catchment area of about 14,500 km^2. The lake catchment is drained by seven small rivers[19] - Chalakudy, Periyar, Muvattupuzha, Meenachil, Manimala, Pamba and Achankovil rivers. These rivers originate from the Western Ghat mountains and flow generally westwards before debouching into the Vembanad lake. River sand and gravel are mined extensively from the drainage networks of the Vembanad lake catchments, irrespective of the physiographic zones, river orders and ecological significance. However, the intensity of mining is high in the alluvial reaches of the main channels. In addition to mining of sand and gravel from active channels (instream mining), a substantial amount of sand is also being extracted from the overbank areas (floodplain mining) of the river as well. Generally, two types of instream mining are in practice in the area—pit excavation and bar skimming. Pit excavation is extraction of sand and gravel from the riverbed or floodplain areas by uncontrolled digging. In some cases, diesel powered suction pumps are used to extract sand rich sediments from wet pits in the active channels and floodplains. Bar skimming, on the other hand, is the controlled extraction of sand from the exposed sand bars (instream bars and point bars) in the channel environment. Usually, bar skimming would be done above the water table and within a minimum width buffer that separates the excavation site from the low flow channel and the adjacent active channel bank. Of the two types, pit excavation is the widespread sand mining method adopted in the alluvial reaches of the rivers in the Vembanad lake catchments.An amount of 11.73 million tonnes of sand and gravel are being extracted annually from the active channels of these rivers. Out of the total quantity of sand extraction, nearly half the amount (i.e. 5.64 million tonnes) is from the Periyar river, which flows through the most urbanized and industrialized areas of the Vembanad lake basin, the Kochi city. Although small in river length and catchment area compared to Periyar river (244 km/5,398 km2), the river Muvattupuzha (121 km/1,554 km2) is also affected severely by sand extraction (2.00 million ty–1), owing to its proximity to the development centre, the Kochi city and its satellite townships.

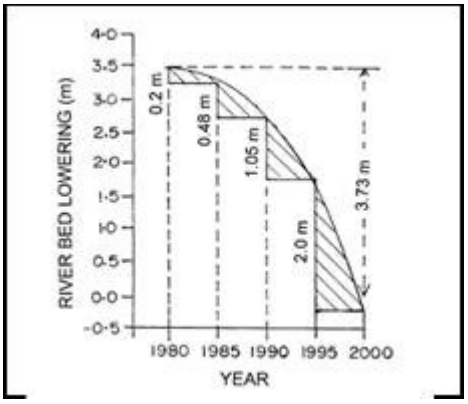
River degradation, damage to agricultural lands close to river channel, etc., led to agitation among the local people who directly depend on rivers for various purposes. People's opposition and strict regulation of instream sand mining often lead to mining of sand from floodplains and/ or river terraces. Floodplain mining is severe in the lowlands of Muvattupuzha river basin compared to the others. It is estimated that an amount of 0.414 million ty–1 of sand and gravel is being mined annually from the floodplain areas of the seven rivers.

All the seven rivers draining the Vembanad lake catchments are degrading severely since 1980 consequent to indiscriminate mining of construction grade sand from instream and floodplain areas. As a result, the channel beds in the storage zones of these rivers are lowering fast, posing instability

19 Padmalal et al Environ Geol (2008) 54:879–889

problems to riverbanks and associated engineering structures. In the past 3–4 decades, rivers in the densely populated areas of the world are subjected to immense pressures due to various kinds of human interventions, among which indiscriminate mining for construction grade sand from alluvial reaches is the most disastrous one. This is mainly because of the fact that uncontrolled scooping of sand aggravates river degradation and threatens its trophic structure. The situation is rather alarming in the small rivers of Kerala in the southwest coast of India, which support the life and greenery of the region. Loss of riparian and instream vegetation, changes in the feeding, breeding and spawning grounds of aquatic organisms including fishes not only impose stress in the river ecology but also create damages in the terrestrial and near shore marine environments as well.

Sl No.	System/ Components	Impacts
1	River Channel	Erosion of river banks; river bank slumping; lowering of river channels; changes in river bed configuration; undermining of engineering structures like bridges, water intake structures, side protection walls, spillways, etc.; loss of placer mineral resources associated with alluvial sand and gravel
2	Surface Water	Rise in suspended particulate level, turbidity and other pollutants like oil, grease, etc., from vehicles used for the removal of sands; ponding of water and reduction in natural cleansing capacity of river water; aggravated salt water ingression
3	Ground Water	Lowering of ground water table in areas adjacent to mining sites; damage to the fresh water aquifer system in areas close to the river mouth zones
4	Flora & Fauna	Dwindling of floral and faunal diversity within river basin; decline in terrestrial insects like mayfly, dragon fly, stone fly etc., whose larval stages are in the shallow water sandy fluvial systems; habitat damage/loss and changes in breeding and spawning grounds; reduction in inland fishery resources
5	Culture	Damage to culturally significant places; places of annual religious congregations, etc
6	Coast/Near Shore	Lack of replenishment of coastal beaches leading to coastal erosion and reduction in the supply of nutrient elements from terrestrial source
Souce: Padmalal et al Environ Geol (2008) 54:879–889		



The rate of channel bed lowering in the other rivers exhibits wide fluctuation during the monitoring periods because of interventions of Honourable Court and Government from time to time. Although such interventions could yield positive results for short-term periods (which in turn reflected well in the slow pace of channel bed lowering at certain periods) the efforts could not sustain long due to the ever increasing demands of river sand for construction works. The riverbed lowering and channel degradation have

damaged many bridges, rural water supply schemes and side protection structures in addition to imposing habitat changes through riparian and instream vegetation. Many perennial wells in the floodplain areas became dried up in summer season due to lowering of water table in the nearby areas of the river channel.

63. In one particular case in the High Court[20] upheld the view of the geologist imposing severe restriction. The petitioner challenged two conditions imposed by the Geologist, while granting the quarrying permits to them for quarrying ordinary sand and brick clay in Velloor Village in Vaikom Taluk. Those permits were issued with 18 conditions, subject to which the minor mineral can be mined. One of the particular condition challenged was that "No dewatering the mine pit using pump is permissible and mining has to be ceased once this becomes necessary and mining should be done manually". The petitioner submitted that the above said conditions are imposed according to the whims and fancies of the Geologist and are not authorized by any of the provisions of the Rules. Unless dewatering, using pumps is allowed, manual quarrying of sand or clay many not be profitable, It is also contended that none of the Rules prohibits the use of mechanical devices of quarrying. On the above grounds, the petitioners pray for issuing a writ of certiorari to quash condition and issuance of a writ of mandamus, directing the 1st respondent Geologist to permit the use of pump for dewatering the quarrying pit. The respondent maintained that the conditions imposed are essential in public interest. The petitioners have raised the objections to subserve their vested interests, without adverting to critical factors like distance, cohesion of the subsurface etc. It is submitted that to avoid dangers of lateral collapse in the sand mining pit, the use of pump is prohibited. It is also submitted that the purpose of prohibition in using pump, is to ensure that the mining operation is stopped at the level of occurrence of ground water. If the mine pit is dewatered and the mining continued, it would result in the collapse of boundaries, adversely affecting the safety of adjacent lands and structures. Further, draining of potable ground water from the mine pit has a deleterious effect on the level and quality of ground water, which will lead to ground water scarcity. If more pumps are used, the same will affect the safety and drinking water availability of neighbouring landowners. It is also submitted that the prohibition of pumping, in the instant case, has been introduced, as the area is an unstable sedimentary flood plain. The counsel for the petitioner reiterated the contentions raised in the Writ Petition stating that the

20 Soman vs Geologist [2004 (3) KLT 577]

impugned conditions are ultra vires and unauthorized. He also argued that no environmental degradation is caused by the use of pumps as the ground water is not pumped out, but it is used for washing the sand and it is being collected back in the very same pit. The Government pleader, arguing on behalf of the Geologist contended that the intention of the competent authority is that mining should be stopped when the pit reaches the ground water level. The same will prevent unnecessary wastage of ground water. Though the petitioners have contended that they are not pumping out water, but the same is cycled for washing the sand, the said contention cannot be accepted. There is always the possibility of pumping out ground water. Thus, the prevention of use of pumps to safeguard ground water is evidently, a step taken in public interest. There is no underground boundary, dividing the ground water under the petitioners' land with that of the neighbouring land owners. Therefore, any pumping of ground water will affect the water level in the neighbouring lands. In view of the shortage of drinking water, any step taken to protect ground water, should be deemed to be done in public interest.

