IMPACTS ON WATER – SOME EXAMPLES FROM INDIA

FOR THE ICN – WORKING GROUP ON WATER

A NOTE FROM ENVIRONICS TRUST/MM&P

PREFACE

This is a quick and not so dirty compilation of some of the work we have been doing in the recent past to understand the implications of mining on water resources.

The overview and examples have been put together to provide an agenda point for discussions for the ICN Water Working Group.

I hope it will provoke some important discussions amongst ourselves and exchange of material that can enrich our understanding and enable communities to address the situations.

R.Sreedhar

New Delhi

June 2013

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 underground 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 industries 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:

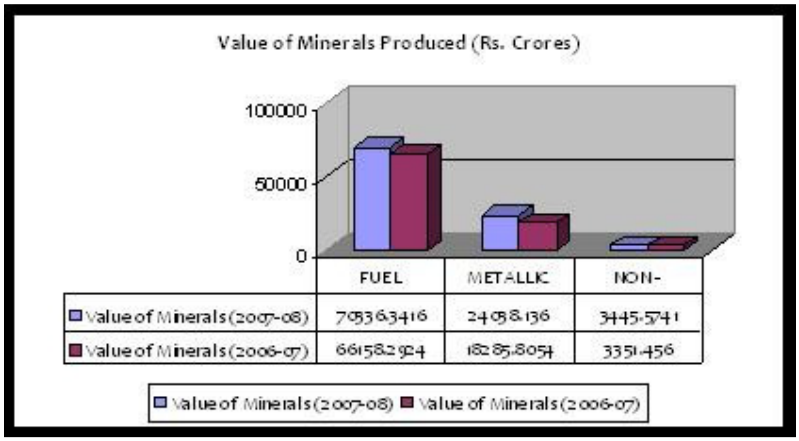
S.No.	Mineral	No. of Leases	Lease Area (Hect.)	Percent lease area distribution#
1	Limestone	1714	126894.59	26.44
2	Iron Ore	577	80962	16.87
3	Bauxite	349	30069.8	6.26
4	Manganese Ore	294	21101.7	4.40
5	Steatite	412	19318.54	4.02
6	Silica Sand	470	17544.65	3.66
7	Fireclay	256	16519.66	3.44
8	China Clay	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 quarries which have been operating without requisite permits. 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 are 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 Mineral Conservation Rules, yet the prosecution is limited and the penalties very meager.

