

Hydrological Implications of the 4000 MW coal-fired Ultra Mega Power Project in Cheyyur, Tamil Nadu

By Community Environmental Monitoring, a program of The Other Media
with inputs from S. Janakarajan, Siddharth Hande & Nityanand Jayaraman

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About the Contributors

Community Environmental Monitoring, a program of The Other Media, extends scientific, legal and media advocacy support to communities opposed to pollution and wrongful alienation of land and natural resources.

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EXECUTIVE SUMMARY

A 4000 MW coal fired power plant is proposed to be set up under the Government of India's Ultra Mega Power Project (UMPP) scheme in Cheyyur Taluk of Kancheepuram district, Tamil Nadu. The coastal plant will run on imported coal that will be received at a captive jetty-cum-port in Panaiyur village. A 300,000 tonne coal storage yard will be located at Panaiyur Kuppam village. The coal will be conveyed to the power plant located in Vedal, Chitarkadu, Cheyyur and Gangadevankuppam villages through a 6.5 km coal conveyor. Seawater for cooling and for desalination for use in steam generation will also be conveyed through pipelines laid along the same corridor. Wastewater will also be pumped out to sea along the same alignment. Also proposed along this alignment is a storm water drain that will collect the runoff from the power plant site and discharge it to sea at a point south of Periakuppam village. An ash pond to store the flyash and bottom ash from coal burning is proposed to be located over 200 acres in Vilangadu village. Other project components include a railway siding and a 4 km access road connecting the plant to East Coast Road.

Water is crucial for the predominantly agricultural and fisheries-based economy in Cheyyur taluk. The proposal to locate a potentially polluting and large power plant and associated infrastructure in an area dotted with water bodies, their catchments and drainage routes needs to be examined carefully from a hydrological perspective.

The plant and port sites are surrounded by ecologically sensitive areas, including estuaries, breeding grounds for specific species and water bodies. The lands being acquired for the power plant include 150 acres of waterbodies. Nearly 80 percent of the lands being acquired for the power plant is agricultural. Another 24.5 acres of Reserve Forest is shown as being diverted; an unquantified area of forests lying on private or revenue lands are also being diverted for the coal conveyor corridor.

This report evaluates the project documents and the due diligence of the regulatory and licensing authorities (namely, the State Coastal Zone Management Authority and the Ministry of Environment & Forests) to conclude that neither the documents nor its treatment by the authorities provide any justification for siting the project in its current location.

The project and its various components have been proposed without any understanding of gradients and water flow patterns. The inadequacy in impact assessment, and the non-application of mind in the selection of the sites (coal yard on sand dunes; storm water drain traversing through waterbodies and sand dunes; ash pond site which is upgradient of a number of important irrigation tanks and the Cheyyur lagoon) make it evident that this site is not appropriate for hosting a coal-fired thermal power plant of this size.

Persisting in locating the project here will damage the hydrology, and perhaps even irreversibly contaminate ground and surface water reserves and harm agriculture. Not locating the project here keeps open the option of developing this area for its agriculture and hydrological potential. The network of irrigation tanks need to be maintained, not abandoned or diverted for other uses, if Tamil Nadu is interested in some long-term water security for its fast urbanising population.

Recommendation:

1. Relocate the project to a site that complies with the siting guidelines, particularly with respect to hydrological factors.
2. Invest in the upgradation and maintenance of irrigation tanks and related infrastructure within Cheyyur and surrounding areas as a means of maximising water storage and groundwater recharge.
3. Regulate future activities in the region carefully to ensure that any new activity contributes to, and does not compromise, local natural water security.

INTRODUCTION

A 4000MW coal-fired ultra mega power project is proposed to be constructed in Cheyyur taluk, Kancheepuram district. Considering the prevalence of *eris* (irrigation tanks) and other waterbodies in Kancheepuram district, it is important to properly assess the impact of the proposed project on the water resources and dependent economies of the region. As per procedures laid out by the Ministry of Environment and Forests, if a site is found to be suitable for the power project and the impacts manageable, an appropriate Environmental Management Plan ought to be developed on the basis of the impact assessment report. In the case of Cheyyur, it is all the more imperative because Tamil Nadu is a water-stressed state where competing demand for water across users and uses is so intense. Water is as pressing a need as electricity. So it is important that the search for one does not compromise the other.

This report examines various project documents and applications submitted by the project proponent M/s Coastal Tamil Nadu Power Ltd (CTNPL) to various statutory authorities, and the responses of the authorities on aspects relating to the surface water and groundwater hydrology of the region.

Additional documents obtained through Right to Information Act, 2005, GIS maps of the region and its water bodies developed by Janakarajan, and ground-level verification by other authors were also relied upon for the purposes of this assessment. The sub-basin and the stream network within the sub-basin or catchment was modelled using SRTM 3 Arcsecond (cellsize of 90 m x 90 m = 8100 sq. m) tileset elevation data for Cheyyur region obtained free from NASA's Earth Explorer data platform. The catchment model was created using GRASS GIS using "r.watershed" module.¹

This assessment sought to answer the following questions:

1. Does the applicant accurately depict the hydrological situation in the project and study areas?
2. Do the EIAs and other reports adequately and accurately assess the impacts on the hydrology and local and neighbourhood ecology of the region?
3. Has the site been selected in line with site selection guidelines and hydrological considerations?