The judgement reads, " the point to be considered is whether the conditions, imposed by the Geologist, should be condemned as unauthorized restrictions. I think, the rights of the people of the locality to have a decent environment, flowing from Art.21 of the Constitution of India, will save the restrictions imposed. The new concept of sustainable development, which is, now, part of the law of the land, will definitely help in deciding whether the impugned conditions should be sustained or not. The World Commission on Environment and Development has observed that sustainable development aims to meet the needs and aspirations of the present generation, without compromising the ability to meet those of the future generations. Any developmental activity without considering the rights of future generations is not a sustainable use of land. Natural resources cannot be extracted at a rate faster than the nature's capacity to re-generate them. It is absolutely necessary that the basic qualities of the land have to be maintained for the succeeding generations." Citing several judgements of the Apex Court on the concept of "sustainable development", the judge observed, "the Precautionary Principle and the Polluter Pays Principle have been accepted as part of the law of the land" (Art.21 Arts.47, 48A and 51A(g)). Further the judge noted "apart from the constitutional mandate to protect and improve the environment there are plenty of post-independence legislation". The judge held that "in view of the above-mentioned constitutional and statutory provisions we have no hesitation in holding that the

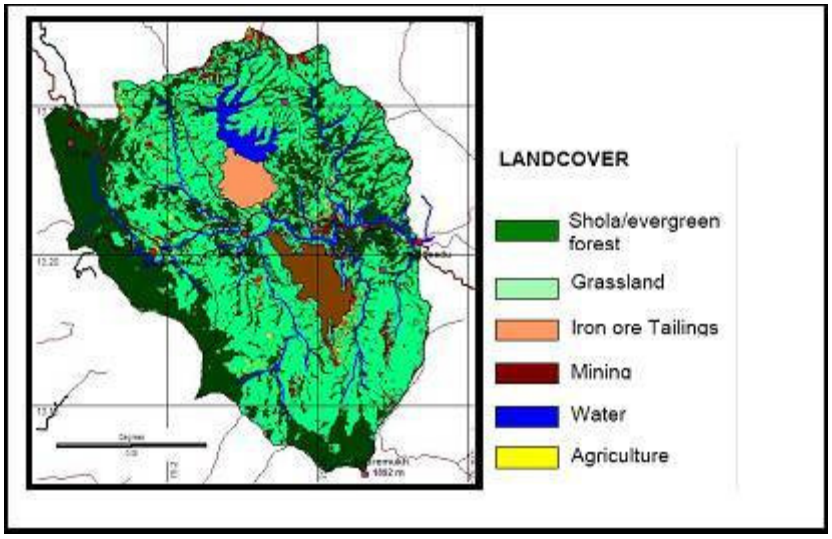
Precautionary Principle and the Polluter Pays Principle are part of the environmental law of the country. The judge went further to reitierate that "even otherwise once these principles are accepted as part of the Customary International Law there would be no difficulty in accepting them as part of the domestic law. It is a almost an accepted proposition of law that the rules of Customary International Law which are not contrary to the municipal law shall be deemed to have been incorporated in the domestic law and shall be followed by the Courts of Law." In view of the above and other judgments, the court held that the conditions impugned in this Writ Petition are necessary to protect the environment. If every land owner, driven by profit motive, is to dig his land to win sand, no land except pits will be left for the future generations. So, the petitioners should stop mining, when it reaches the ground water level and immediately, all the pits should be filed up, as provided in condition No.16, which reads as follows:

"All excavations have to be immediately filled and reclaimed." The principle of sustainable development, now being part of the environmental jurisprudence, flowing from Art.21 of the Constitution of India, the State is bound to impose the impugned conditions, while granting the permit. Even if such conditions are omitted to be mentioned in the Kerala Minor Mineral Concession Rules, still the State can impose them, in view of Art.21 of the Constitution of India. The court also noted that " the petitioners have undertaken mining in the lands concerned, using pumps, going beyond the ground water level. So, the 1st respondent Geologist shall take immediate steps to stop mining from all the pits where the mining has reached the grounds water level. In the light of the principle "Act of Court can prejudice none", the petitioners are bound to fill the pits immediately, where the mining has been done beyond the ground water level, on the strength of the interim orders of this Court. This, they are bound to do under condition No.16 of the permit also. The doctrine of "Polluter Pays" also obligates the petitioners to fill the pits. The 1st respondent shall ensure that all the pits where the mining has reached the ground water level, are filed as expeditiously as possible, at any rate, within a period of six months." The judgement also took up the issue of miners who have abandoned the pits after mining and ordered "All the grantees of mining permits have executed agreements in stamp-papers worth Rs.50/-, agreeing to fill the pits, after the mining of sand is over. The learned Government Pleader has pointed out that many of the licensees have abandoned the pits, after the mining is over. Not only, going by the principle "Polluter Pays"; they are bound by the conditions of the permits and also by the agreements executed by them to fill the land. But, if any of the licensees, including the

petitioners, does not fill the land once the mining is stopped, the Geologist shall prepare estimates or cause to prepare estimates, regarding the amount required for filing the pits. The said amount, including cost escalation, if any, shall be recovered from him, invoking the provisions of the Kerala Revenue Recovery Act and the pits shall be filled using the said amount.

Since the issue of riverbed mining did not end with such judgements and sand audits were resorted to with an expert committee allowing for mining. However in a recent judgement21 the court held "Admittedly sand audit is long is long overdue since 2004. The report period expired in 2007. It is shocking that without conducting the mandatory sand audit, sand mining permits have been issued from the year 2007-08. It is a violence not only for the legislation but also to the environment as such. In such circumstances, this Court has a duty to protect public interest. Therefore, in public interest, we deem it necessary to issue a direction that unless sand audit is conducted in respect of the Periyar river flowing through Ernakulam District, the expert committee shall not issue any new sand mining permits. In other words, only after the audit report from the expert body, namely CESS or CWRDM, and giving regard to the said report only, the expert committee under Section 9 of the act shall fix the quantity of sand that can be removed from the kadavus or river bank. As far as the on going collection of sand is concerned, for the present season ending by June, 2009, we direct the expert committee headed by the District Collector to ensure that there is no sand mining within the prohibited distance of bridges, river banks, bathing ghats, irrigation projects, etc. Steps should also be taken to see that the river basin is protected. The mining shall only be by permissible methods without affecting the river basin. We deem it our duty to issue such a direction also in view of the tragic deaths due to drowning which have been taking place owing to the pitfalls formed by the indiscriminate mining of sand during the past several years using unauthorized methods."