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 majority of the

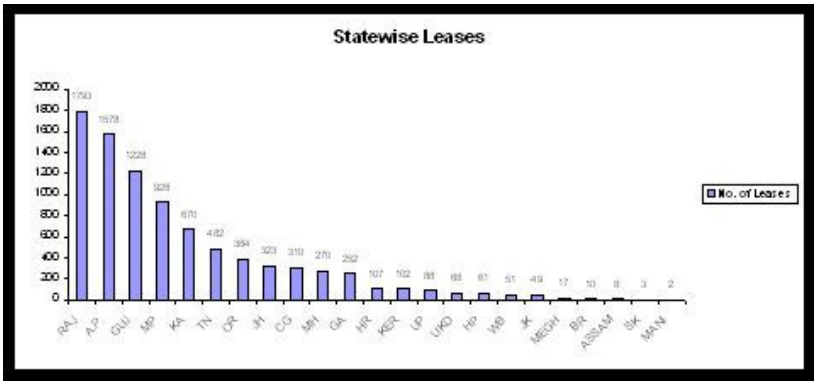
1 Coal and Lignite

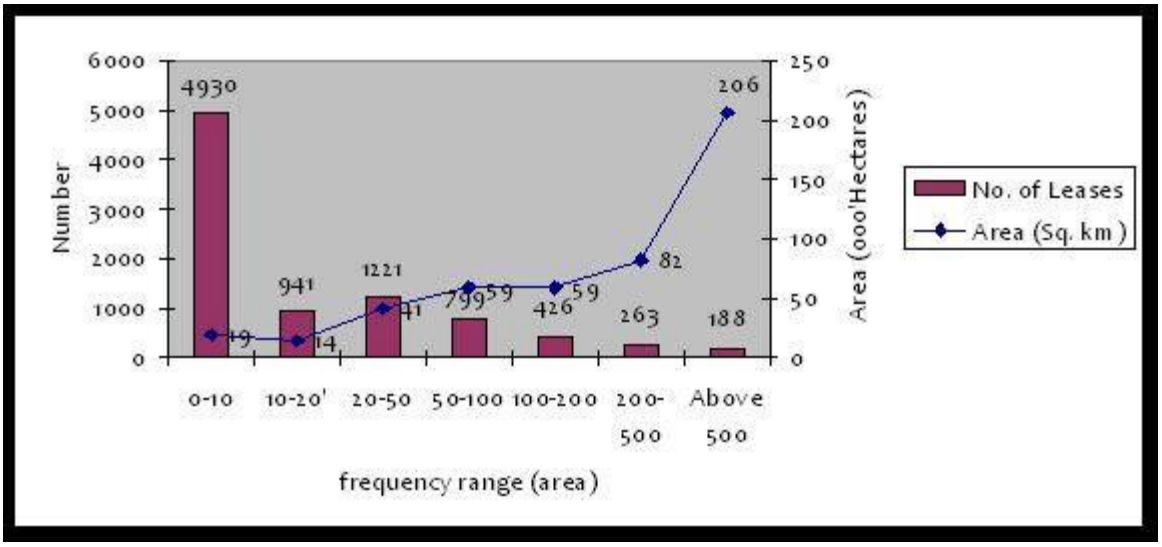
2 Natural gas and Petroleum

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

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.





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 42.9% area is under large leases) whereas for 4930 leases, the corresponding area is 19,000 hectares.

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.

17. We present 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'.

18. It must be emphasised that Corporate Social Responsibility (CSR) or otherwise, the mining sector should be sensitive enough alteast to ensure clean drinking water is available to the very people involved in mining – those whose lands have been affected and those who work in the mines.

19. Thus the problem of mining in India is manifold. The destruction of the preexisting habitat by mining undermines the possibility to look for alternatives. The Mining Industry is wide spread and severe adverse impacts are visible from small scale rat hole mining and stone quarrying to large open cast and deep underground mines.

20. The social and political implication of mining assumes far reaching ramifications when this principal mineral wealth lies in the most forested regions and those homelands traditionally inhabited by adivasis and dalits. The situation has reached a point when governments are unwilling to look at other options and alternatives and they are progressively binding themselves to systems that have failed.

21. Mining activities have increased exponentially since the beginning of economic liberalization in the early nineties. The National Mineral Policy (NMP) 1993 and reiterated again in the NMP 2008, initially aided the State actors through de-regulation and later, the corporates, as promoter of economic growth and private profitability by rapidly abstracting mineral wealth of the country.

22. Various actors have invested into the sector, including national and international companies, banks, equity funds, and even "round-tripping" of illegal funds. Within two decades of liberalised economy, much in contrast with the Constitutional objectives, mining as a sector has come to be associated with scams and illegalities, conflicts, violence, human rights abuses and ecological degradation.

23. The threat of mining in India is powerful, multi- faceted and complex. An exponential increase in the sector calls for urgent action by all groups - mining, environment and forestry, human rights and social justice. It is in this context that this collaborative task of understanding and action emerges.

2. COAL MINING – VIOLATIONS AND IMPACTS GALORE!

24. Mining in India is plagued by illegality. It is now predicted that the legal mines would be doubling within the next 15 years and therefore the total mines will expand multi-fold. ***Even the legal mines have a number of violations from their cradle to grave, that is, from allocation of concessions to closure of mines.***

25. The case of coal is very stark. Coal epitomises the nature of the mining sector and is already causing irreversible damages to the people and their environment.

26. The Coal mining industry today is a consequence of a process where the state and the corporate nexus have colluded at the highest levels of resource allocation and policy decisions in India.

27. The spurt of coal mining, in particular, is accompanied by a peculiar rationale that revolves around the urgent need for energy required to power India's economic growth. This in turn, it is argued, shall reap benefits for the country at large. This rationale is generally accepted to be true by many sections and tends to disregard and neglect the disastrous impact of mining. It is seen almost as an inevitable consequence of mining.

28. Further it is argued that in an era of globalisation, we are twinned with the various economies of the world and would need to reciprocate in terms of resource aggrandizement and also allowing trans-national corporations into our land.

Australian coal, European turbines, US boilers, Japanese instruments... They want India to cut emissions.

A telling cartoon by the perceptive cartoonist Ajit Ninan, depicts the mainstream argument of climate change and globalisation.

In the context of the Sipat Thermal Power Plant (briefly described in this document) there is money from across the world including MDBs like ADB, vendors from Russia too!!