21 W.P.(C)NO. 3128 OF 2009 (S)



64. Kudremukh mines were closed down under a Supreme Court order considering the ecological impacts of mining in the region. Opposition to its activities has built up over the years - from environmentalists and wildlife conservationists who are concerned about the threat to the region's flora and fauna, to farmers who are affected by the pollution of the streams that originate in the mining area. Kudremukh has the largest extent of bio-diversity rich shola-grassland ecosystems located in a hilly, high rainfall region (6000-7000 mm yr-1) in the Western Ghats, a global biodiversity hotspot. The Kudremukh National Park is a rich repository of biodiversity and has significant populations of many endangered and globally significant flora and fauna including the Lion Tailed Macaque, Great Hornbill and the tiger. In addition the Bhadra River and its tributaries are the habitat of several fish and mollusc species besides the endangered otter. Downstream of Kudremukh, the Bhadra river flows past the recently established Bhadra Tiger Reserve, an area rich in moist deciduous forests and habitat for several large mammals and is particularly rich in avifauna and drains into the Bhadra reservoir which is one of the important irrigation storage projects in Karnataka.

65. Kudremukh Iron Ore Company Limited (KIOCL) conducted its mining operations on an area of 4,604.55 ha in the Western Ghats for over 20 years. An intensive study by the ATREE concluded “Secondary data as well as the monsoon study presented in this report confirm that not only has the sediment load in the Bhadra River dramatically increased as a result of the mining, but also that a very small fraction of the watershed area, comprising the KIOCL mining site, is by far the major contributor to sediment loads in the

Bhadra River. Sediment loading since the beginning of mining in the early 80's increased successively from 1,197 tons in 1984 to 49,429 Tons in 1986 measured at Malleswara. From this study based on only 67 days of 2002 monsoon alone, more than 68,000 tons of sediment load were exported as estimated for Nellibeedu just downstream of KIOCL's mining area at Malleswara. This study clearly shows the severe impact of KIOCL's mining on the sediment load in the Bhadra River. Although the Supreme Court has ordered the closure of KIOCL operations in Kudremukh by 2005, it is important that rigorous gauging of streamflow, sediment and rainfall needs to be continued, to monitor the water quality as well as levels of sediment inflow into the Bhadra reservoir. It can be expected that it will be a fairly long time before sediment levels decrease significantly downstream of the mined area because of the exposed mined area as well as steep terrain and rainfall characteristics. Therefore apart from stoppage of mining it is essential to undertake the restoration of the mined area on a priority basis as directed by the Supreme Court".

66. Goa state has a total surface area of 3,70,000 ha out of which 65,400 ha area (17.6%) has been leased for iron-ore mining and 18300 ha (5%)has been the site of actual mining operations. The 70 active mines cover an area of about 6082 ha and yield more than 80% of the total mineral production from Goa. Over 350 million tones of iron-ore were exported between 1947 and 1994. This mining produced more than 600 million tones of waste consisting of overburden, low-grade ore, and tailings that accumulated around the mining areas. Waste to be ratio has increased form 2:1 to 3.5:1. the present annual production is 15 million tones of iron-ore and an additional accumulation of 40 to 50 million tones of waste material generated by this mining will be about 5000 million tonnes.

Mining activities in Goa contribute to water pollution mainly due to the following three activities:

- ✓ Dewatering of the mining pit water to enable to proceed the mining below the ground water level
- ✓ Effluent discharge from beneficiation plants and workshops
- ✓ Stormwater run-off from mine dumps and surrounding areas
- ✓ Accidental spillages of oil by the barges during ore transportation are also another source for water pollution in Goa region.

A large percentage of ore in the region is located below the water table and a number of mines are now operating below the water table. A cone of water table depression is created around the mine

area being worked and it is reported that in certain areas this has given rise to drying up of the nearby wells and springs which serve the neighboring villages. This problem is most acute during the summer months and during this period particularly the affected population will tend to resort to surface waters including the rivers and streams that are the recipients of the effluent waters from the working pits. The water discharged from the working pit is normally laden with suspended solids derived from within the pit.

Another existing water pollution concerns the management of beneficiation plants, associated loading points and stacks. Where the water containing very fine (colloidal) inorganic particulate solids in suspension generated out of washings from the beneficiation plants are discharged directly to a natural watercourse, the environmental impact is very serious. Where the wastewater is recovered and recycled through the process, the environmental impact is minimised.

The mining belt in Goa has two proved aquifer, namely the top laterite layer and the powdery iron ore formation at depth. The top layer with laterite cover is quite extensive in the area and even though mining activities have denuded much of these areas of laterite cover, still some areas are left which have laterite cover. Here, the water is in the form of parched water table with or without any confined pressure. The friable powdery iron ore at depth are highly porous, permeable and are completely saturated with water. During mining, these ore bodies (aquifers) are exposed and water in them gushes into the mine pits under pressure. This belt is spread across a strike length of 50 km with an average of 1 m and average thickness of 30m. Considering 35% yield, the total quantity of water likely to be confined to this area alone is expected to be about 525 Mcm. It is good quality potable water and if properly harnessed can meet the demands of the surrounding villages. The present practice is that mine water is simply pumped out and allowed the natural topography.

The ground water being pumped from the mine pits comes from shallow unconfined and deep confined aquifers layers. Even a decade ago TERI in a study pointed out:

- ✓ The shallow aquifer water levels are affected due to mining and this phenomenon is site specific and time specific. For example, the case of drying of shallow open wells around Pissurlem area is not witnessed around Kudne mines as these mines are located at the receiving end of the ground water(all ground water is flowing towards these areas) besides having local ground water barriers which are isolating the shallow aquifer water from being let into the mine pits. However, with passing of time and the spread of mining activity this may change. On the other hand mines around Pissurlem are located at the surface water divide of the catchment and therefore at the loosing end of ground water (ground water flows away from these points) and hence magnifying these effects.
- ✓ The linkage between mine pit water and the aquifer water is more than evident from the study; however at some locations it is yet to be felt.
- ✓ Under natural conditions the rain water percolates down into soil and slowly emerges at the stream banks as lean-period flow or base flow. As most of this flow emerges after the rainy season, this forms an important resource for various purposes. In Goa, most of the mines are located in close proximity of the rivers. When ground water from mine pits which are far below the river bed level are pumped, the base flow getting into the river is cut off besides the river bed itself may go dry if the mine is very close by.
- ✓ Mining in Goa has not only diverted the base flow component from rivers, but the nearby surface water bodies, springs and even soil moisture in nearby agricultural lands have been depleted.

In a recent study of water quality in eight villages namely Bicholim, Lamgaon, Mulgaon, Asnode, Shrigaon, Mayem, Piligoan and Sarvan showed that the greatest casualty has been the availability of dissolved oxygen. The area largely in the Mayem catchement has Mandovi river flowing from east to west about 4 km to the south of the mine area. Bicholiom river a tributary of Mandovi river, flows SW to its confluence with Mandovi river at Sarmanas in Piligao village. Asnode river, another tributary of Mandovi river flows SE, meeting Mandovi river as south of Corjuvem. Mayem Lake is 1.5 Km SW of the Mine area. Open pit mining covers an area of 206 ha. Out of total leasehold area, only 63.5% is part of the actual mining operation and remaining 36.5% is undisturbed. Major land-use in the peripheral zone is cultivation (45%), forest (35%), mining (working or abandoned mines of other private companies, 15%) and urban development (5%) other minor of land-use in the peripheral area include industry, grassland, mangroves and barren land. The urban area includes eight villages, Bicholim town and some small hamlets. Total population in the buffer zone is about 3300.