29. The allocation of coal mining concessions is under cloud of suspicion. **Beyond the existing 574 coal mines in the country, a total of 301 coal concessions have been allocated in 189 coal blocks.** The Supreme Court of India recently ruled that natural resources belong to the "People of India" and cannot be allocated on a first-come-first-served basis. Comptroller & Auditor General of India have severely indicted the Government on Coal Mine allocations.

30. The amount of financial loss in the process has been fixed at 200 billion USD, which is almost equivalent to India's GDP in 2010. There is growing evidence that these losses to the exchequer have been allowed for financial and political considerations by the decision-makers and have undermined the huge concerns that underlie mining.

31. The demand for a thorough investigation has been raised across the country and the Central Bureau of Investigation has initiated criminal investigations. Through the privatization process, the corporates have already cornered a fifth of the national reserve by preferentially getting allotted 47.8 Billion Tonnes out of the known 267 Billion tonnes of coal in the country.

32. Even without such opaque allotment, a huge number of illegal operations have also been identified in the coal mining sector and the Parliament was forced to pose this issue to the

Standing Committee, which in its investigations came across over 400 illegal coal mining operations.

33. Coal mining has been among the major cause for displacement of people and the current estimates are that over 2 million people in India would have been displaced so far from this activity alone and a major proportion of them being the indigenous. Compared to the number of people displaced, the rehabilitation of the displaced people has been minimal and not very successful. One estimate puts the percentage of people rehabilitated at only 29 per cent of all the total number of people displaced due to development projects. In case of mining projects, the percentage of people resettled is slightly lower at 25 per cent (which is 6.3 lakhs). This is quite a poor performance. Same is the case with the resettlement of tribal population displaced by the mining projects.

34. In the coal mining displacement around Singrauli, the proportion of landless people skyrocketed from 20 per cent before displacement, to 72 per cent after. Various studies clearly establish that displacement often results in "new poverty". A study conducted in Orissa on pre/post displacement by six infrastructure projects indicate that landlessness increased after displacement in all six populations, reaching up to five times its pre-displacement rates . It is important to understand the juggernaut of coal mining driven by GoI policies and its impact on indigenous communities who are already living in vulnerable conditions.

35. Coal mining is one of the most important causes of forest-loss and environment, forest and wildlife clearances for destruction of prime forests for coal mining, especially in central India, are being granted liberally without taking into account individual and cumulative impacts. Pock-marking of dense forests is taking place without any attempt to understand the implications to the livelihoods, climate and food security, impact on wildlife habitats and corridors and the overall environmental damage and ecological degradation. The process and parameters on which the clearances are granted are dubious and the process of public hearing has turned out be a mockery.

36. Coal mining alone devoured more forests in the last five years than all the mines in the previous five-year period and over 200 coal mines operated without proper environmental permits.

37. The Government of India and the state governments have openly intimidated civil society organisations and individuals from exercising their rights to express their opinions and peacefully assemble. It has, in collusion with industry lodged false cases and branded them as anarchists/Maoists/extortionists. There are enormous concerns over understanding and implementing human rights norms and there is an urgent need to stop repression of human rights defenders peacefully protesting the unruly expansion of the coal mining industry in India.

3. COAL & LIGNITE

38. **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.

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					

39. 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.

40. 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 aspects. Mine waste collected during overburden removal is simply strewn and allowed to seep into underground water aquifers. Since mining started in the region the incidence of malaria has increased. Water resources in the region and wells provided to Project Affected Persons 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[4] 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 home and land to the company now you will not get water.

This statement itself shows the reality behind company's claim of providing all necessary amenities to Project Affected Peoples. The social and communal isolation people of Parej because of Central Coalfields Limited 's (a subsidiary of Coal India Limited) acquisition of their lands are real and unfortunate.