Sl. No	Sampling Site/Specification	pH	Color/Odor	TDS (mg/lt)	DO (mg/lt)	Hardness (mg/lt)	Iron (mg/lt)	Magnesium (mg/lt)
1.	Bicholim Stream near Santha Durga High School (SW)	6.2	Un acceptable	667.3	Absent	165	122	129.5
2.	Bore Dem village, Bicholim (old well in temple) (W)	6.9	Acceptable	163	1.2	136	43	39.0
3.	Mudgon lake (Outlet) (GW)	6.8	Un acceptable	822	Absent	444.2	183	24.0
4.	Lamgon lake (GW)	6.5	Un acceptable	329	Absent	184	119	18.3
5.	Mudgon lake II (GW)	6.7	Un acceptable	168	0.26	84.2	156	12.65
6.	Outlet of trench canal coming from mining site to domestic area in Lamgon (SW)	8.2	Turbid	1835	Absent	328.5	236	34.2
7.	Lakhu J Pal House, Valshi, Well established in 1992 (DW)	6.5	Acceptable	33.8	0.27	103.5	119	0.39
8.	Sarmanas Feri Point (Mandovi River)	6.0	Disorder/Muddy Red	1423	Absent	354.2	79	0.48
9.	Harvalem fall Kudney River	6.2	Muddy Red/Disorder	362	0.04	192	66	39
10.	Pissurlem nallah Highway Bridge	6.1	Disorder	168	Absent	124	44	28
11.	Mayam Lake	6.5	Colourless	212	0.26	108	33.5	56
12.	Poira Village Sikeri River	6.1	Partially disorder	165	Absent	88.4	54.2	26
13.	Kudner River	6.0	Partially disorder	98	Absent	104	66	14.5
14.	Outlet pipe from distillation tank, Segregation unit	60.	Muddy Red/Disorder	449.2	Absent	166	98.2	64

Average annual rainfall of the area is 3500 mm. in which 45%is lost as surface runoff. The balance is partly lost through evaporation and transpiration (25% of the balance amount) and the remaining 30% enter into the subsoil. The 50% of gravitational water that enter into the soil is lost through slow downward movement of groundwater towards the sea and a part is held up as capillary moisture in different subsurface horizons. Therefore, only 50% of the remaining gravitational water entering into the soil represents utilizable groundwater resources. Thus the scope of any artificial recharge is also minimal and depending upon the nature of the specific aquifer the possibilities in the areas where pumping is being resorted. The impact on Goa's water resources through mining extends into the rivers which are used for transporting ore in barges. While sailing through the estuaries, barge movement gives rise to strong waves, which sometimes damage the young mangrove seedlings. Rhizophora seedlings are broken by the boats passing through the plantation according to the scientists at the Forest Research Institute, Dehradun. The petroleum residues from barges, tankers and trawlers in the rivers compound the problem. The movement of barges has also been held responsible for the destruction of the protective dykes of the rich paddy fields reclaimed from the sea. Another example of the impact of barges on ecology is the accidents that take place. A barge laden

with an estimated 700 tonnes of mineral ore, capsized and submerged at the Kapxem river-side loading point near Sanvordem. Such incidents cause heavy damage to the river's ecology. Environmentalist Claude Alvares says that the over the last twenty years, the river and its salt-water ecosystem had been repeated victims of such disasters and the river's eco-system is "already dead". "Every year, 1, 20,000 tonnes of iron ore, sediments from mines and other mining rejects get into the river bed. The latest capsized barge will mean that its ore will be deposited on the river bed." National Institute of Oceanography (NIO) had studied the river a while ago and Alvares said, "The fish and shell fish have already been destroyed since the water is contaminated."

URANIUM: IN PERPETUAL DENIAL OF IMPACTS

67. Uranium mining and milling currently takes place in two regions in India. The infamous Jadugoda-Narwapahar region in the Singhbhum District and in Cuddapah District of Andhra Pradesh. The impacts in Jadugoda have been mapped by several institutions and the pollution from the tailing pond is affecting even the Suvarnarakha River. However the UCIL and the DAE's Health Physics Division continue to hold that the pollution loads have always been below the treshold values. The controversy never ending and people continue to be impacted. The Cuddapah deposit has been developed after another deposit in the Nalgonda district also in Andhra Pradesh faced severe opposition as it was in the immediate catchment of the Nagarjuna Sagar reservoir which also provides drinking water to Hyderabad. The new area where significant attempts are being made to develop an Uranium depost is in Domiasiat in Meghalaya whose name has been now changed, probablly to hoodwink protestors to Kylleng-Pyndengshohiong Uranium Mining and Processing Plant. We present here the fundamental reason why the development of such a mine in the region and the processing of it is going to be really hazardous from the viewpoint of the basic quality of this Uranium ore and the method that is planned to be adopted for processing.…

68. We present here abstracts of the two papers of the Atomic Minerals Division which is a part of the Atomic Energy establishment of the Government of India. The first abstract says that the Uranium deposits of Domiasat are highly water soluble (upto 35% of the uranium in the ore). Thus the water flowing through the mine, mine dump and the milling wastes are going to be highly radioactive. The second one adds even greater worry as the process by which 90% extraction could be achieved is with leaching with hot Sulphuric acid (264 litres/tonne), which will definitely lead to acid drainage as the residue cannot be completely drained out. We further reproduce the Environmental Clearance letter which does not reflect upon this grave issue and has very little of stringent measures for either control or even establishing if the project is worthwhile considering now established law on "precautionary principle". The last is a reproduction of the concerns of the local community articulated as a complaint to the United Nations. We have refrained from paraphrasing or critiquing the EIA documents to show how in their

own words and documents we are seeing the inconsistencies that would lead to a huge destruction of the source of drinking water in the region.

Why it is going to be environmentally disastrous to open the Domiasat mines?

AN UNUSUAL FEATURE OF URANIUM ORE FROM DOMIASIAT, MEGHALAYA -PRESENCE OF WATER SOLUBLE URANIUM

Ajoy Kumar Singh, N.P.H.Padmanabhan, K.Sivaramakrishnan, and N. Krishna Rao
Ore Dressing Section, Bhabha Atomic Research Centre
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Abstract

An unusual feature of the recently discovered sandstone-type uranium deposit in Domiasiat is the presence of appreciable amount of water soluble uranium. With normal tap water at its natural pH (7.5 – 7.8), up to 35% of the uranium in the ore was found to be soluble during agitation in the different samples. Presence of other ions in appreciable quantities, particularly SO4-2, CI - and Fe+3 appears to influence the dissolution. Percolation experiments give terminal solubilization of up to 58% , but the instantaneous uranium concentration in the percolating water attains its maximum within the first few minutes of contact. A detailed study on the chemistry of uranium dissolution may throw light on the physico-chemical controls of localization of uranium in the deposit.

FEASIBILITY STUDIES ON URANIUM EXTRACTION FROM THE SANDSTONE-TYPE ORE, DOMIASIAT, WEST KHASI HILLS DISTRICT, MEGHALAYA, INDIA

S.R. SHIVANANDA, K. VISWAMOHAN, K.B. MOHANTY, and RAVI KAUL
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Hyderabad - 500 016.

Abstract

Uranium mineralization in the Lower Mahadek (Upper Cretaceous) sandstone of Domiasiat, is characterised by the intimate association of ultrafine pitchblende and coffinite with pyrite-bearing organic matter of both fragmental and cementing matrix-types. Characterisation of the extractable uranium indicates the presence of very small amounts of uranium with humates. In view of this and the presence of small amount of acid consuming minerals, extraction of uranium in an acidic circuit is feasible. Conventional hot agitation leaching of roasted and un-roasted feed has not yielded satisfactory results. Among the different process variables, only leachant concentration is found to be the efficiency-determining factor, with the result that high dosage of acid (264 kg H2SO4/t) is necessary to obtain 90% of uranium extraction. In order to reduce acid consumption, a strong acid pug-cure-leach process as practiced for the sandstone-type deposit at Niger, has been tested. Uranium extraction of over 90% has been obtained. The paper presents the data on various process parameters tested and results obtained.

If you look at their EIA reports they will say there is nothing to worry and the Ministry of Environment and Forests gives a clearance letter which seems to be oblivious of this fact and its recommendations will all the more ensure contamination as is obvious from its clauses under which clearance is granted!!

No.J-11015/592/2007-IA.II (M)
Government of India
Ministry of Environment and Forests

Paryavaran Bhavan
C.G.O.Complex,
Lodi Road, New Delhi-110 003

Dated the 20th December, 2007

To
M/s Uranium Corporation of India Ltd.
Jaduguda Mines, Post Office Sundernagar,
District East Singhbhum,
Jharkhand-832 102

E-mail: uranium@satyam.net.in

Subject: Kylleng-Pyndengshohiong Uranium Mining and Processing Plant Proposal of M/s Uranium Corporation of India Limited located in Village(s) Nongbah-Jynrin, Nongtynger & Mawthabah, Tehsil Mawkyrwat Development Block, District West Khasi Hills, Meghalaya? environmental clearance reg.

Sir,

This has reference to the Department of Atomic Energy, Government of India letter No.10/7(1)/2004-PSU/385 dated 26.06.2007, your letter No.UCIL/ED/6(1)/2007 dated 26.06.2007 and subsequent letters dated 16.10.2007 and 10.12.2007 on the subject mentioned above. The proposal is for opening of a new mine for production of 0.375million TPA of uranium ore and setting up of uranium ore processing plant at Mawthabah. The total land requirement of the project is 351ha, which comprises mining lease area of 290.45ha, which is a wasteland. No forestland is involved. It has been noted that the earlier lease area of 292.15ha was reduced to 290.45ha as an area of 1.7ha falling under the village Domiasiat was not available from the concerned land owner. The uranium ore processing plant is located at a distance of 5km from the mine lease. Area proposed for mining is 125ha, an area of 39ha is kept for OB dumps including storage of topsoil and mineral, 28ha for infrastructure, 23ha for roads, 49.45ha for green belt, 10ha for tailing pond, 1ha for ETP, 42ha for primary crushing plant/processing plant, 18ha for township, 14ha for internal roads and 1.55ha for water supply system and pipelines. No ecologically sensitive area such as national park/wildlife sanctuary/biosphere reserve/tiger reserve etc. is reported to be located in the core and buffer zone of the mine and that the area does not form corridor for Schedule-I fauna. There are 23 households from two villages namely Nongbah-Jynrin and Mawthabah comprising a population of 131 people, are in the core zone. Displacement of population and R&R is not envisaged. Working will be opencast by mechanised method involving blasting. The targetted production capacity of the mine is 3,75,000TPA (0.375million TPA) and life of mine is 24years. The topography of the area is undulated and hilly at an elevation ranging from 750m-905m RL. The ultimate working depth of mine will be 756m RL. ***The ground water table varies from 778.08m to 822.56m RL. The mine working will intersect ground water table. The peak water requirement of the project is estimated as 4500m3 per day, which will partly be sourced from Umsophew River and partly from deep nallahs. It is estimated that 24.8million m3 of over burden and 3.7million m3 of tailings will be generated during the mine life. The over burden generated shall be dumped in the earmarked areas. There will be two external over burden dumps during the first two years having maximum height of 10m each. Concurrent backfilling will be carried out from the 3rd year onwards. An area of 10ha has been earmarked for tailing pond for first three years, thereafter, the mined out pit will be used for tailing pond. There will be no separate tailing pond for the project. Plantation will be raised in an area of 250ha at the end of the mine life.*** The public hearing of the project was held on 12.06.2007. The Department of Atomic Energy, Government of India approved mining plan of the project on 24.07.2007 for lease area of 290.45ha. The capital cost of the project is Rs.814.66crores.

2. The Ministry of Environment and Forests has examined the application in accordance with Section 12 of the EIA Notification 2006 read with para 2.1.1(i) of the Circular No.J-11013/41/2006-IA.II(I) dated 13.10.2006 and hereby accords environmental clearance under the provisions thereof to the above mentioned Kylleng-Pyndengshohiong Uranium Mining and Processing Plant Proposal of M/s Uranium Corporation of India Limited for an annual production capacity of 3,75,000tonnes (0.375million tonnes) of uranium ore by opencast mechanised method and processing of 1500tonnes per day of ore processing plant involving total land requirement of 351ha, comprising mining lease area of 290.45ha, subject to implementation of the following conditions and environmental safeguards.

A. Specific conditions

(i) The project proponent shall obtain Consent to Establish from the State Pollution Control Board and effectively implement all the conditions stipulated therein.

(ii) The project proponent shall ensure that no natural watercourse and/or water resources shall be obstructed due to any mining operations.

(iii) The top soil should be stacked at earmarked(s) site only with adequate measures and should not be kept unutilized for a period more than 3years. The topsoil should be used for land reclamation and rehabilitation of mined out areas.

(iv) The over burden generated during the initial two years shall be stacked at earmarked dump site(s) only with proper terracing so that the overall slope shall not exceed 28 degree and stabilized. The over burden dumps shall be scientifically vegetated with suitable native species to prevent erosion and surface run off. In critical areas, use of geo textiles shall be undertaken for stabilization of the dump. Monitoring and management of rehabilitated areas should continue until the vegetation becomes self-sustaining. Compliance status should be submitted to the Ministry of Environment & Forests and its Regional Office located at Shillong on six monthly basis.

(v) Catch drains and siltation ponds of appropriate size should be constructed for the working pit and over burden dumps to arrest flow of silt and sediments. The water so collected should be utilized for watering the mine area, roads, green belt development etc. The drains should be regularly desilted, particularly after monsoon, and maintained properly. Garland drain of appropriate size, gradient and length shall be constructed for both mine pit and over burden dumps and sump capacity should be designed keeping 50% safety margin over and above peak sudden rainfall (based on 50 years data) and maximum discharge in the area adjoining the mine site. Sump capacity should also provide adequate retention period to allow proper settling of silt material. Sedimentation pits should be constructed at the corners of the garland drains and desilted at regular intervals.

(vi) Dimension of the retaining wall at the toe of the dumps and OB benches within the mine to check run-off and siltation should be based on the rain fall data.

(vii) Suitable embankment of proper dimensions should be constructed to protect the area from flood water during rainy season.

(viii) The tailing dam shall be so designed so as to ensure that the permeability shall be less than 10-9m/s on all sides including bottom area.

(ix) The design of the tailing dam shall also take into account the spill way and over flow during heavy rain and also provide for dam burst scenario. It shall be ensured that there is no adverse impact on the public health, safety and environment due to the tailings in the tailing pond.

(x) The project proponent shall effectively address the concerns raised by the locals in the public hearing as well as during consideration of this project while implementing this project.

(xi) The project proponent shall develop effective emergency response procedure to ensure appropriate risk management measures in the public domain, if any, due to the project.

(xii) Plantation shall be raised in an area of 250ha including a 7.5m wide green belt in the safety zone around the mining lease by planting the native species around ML area, over burden dumps, backfilled and reclaimed area, roads etc. in consultation with the local DFO/Agriculture Department. The density of the trees should be around 2000 plants per ha.

(xiii) Regular water sprinkling should be carried out in critical areas prone to air pollution and having high levels of SPM and RPM such as haul road, loading and unloading points, transfer points and other vulnerable areas. It should be ensured that the Ambient Air Quality parameters conform to the norms prescribed by the Central Pollution Control Board in this regard.

(xiv) The project authority should implement suitable conservation measures to augment ground water resources in the area in consultation with the Regional Director, Central Ground Water Board.

(xv) Regular monitoring of ground water level and quality should be carried out in and around the mine lease by establishing a network of existing wells and constructing new piezometers during the mining operation. The monitoring should be carried out four times in a year ? pre-monsoon (April-May), monsoon (August), post-monsoon (November) and winter (January) and the data thus collected may be sent regularly to Ministry of Environment and Forests and its Regional Office, Shillong, Central Ground Water Authority and Regional Director, Central Ground Water Board.