41. Fortunately, many of these coal deposits in Jharkhand 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 here. 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 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

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

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. [5]

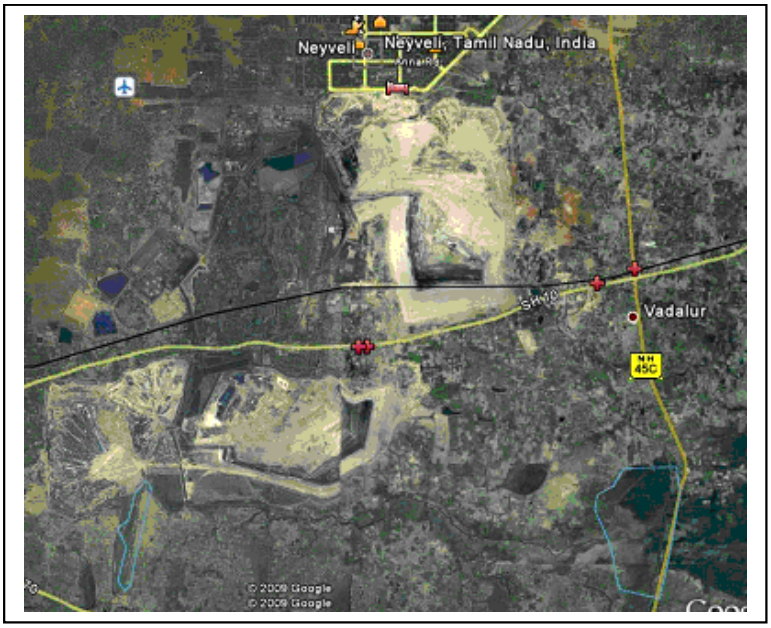
42. Lignite is principally used for power generation at pit head power plants. The percentage of lignite actually used for power generation has varied from 80% to 86% since 2001-02 (more than 98% of lignite consumed in Tamil Nadu was for power generation during this period). Demand for lignite is thus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

43. 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.

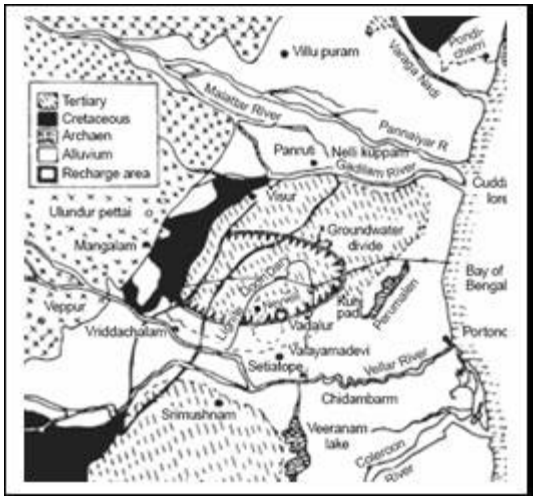
44. Several other lignite deposits in India, particularly in coastal Kutch also have artesian conditions and the continued expansion and deepening of lignite mines will eventually lead to a massive destruction of the storage potentials, loss of groundwater utilizable without expending energy and obliteration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

5 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

4. 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

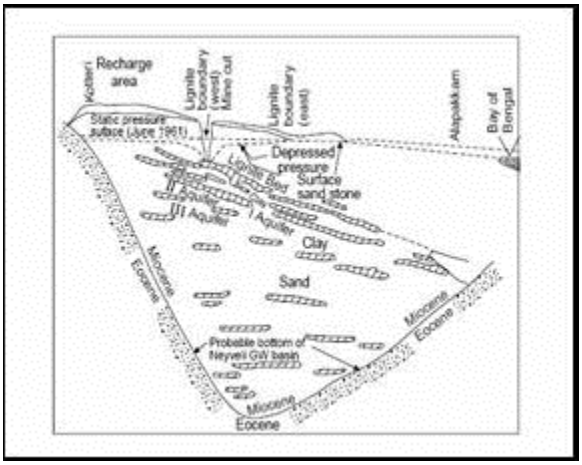


Currently Neyveli Lignite Corporation Ltd. (NLC) is India's largest lignite mining company, and a leading power generation company. The company operates three open cast mines in Neyveli, producing some 24 million tons of high-grade lignite per year.

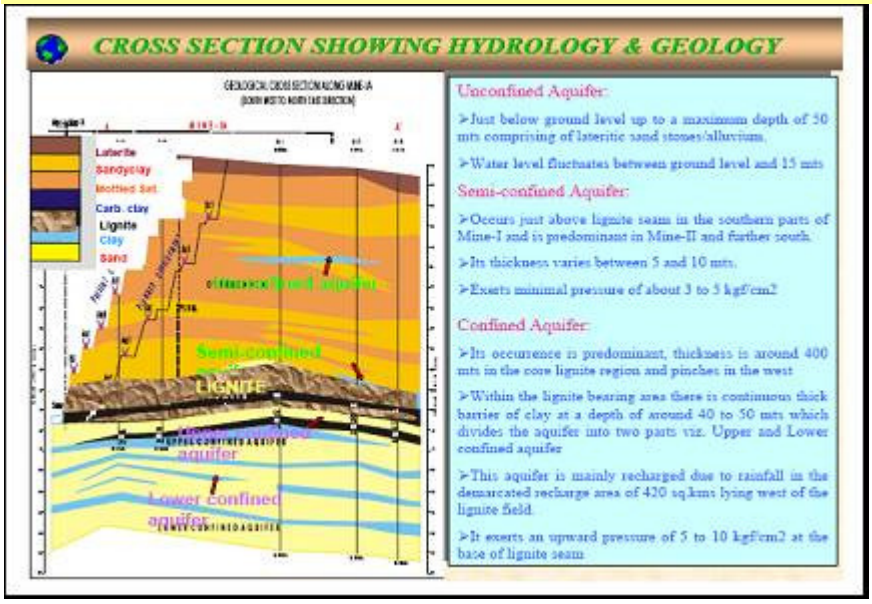
Mine I (Northern in the image), the company's original mine, is operated over an area of nearly 17 square kilometers and offers a reserve of nearly 300 million tons. Mine II, first tapped in early 1984 and expanded in the early 1990s, features a reserve of nearly 400 million tons. The total reserves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

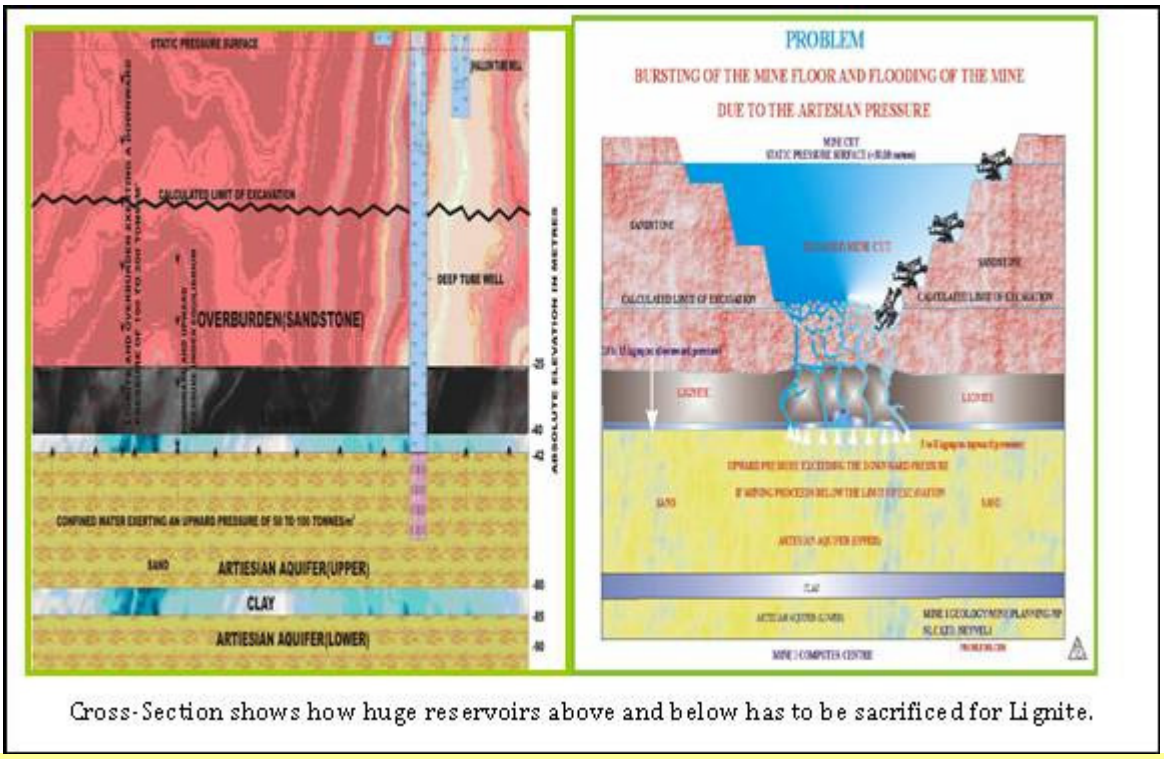


The impact of Lignite mining in Neyveli on the water regime is particularly severe because of the unique hydrogeological conditions of the region. Ground water occurs in unconfined and semi-confined aquifers in the upper layers and artesian conditions in the layers below the lignite deposit. This means 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.