(xvi) **The project proponent shall regularly monitor the water quality including radio-nuclides levels at different locations in the upstream and downstream of Mawkhan Nallah, Phot Rangam Nallah, Sindumdum nallah and Snget Nallah and both the rivers namely Wahphodthra and Umsohphew in consultation with State Pollution Control Board. The record of the data shall be maintained and report submitted to the concerned Department of the State Government, CPCB, SPCB, Ministry of Environment and Forests and its Regional Office, Shillong on six monthly basis.**

(xvii) The project authorities should obtain prior approval of the competent authority for drawal of surface water and ground water, if any, required for the project.

(xviii) The project authorities should undertake sample survey to generate data on pre-project community health status within a radius of 1 km from proposed mine.

(xix) The mineral handling plant should be provided with adequate number of high efficiency dust extraction system. Loading and unloading areas including all the transfer points should also have efficient dust control arrangements. These should be properly maintained and operated.

(xx) Consent to operate should be obtained from SPCB before starting mining activities.

(xxi) Vehicular emissions should be kept under control and regularly monitored. Measures shall be taken for maintenance of vehicles used in mining operations and in transportation of mineral. Overloading of trucks be avoided to stop spillage. The loaded trucks be covered with tarpaulin sheets to prevent spillage of ore.

(xxii) Digital processing of the entire lease area using remote sensing technique should be done regularly once in three years for monitoring land use pattern and report submitted to Ministry of Environment and Forests and its Regional Office, Shillong.

(xxiii) The project proponent should take all precautionary measures during mining operation for conservation and protection of endangered flora namely Neptehnes khasiana and Rauvolfia densiflora etc. and endangered fauna namely Indian Elephant, Leopard Cat, Hoollock Gibbon, Sloth Bear, Tiger etc. spotted in the study area. Action plan for conservation of flora and fauna shall be prepared and implemented in consultation with the State Forest and Wildlife Department. Necessary allocation of funds for implementation of the conservation plan shall be made and the funds so allocated shall be included in the project cost. Copy of action plan shall be submitted to the Ministry of Environment and Forests and its Regional Office, Shillong within 3 months.

(xxiv) Monitoring of background radiation levels in water, soil and ambient air should be carried out periodically in the study area (core and buffer zone) of the project.

(xxv) The plants growing in the area, soil invertebrate animals and local agricultural produce should be analysed to check the build up of radioactivity levels, if any.

(xxvi) Discharges from the treatment plant and settling pits should be constantly monitored for concentration of radio nucleides.

(xxvii) Sludge from the treatment plant and settling pit should be transported in safe containment.

(xxviii) The project proponent shall have an emergency response plan to ensure that all potentially affected people understand the possible causes and consequences of radiation and other project related activities.

(xxix) Land oustees and land loosers, if any, shall be compensated as per the National Policy on Resettlement and Rehabilitation of project Affected Families (NPRR), 2003.

(xxx) Wet drilling and water spraying on muck should be practiced to reduce generation of silica and low level of radioactivity in the work place. The external radiation dose should be monitored quarterly to ensure that workers engaged in the work place are not over exposed.

(xxxi) Blasting operation should be carried out only during the daytime. Controlled blasting should be practiced. The mitigative measures for control of ground vibrations and to arrest fly rocks and boulders should be implemented.

(xxxii) A Final Mine Closure Plan along with details of Corpus Fund should be submitted to the Ministry of Environment & Forests 5 years in advance of final mine closure for approval.

B. General Conditions

(i) No change in mining technology and scope of working should be made without prior approval of the Ministry of Environment and Forests.

(ii) No change in the calendar plan including excavation, quantum of mineral uranium ore and waste should be made.

(iii) Atleast four ambient air quality monitoring stations should be established in the core zone as well as in the buffer zone for RPM, SPM, SO2, NOx, and CO monitoring. Location of the stations should be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets in consultation with the State Pollution Control Board. Data on ambient air quality (RPM, SPM, SO2, NOx, and CO) should be regularly submitted to the Ministry including its Regional Office at Shillong and to the State Pollution Control Board/Central Pollution Control Board once in six months.

(iv) Adequate measures should be taken for control of noise levels within prescribed standards. Workers engaged in blasting and drilling operations, operations of HEMM, etc., should be provided with ear plugs/muffs.

(v) Industrial wastewater (workshop and waste water from the mine) should be properly collected, treated so as to conform to the standards prescribed under GSR 422(E) dated 19th May 1993 and 31st December 1993 or as amended from time to time. Oil and grease trap should be installed before discharge of effluents from workshop.

(vi) Personnel working in dusty areas should wear protective respiratory devices and they should also be provided with adequate training and information on safety and heath aspects. Occupational health surveillance programme of the workers should be undertaken periodically to observe any contractions due to exposure to radioactive mineral dust and take corrective measures, if needed. The same programme may be extended to adjoining villages also.

(vii) A separate environmental management cell with suitable qualified personnel should be set up under the control of a senior Executive, who will report directly to the Head of the organization.

(viii) The funds earmarked for environmental protection measures should be kept in separate account and should not be diverted for other purposes. Year-wise expenditure should be reported to the Regional Office, Shillong of the MOEF and to the Ministry.

(ix) The Regional Office of this Ministry located at Shillong shall monitor compliance of the stipulated conditions. The Project authorities should extend full cooperation to the officer(s) of the Regional Office by furnishing requisite data/information/monitoring reports.

(x) The project proponent shall submit six monthly report on the status of the implementation of the stipulated environmental safeguards to the Ministry of Environment and Forests, its Regional Office, Shillong, Central Pollution Control Board and State Pollution Control Board.

(xi) A copy of the clearance letter will be marked to the concerned Panchayat /local NGO, if any, from whom suggestions/representation has been received while processing the proposal.

(xii) The project authorities should inform to the Regional Office located at Shillong regarding date of financial closures and final approval of the project by the concerned authorities and the date of start of land development work.

(xiii) State Pollution Control Board should display a copy of the clearance letter at the Regional Office, District Industry Centre and Collector?s/Tehsildar?s Office for 30 days.

(xiv) The project authorities should advertise at least in two local newspapers widely circulated, one of which shall be in the vernacular language of the locality concerned, within 7 days of the issue of the clearance letter informing that the project has been accorded environmental clearance and a copy of the clearance letter is available with the State Pollution Control Board and also at web site of the Ministry of Environment and Forests at http://envfor.nic.in and a copy of the same should be forwarded to the Regional Office of this Ministry located Shillong.

3. The Ministry or any other competent authority may alter/modify the above conditions or stipulate any further condition in the interest of environment protection.

4. Failure to comply with any of the conditions mentioned above may result in withdrawal of this clearance and attract action under the provisions of Environment (Protection) Act, 1986.

5. The above conditions will be enforced inter-alia, under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986 and the Public Liability Insurance Act, 1991 along with their amendments and rules made thereunder and also any other orders passed by any Court of Law relating to the subject matter.

(SATISH.C.GARKOTI)

Additional Director

AND THIS IS WHAT THE COMMUNITIES ARE COMPLAINING TO THE UNITED NATIONS

There are proposed open cast Uranium mining by the Uranium Corporation of India Limited (UCIL) in West Khasi Hills District of Meghalaya, which is facing very strong resistance by the Khasi people due to the fear of the radioactive exposure22 having severe health & human rights violations. We believe that no dialogue on Uranium mining can take place without engaging our own community in true sense of spirit. We are aware that those who support uranium mining their definition and purpose are peaceful activities. However, for us the outcome is genocide. After having seen over fifty years of development and industrial projects, the Khasi people have realized that their rights over land does not exist as the States ownership of everything six feet below the surface (including the mineral resources) entails the loss of rights over their ancient land handed to them by their ancestors, in trusteeship for their unborn generations. This makes more the reason to fight for ownership rights over land & its resources. The Khasi people are also the poorest of the poor; they are marginalized with systematic discrimination and have less power to demand accountability or respect of their rights. The effects of land, resources alienation and an imposed framework of development process have affected their, identity, culture and a commercial exploitation scheme that has led to the overall failure in promoting a healthy and balanced economic development.
Dino Submission to UN Special Group on Minority

[22]Radio-active heavy-metal element used in nuclear reactors and for the production of nuclear weapons. Its isotopes (reflecting different atomic mass) are U-233, U-235 and U-238." (Source: United Nations, Glossary of Environment Statistics).

MINING FOR WATER FOR CHENNAI METROPOLITAN AREA

69. Water is also a mineral by its geological definition. Modern cities depend heavily on mining of water from the local and regional aquifers. Infact a significant business operates on the mining of water and its supply. The menace has become so huge that in several cities there is a "borewell and tanker mafia".

Chennai Metropolitan Area is one of the examples of how urban growth causes mining of water itself. From its formation in 1872 and up until 1969, water supply was from local tanks and wells. Based on the UNDP studies carried out during 1966 to 1969, ground water aquifer was identified at Tamaraipakkam, Panjetty and Minjur in the Araniar-Kosathalaiyar Basin (A.K. Basin) located north of Chennai. These three Well fields were developed for abstracting water at an estimated yield of 125 MLD. Ground water abstracted through bore wells from these well fields was supplied to Industries in Manali from 1969 by the PWD Ground Water Wing, later taken over by CMWSSB in 1978. This water was partly diverted to City's water supply system from 1981. Since then "water mining" has been the basis for the augmentation of supplies for the city. The Northern "Well Fields" for abstraction and their status in 2005 clearly presents a picture of how the water resources were completed destroyed by over drawal.

After depleting these aquifers, the CMWSSB has hired private agricultural wells from 2000 to augment water supplies. The average yield from such sources during 2005 is to the tune of 77 MLD.

After unsustainable withdrawal, the Chennai Metropolitan Water Supply and Sewerage Board has reported that all other possibilities of augmenting water supply to the Chennai City have been exhausted. It felt that it is necessary to regulate and control the extraction and use of ground water in any form and to conserve the same in the City of Chennai and the district of Chengalpattu and to regulate and control the transport of groundwater! For its own purpose, the City went to seek distant groundwater sources.

Well Fields	Year of Commissioning	No. of Wells Installed	Yieding Wells 2005	Design Yield (MLD)	Average Yield in 2005 (MLD)
Tamaraipakkam	1969	30	2	50	1.60
Panjetty	1969	13	1	41	0.08
Minjur	1969	9	5	34	3.10
Poondi	1987	12	4	27	1.20
Flood Plains	1987	0	5	14	0
Kannaigaiper	1987	0	5	14	0.01
Total		74	12	180	5.99
Source: Chennai Metropolitan Water Supply & Sewage Board					

Back to Neyveli

Chennai Water Supply Augmentation Project-I (to add 180 MLD water to Chennai City water requirement) was taken up by CMWSSB in 2004 at a cost of Rs.720 crores. It is to draw 190 MLD of raw water from Veeranam Lake near Sethiathope, situated in Cuddalore District at about 230 km. from Chennai City. This controversial project aimed to pump the raw water to about 20 km. through the pipeline to Vadakuthu for treatment, pump the treated water from Vadakuthu for a distance of about 8 km. to the Break Pressure Tank at Kadampuliyur ridge point[23]. From here, the hope

23 Source: http://www.chennaimetrowater.tn.nic.in/engg/operationmaintenance/cmwdrw04.htm

was to convey the water from this ridge point by gravity for about 200 km. to the Water Distribution Station at Porur in Chennai and distribute to the public through the distribution network system. Conceived in the sixties and after several scams, when the project was actually taken up there was actually no water in the Veeranam lake available. As one reporter remarked "there is no water in sight at Veeranam, which has an expanse of 28 sq km. For children from surrounding villages the lake is now a giant cricket field". Therefore, 45 Bore wells were erected with submersible pumpsets (30 for operation and 15 as standby) in between Gadilam river and Paravanar river over a stretch of 30 km. based on a detailed investigation and recommendation for the extraction of 60 MLD from the Neyveli Aquifer. Necessary pipeline for connecting the Bore well water to the underground tank of Water Treatment Plant at Vadakuthu was also carried out. By the middle of April 2004, most of the works in the treated water pumping arrangements and treated water-conveying mains from Vadakuthu to Porur were completed under New Veeranam Project. Farmers are also aghast at the digging of the deep borewells. C.S. Kuppuraj, former Chief Engineer of the Tamil Nadu Public Works Department (PWD), said that the exploitation of groundwater on such scale would result in severe damage to the aquifer and lead to the intrusion of sea water because the sea shore was only 20 to 25 km away from the wells. A vehement critic of the Veeranam project, he pointed out that similar over-extraction of groundwater by Metrowater on the northeastern fringes of Chennai had resulted in sea water intrusion. Kuppuraj argues that Metrowater would need to pump 180 mld for 155 days in order to gather one tmcft of water for Chennai. The project is "wasteful" because Chennai's needs are far greater. "In any case, even if there is water in Veeranam and even if all of it is sent to Chennai, it will be like pouring a mug-full of water into the sea." Kuppuraj is critical of the government for not having examined other options and predicts that the project is "doomed to fail because it defies all logic"[24] Pumping water at the rate of 60 mld from 30 deep borewells will result in at best 0.33 tmcft of water for Chennai. Even this calculation assumes that water is pumped from the wells round-the-clock for 155 days a year. Farmers and irrigation experts fear that such aggressive pumping will cause severe depletion of water resources in the area, apart from causing damage to the aquifers.

24 http://www.frontlineonnet.com/fl2110/stories/20040521004009700.htm

Details	1978	March 2008
Operational Area	City 176 sq.km.	City + surrounding areas(176 + 8 sq.km.)
Population	30 Lakh	54 Lakh
Water produced (Normal years)	240 MLD	645 MLD
Area covered with piped supply	80%	99%
Treatment capacity	182 MLD	1,280 MLD
Length of water mains	1,250 km.	2,924 km.
No. of consumers	1,16,000	4,79,850
Distribution Stations	3 No.	16 Nos.
Source: Chennai Metropolitan Water Supply & Sewage Board		

The following is the growth profile in water supply since the formation of the Board in 1978 to March 2008 indicates that for less than a doubling of the population the water resource augmentation has been almost six-times and yet the city has one of the lowest per capita availability among the metros.

RIGHT TO WATER OF MINE WORKERS

70. Mine workers and especially in small quarries and mines are deprived of basic need of clean drinking water and in several states it has been only after civil society groups have taken up the issue some reprieve has been available. In Rajasthan a petition filed by Mine Labour Protection Campaign led to the High Court order strict compliance and some positive changes were seen. In Maharashtra, Santulan has been in the forefront of community effort to enable workers get their right. In Bundelkhand it continues to be an issue.
71. There is no provision made for sanitation in legal diamond and stone mines. People are forced to drink the dirty water from that mine or nearby streams. In all mines of diamond, stone, granite, or stone grit situated in Panna there is no arrangement of drinking water for labour in any mine.One can visit any mine and can see that when there is no arrangement even for drinking water from where they can get water for other uses. Therefore labour working in mines uses water stored in mines or from nearby streams for drinking and other uses.
72. Here we present the case of Maharashtra.

Economically, Stone Quarry workers community are Landless, Homeless, Migrants, affected by Famine & Earthquakes, Tribal, Uprooted from Traditional Livelihood, Indebted,' categories as unorganized workers across the State. In the past stone breaking was an occupation of a particular caste community namely Vadars (Stone Breakers Community). With the growing displacement from their sources of livelihood various communities of common identity i.e. lower socio-economic strata across the State are found '*tolling for survival*'. Socially, over 96% of them belong to lower caste categories classified under Indian Constitution. Predominantly over 90% to 95% workers in Stone Quarry/Crusher sector belong to socio-economically deprived & marginalized communities of India, they are constitutionally categorized as Vimukta Jati (V.J.), Nomadic Tribes (N.T.), Scheduled Castes (S.C.) Sheducled Tribes (S.T.) and Other Backward Communities (O.B.C.) Once there was a monopoly of a particular tribe i.e. Vadars (Stone breakers) who depended on stone occupation for generations.