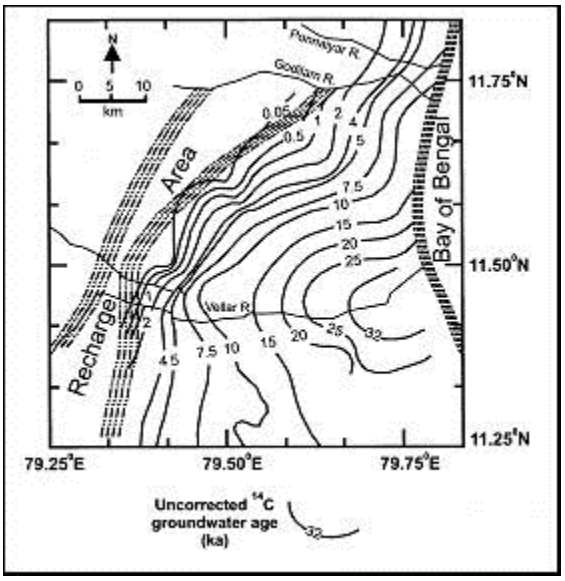
The artesian conditions of the layers below the lignite makes it complex for the mining and it must commended that the pioneers evolved methods with little external assistance in dealing with such a complex problem. The artesian conditions meant that when drilled the waters from this aquifer could gush 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



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

bursting.



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 need is 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[6] 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

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

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 pre-monsoon and post-monsoon 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 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 areas7. 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.

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

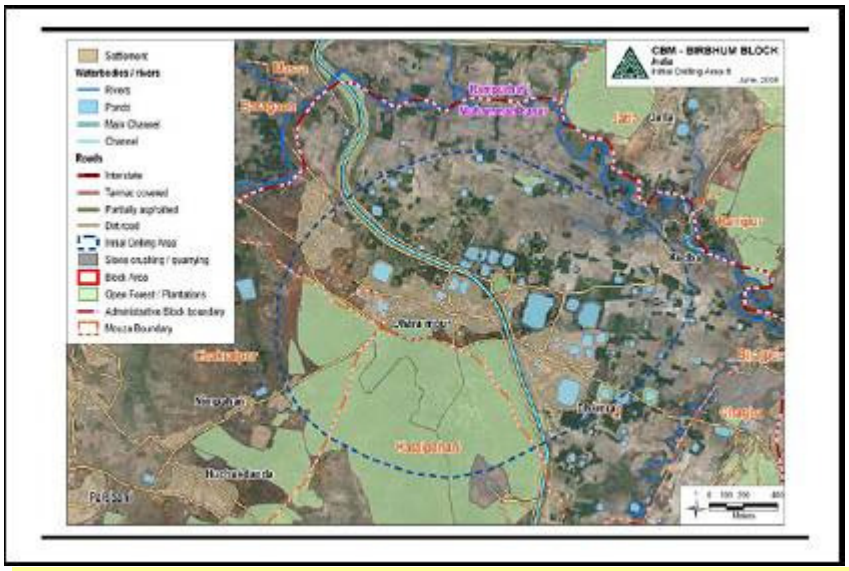
The irony of Lignite Based power development, particularly for the local people, is the community blessed not only to have surface sources but also groundwater sources which would be available at the source without use of external energy have to dig pits to receive their water as the supply is at such low-pressures.

5. IMPACT ON WATER OF COAL BED METHANE EXTRACTION

45. **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 coal 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.

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

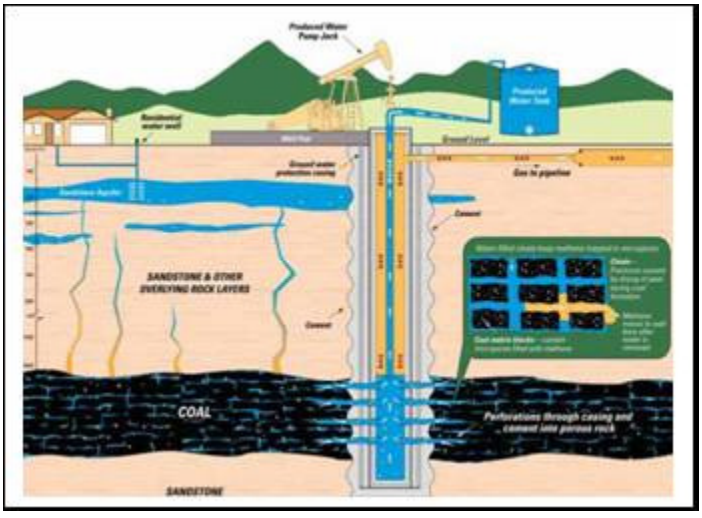
last for 2.5 years (850 days) the deep acquifer waters that will be removed will be about 1.2 million cubic meters for just one initial project for which a preliminary EIA exists in public domain for a CBM project in the Birbhum district of West Bengal.