The prime motive of worker's is 'survival'. They live next to Stone Quarry/Crushing sites in the remote areas. The huts are hardly 3 to 4 feet high, covered with temporary iron or plastic sheet and walls made up of lose stones. In general, there are absolutely no basic amenities, most pathetic & unsecured. Workers have neither Birth nor Death records... no Ration Cards... not enrolled in voting

list... neither included in population survey... no benefits from any Govt. schemes... no Health Safeties, Schools or any Social Securities. Its an '*identity less survival*',

To achieve the objectives of promoting exploration & mineral development the State Government framed *'Maharshtra State Mineral Development Fund (Creation & Utilization) ordinance 2001.* The contribution of this fund would be raised from the 10% of the total mineral revenue collecting during the preceding financial year in the State. Government of Maharashtra based on the above policy passed the following important Government Resolution making financial provisions of 'Mining Development Fund' (MDF) for the mining affected areas: includes ROAD, DRINKING WATER, HEALTH SERVICES, ELECTRICITY & ENVIRONMENT, SCHOOLING, ETC. *(GR: MDF-1002/P.No. - 55, Industy-9, Mantralya, Mumbai-400, Dated 26th August 2002.)* . Unfortunately, since 1999 to 2005 over 80% of MDF is been spent on roads and insignificant amount is spent on environment, health, water and nil on education. Since the regular drinking water programmes have neglected Mining Workers, it is the onus of the mining industry. Santulan took up the issue of provision of drinking water to the quarry workers near Pune. While battling on various fundamental issues of stone quarry workers such as right to education, right to ration cards & public food distribution system, right to vote, right to heath, right to housing, right to Social Security, right to legal protections, 'Right to Safe Drinking Water' emerged as one of the serious issues faced by over 1000 stone quarry workers families in Wagholi stone quarry cluster in Pune, Maharashtra.

The Chronology of this activity proves that unless dictated by the courts even the basic provision of drinking water to workers does not happen as a natural course of our resource extraction and an institution has to battle for three years before redressal.

1. A demand for Drinking Water Scheme to Stone Quarry Workers at Wagholi, Pune was made by Santulan to the District Collector on **22/12/2003.**
2. On the basis of the demand the Executive Engineer for Public Water Supply Dept. prepared a scheme titled ***'Construction of Public Water Scheme at Wagholi for Quarry Labour Taluka Haweli Dt. Pune'*** with the population of 3485 x 40 LPCD = 1,39,400 litters water per day, costing Rs. 32,58,812/-only and was send on **12/4/2004** to the Managing Director, Maharashtra State Mining Corporation (MSMC) Ltd. Nagpur-10 for sanction under MDF.
3. On 6/5/2004 MSMC office returns the proposal to District Collector of Pune for lack of Technical Sanction & Certificate from the District Mining Officer with a requeast to send it back on priority basis for tabling it to the coming MDF meeting
4. On 19/8/2004 MDF meeting was held and since the water proposal had not reached the MSMC the MDF Committee decided to allot over Rs.284.53 lakhs while it had only Rs. 158.97 lakhs till 2002-2003 for the repairs of Roads. This meant the remaining amount of Rs. 125.56 lakhs will be

recovered from following years leaving no chance for any other project in the next minimum of three years.

5. On 22/1/2005 Santulan issued a legal notice U/s 80 CPC to Secretary to the Mining Minister, Mumbai, Managing Director, Nagpur, Additional Collector, Pune, Executive Engineer & DMO, Pune demanding for (1) Not to release the sanctioned budget for roads until the water schemes is implemented. (2) Action to be initiated against officers responsible.
6. On 29/4/2005 Stone Quarry Workers organized first road show in the form of a huge Rally to the District Collector of Pune demanding for basic Rights and Amenities.
7. In the month of April 2005 Santulan filed a Public Interest Litigation Numbering 47/2005 in the High Court, Mumbai.
8. PIL Judgment - on 10/10/2005 the High Court, Mumbai Directed the State Govt. of Maharashtra "... to complete the Public Water Scheme at Wagholi for Quarry Labour Taluka Haweli Dt. Pune' within four months".
9. As per the orders, the Government received the approval on 19/11/2005 and began the work on 31/1/2006 and completed the project by 30/5/2006.

73. Mining sector is complex and considering its deleterious impacts it is no more a development tool calling for a different model altogether. Further, defacto, mining violates all key policies of the country.

74. Mining is water intensive; current use is enough for at least for 30 crore people's annual water use.

75. Mining emerging as major contributor to depleting water sources. Right to water– threat to water from mining is fundamental - impacting the geological repository of water. Mining depleting water sources and affecting agriculture and access to drinking water.

76. Source destruction is rampant and sustainability of the source is recognized as major factor affecting long-term water availability. Usually poor areas, the intensity of poverty is increasing and some of the vulnerable communities are in "chronic poverty".

77. Conflicts over mining rising: Corporates vs Communities; State vs Communities, Communities vs Communities thus breaking down the social fabric. Mining impacts the key governance responsibilities of local communities.

78. Mining is impacting the watersheds of India and it is the most comprehensive threat to sources. Mining is destroying forests and lands belonging to the poorest. Impact on water sources no more localized as the destruction spreads over a wider region.

79. Coverage for drinking water is slipping and there is an overall quantity problem. Competitive uses bring in new dimension and as if this is not enough, mining strikes at the source impacting both quality and quantity.

80. The available information and data collected so far by different operational and field organizations, scientific groups and engineering community are inadequate for planning, development and management of the vast water resources in the country. The time series data of the hydrological and meteorological variables, the space-oriented data and

relation-oriented data are generated in a fragmented manner for specific locations and extrapolated to larger regions or river basins. Thus, in this regard, a comprehensive, reliable and easily accessible Information System for water resources data is a pre-requisite.

81. Mining must adhere to norms with adequate monitoring. Precautionary Principle must be applied before initiation of mining and definitely when the mining activity breaches the groundwater table. For the destruction already caused the 'polluter pay' principle must apply.

82. The Government of India has embarked on a process of reformulating the Mines Minerals (Development and Regulation) Act. The process is still ongoing. The important departure from the past has been the inclusion of a Sustainable Development Framework in the context of mining. This affords a window of opportunity to identify the go and no-go areas in mining considering the impacts on other ecological and environmental factors. The issue of water must be a critical part of this law and strict penalties must be imposed on the violators.

Environics Trust is a not for profit research and community development organisation and an enabling institution. Environics conducts participatory research on issues of environment and human behavior and uses these outcomes for innovative community development programmes. Environics anchors several networks and partnerships and is currently the Secretariat for The Access Initiative Coalition (TAI) and the Occupational and Environmental Health Network of India (OEHNI). Environics is a co-founder and promoter of the mines minerals and PEOPLE alliance (mm&P), the Indian Network on Ethics and Climate Change (INECC), the EIA Resource and Response Centre (eRc). Environics promotes and mentors environmentally sound enterprises and among these is the Biodiversity Conservation India Limited (BCIL), the largest Sustainable Built environment enterprise in India. Environics provides research and evaluatory services to International, National, State and Local Institutions and directly works with marginalised communities such as those in the mountain regions, tribals and communities adversely affected by mining and industrialisation. Environics is an observer member of UNFCCC; Founder Members of the Editorial Board of the worlds largest community and mining portal www.minesandcommunities.org and a member of the Asian TNC Research Network

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