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.

46. 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.

47. 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.

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.			

6. ENVIRONMENTAL SHORT-COMINGS AND SOCIAL OVERSIGHT CHARACTERIZE ADB SUPPORT TO SIPAT THERMAL POWER PLANT [8]

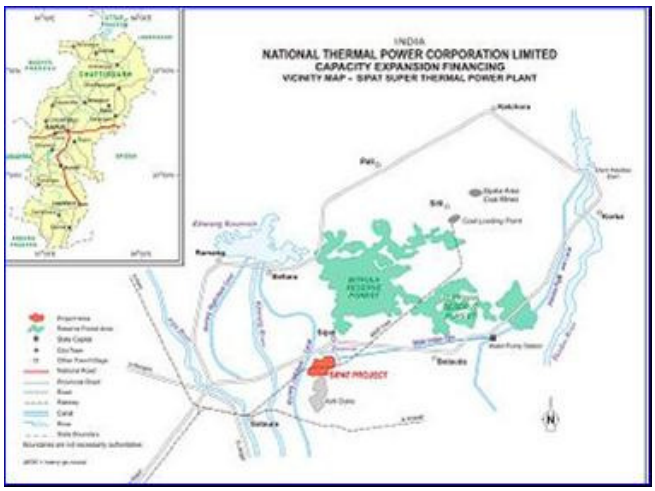
Sipat Thermal Power project is a part of the first loan syndication deal for an Indian Corporate under the Asian Development Bank's Complementary Finance Scheme. This is a relatively new multi-tranche instrument of the Bank through which US $ 300 Million (approximately Rs 13.15 Billion) has been loaned to the Public Sector, National Thermal Power Corporation (NTPC). It's apparent that ADB's finance scheme should have strictly followed the safeguards providing a window for redressal of grievances.

Several short-comings and oversight has characterized the project financing. First, the ADB has conveniently chosen to consider the specific component financed by the loan as something which is independent of the entire project and thereby extricating itself from the aspects which have significant adverse impact on the community and the environment while seemingly funding a benign function of providing support to the Power Sector Development in India. Second, that Coal-based thermal power is ideal for India is a fallacy that has been promoted by the Bank, while there are several other renewable energy and lower carbon options available including a massive scope for efficiency enhancement in the end-use. Third, instead of ensuring that environmental, social and climate safeguards are actually in place the gross violations at the project level demands that the record is set right and commensurate benefits to the affected communities are delivered.

The project authorities by excluding only the homesteads have maintained that there is no displacement and hence many of the safeguard features become inapplicable. However when all livelihood sources have been taken away and the area made unfit for any cultivation it is eventually forces people to migrate out of the area. It is unfortunate that the NTPC as a public sector has also adopted such a mechanism for its acquisition. ADB has been oblivious to this immense dishonesty.

[8] Study of the Sipat Thermal Power Plant, Chattisgarh, India, Accelerating Mainstreaming Climate Change Issues in EIA Processes – Report by eRc/Environics Trust, New Delhi

The impact area is beyond the plant site itself including a captive Merry-Go-Round (~1200 ha) upstream impacts such as Coal Mining Areas for Supply of Coal (~500 ha), , Hasdeo Dam Area providing 120 MCM of water which is estimated to deprive irrigation to atleast 60000 ha of farm land. No wonder that there is a growing dissension between the State Government and the Company over the continued use of water from the Hasdeo Barrage. Air quality modelling (ISCST3) for atmospheric dispersion of stack emissions run for the worst meteorological conditions for atmospheric dispersion, predicted ground level concentrations (GLCs) of SPM, SO_2 and NOx over a 20 km by 20 km area centered on the plant. **The total emission from the mine and the thermal power plant would be 18 Million + 1.5 Million + 2.86 Million = 22.36 Million Tonnes of CO_2.** Thus if we add the areas impacted by the plant it would be nearly a thousand square kilometres.



1. ADB has sought to overlook a variety of aspects probably as the fund is supposedly for specific activity and perhaps knowingly avoids taking responsibility for the environmental and social impacts of the project.
2. ADB has not even provided a semblance of opportunity to the local communities to participate in any of the decision making processes leading to the grant of the loan. By listing the panel members as the participants in a project that affects people across a huge region, the ADB has clearly demonstrated the hallowness of its safeguard policies in action.
3. ADB remains silent on issues of communities who were promised employment in lieu of land acquired from them. Their grievances are not heard despite several attempts by the local communities.
4. ADB has fallen prey to looking at the project narrowly from a warped Power Sector development perspective, rather than a Multilateral Development Bank focussing Environmental, Economic and Social Stewardship.

A legitimate question raised by the community is whether ADB is immune to legal action as the money supports a corporate entity and not the sovereign government.

7. MINING FOR WATER FOR CHENNAI METROPOLITAN AREA

48. Water is also a mineral by its geological definition. Modern cities depend heavily on mining of water from the local and regional aquifers. In fact 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

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					

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 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.

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[9]. From here, the hope 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 north-eastern fringes of Chennai had resulted in sea water intrusion. Kuppuraj argues that Metrowater would need to pump 180 mld

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		

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

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

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"[10] 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.

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.

OUR STRATEGY FOR ENABLING CHANGE

1) To stop the destruction and damage through the emphasis on transparency and strict enforcement of the host of laws

2) To chalk out the alternate narrative on mining and build a movement around it.

3) To develop and implement our shared vision of forcefully articulating the urgency of making new material and energy choices.

Elements of the Strategy

1) To stop the destruction and damage through the emphasis on transparency and strict enforcement of the host of laws

   a) To achieve this, research to gather and document evidence of manipulation and corruption, short-changing of environmental regulations, violations of FRA and PESA, human right violations that are a consequence of actions by the state or corporate actors could be conducted collaboratively in compact regions such as central India. Strategic use of RTI will be made to evince state information.
   b) The various legal, regulatory and process failures identified will be highlighted and clearance granted and compliance reports would be challenged in appropriate forums will to ensure strict adherence. We are all significantly engaged with various capacities in such efforts and would look to collaborate on this work.
   c) Further we will insist on fast tracking of various cases that are in violation of individual and community rights, to highlight the plight of human right defenders, and other environmental regulation violations committed by the mining companies.

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

d) We will also focus on genuine investors and seek their withdrawal from controversial projects.

This could create delays in to particular to large-scale coal mining projects. This will enable the communities to evolve their resistance mechanisms to impede the force of the juggernaut. A disinclination among investors and increase economic costs while frustrating the mining corporations will raise the critical concerns of human rights and environmental rights violations in the judicial processes, which in turn could lead to better legislative and policy environment.

2) To chalk out the alternate narrative on mining and build a movement around it.

   a) Carefully constructed, consistent, cyclical and consolidated campaign which captures the following elements - exposing corruptions scams, financial market investigations, the privatization of natural resources, blood coal and the externalities of coal mining is necessary to deface the coal mining industry in the public light. This should create a public aversion to mining and remove the public sanction the coal mining industry currently possesses.

   b) Highlighting the environmental degradation, loss of food security, and growing left-wing insurgency, as direct consequence of mining and imminent disintegration of central India can create a public upheaval.

   c) From 2013 India will be on election-mode. Several important state legislative assembly elections are scheduled in the run-up to the General Elections in 2014.

   d) All organisations agree that effective challenging and countering of the official narrative will ensure that coal mining and its impact could become part of the electioneering debate. A powerful alternative narrative could capture the imagination of the people.

Both the above-mentioned approaches have to work cohesively building a public movement around an approach to deal with mining consistent with our shared vision. Together they have the potential to paralyze the policy making and implementation processes and lead to a moratorium on green field mining.

3) To develop and implement our shared vision of forcefully articulating the urgency of making new material and energy choices.

   a) So far the new vision that has emerged is more intuitive that anything else. There is a sense of what this new vision would look like and the elements that this vision would comprise of. For example the vision would encompass a shift towards respect for the rights of individuals and communities in the area. It would advocate a shift in energy choices from Coal to other renewable forms of energy.

   b) Nevertheless, all organizations feel the need for further deliberations to evolve a concrete and shared vision.