PROJECT BACKGROUND

Ultra Mega Power Project is a policy of the Government of India aimed at making investments in large power projects more attractive for private players. Under this policy, the Government of India in collaboration with interested state governments will notify sites for pithead power plants (linked to coal from Indian mines) or coastal power plants that will run on imported coal. A Special Purpose Vehicle set up by the 100 percent Government of India-owned Power Finance Corporation will see the project proposal through various environment and forest clearances. The state government will acquire the land, and the SPV puts the tied-up project with all clearances up for bidding. The lowest tariff-based bid will win the contract to build-own-operate and transfer the power plant.

The total capacity of Cheyyur UMPP project is 4000 MW out of which Tamil Nadu's share is 1600MW. The power plant is set to come up in the villages of Cheyyur B Block, Vedal, Gangadevankuppam, and Chitarkadu. The ash pond is set to come up at Vilangadu village. An ash pipeline will convey flyash in slurry form from the power plant to the ash disposal site in Vilangadu. The captive port is proposed to be set up in Panaiyur village. The power plant will be connected to the captive port by a 6.2 km long corridor that will convey coal and raw seawater to the plant, and transport hot wastewater back to the sea for disposal. The water pipelines will be

1 See http://grasswiki.osgeo.org/wiki/Creating_watersheds

buried beneath the coal conveyor belt.² A feasibility study for the coal conveyor corridor has reportedly been conducted by RITES. However, this report is not part of the submissions to the Ministry of Environment & Forests, and are not publicly accessible documents. The conveyor corridor alignment given in the company's submission to the District Coastal Zone Management Committee is different from the alignment given in its submission to the Ministry of Environment & Forests.³ It is, therefore, not clear which one should be relied upon. No impact analysis study or details for the conveyor corridor were available with the Ministry of Environment & Forests and the State Coastal Zone Management Authority. The process of evaluation and approval seem to have been completed without a basis on such information.

A 310,000 tonne capacity coal storage yard is proposed to be constructed between the fishing villages of Panaiyur Periakuppam and Chinnakuppam.⁴ An open channel storm water drain is also proposed to be constructed from the southeastern end of the power plant to the Bay of Bengal south of Periakuppam village. The stormwater drain will run along and beneath the coal conveyor corridor⁵ However, the exact alignment of the stormwater drain is not known as the project proponent has submitted different alignments for the coal conveyor corridor to different statutory authorities.

Other associated facilities include construction of an access road connecting East Coast Road to the plant site, another access road connecting NH 45 to the plant site and a railway siding for transportation of furnace oil and other fuel. Feasibility studies for these features was reportedly conducted by RITES. Electricity produced at the plant will be evacuated through transmission towers and lines as per a power evacuation study performed by Power Grid Corporation of India Ltd. However, these reports are not part of the submissions to the Ministry of Environment & Forests and are not publicly accessible documents.

Daily water requirements are assumed to be 860 mld of seawater for power plant operation. As per this assumption, about 530 mld of hot wastewater and desalination rejects will be discharged into the sea.⁶ The port will reportedly consume about 15 mld of freshwater which will be taken from "approved sources" in Cheyyur village.⁷

The EIA report assumes a coal consumption rate of about 1350 MT/hour (32400 tonnes/day), and daily ash generation of 3240 tonnes, assuming 10 percent ash content in the imported coal.⁸

UMPPs: A Legal Anomaly

UMPPs present a curious legal dilemma in that they are inherently incapable of complying with the environmental laws of the land. For instance, an Environmental Impact Assessment report requires precise knowledge about project specifics – such as technology used, nature and composition of fuel, nature and composition of wastes and other emissions. In this instance, the entity that performs the EIA is not the entity that will operationalise the plant. The latter will be the successful bidder whose bid will be premised on a variety of factors such as technology used for various purposes and the quality and source of fuel (coal, in this instance).

The EIAs for the current proposal are premised on a number of assumptions:

2 Project Information Report: Cheyyur Ultra Mega Power Project (4000 MW). WAPCOS Ltd, Nov. 2012. Page 159-160.

3 Application for prior clearance under CRZ Notification. M/s CTNPL. June 1, 2011

4 Environmental and CRZ Clearance for Establishment of Captive Jetty. Ministry of Environment & Forests. 30 November, 2012.

5 Area Drainage Report for Cheyyur Ultra Mega Power Project (4000MW)-Tamil Nadu. WAPCOS Ltd, Oct. 2012. Page 33-34.

6 Form 1 Application for Environmental Clearance for Power Plant, by M/s CTNPL.

7 Form 1 Application for Environmental and CRZ clearance for Captive Port. M/s CTNPL.

8 CEIA for Cheyyur Ultra Mega Power Project. WAPCOS. December 2012. Page 2-36.

- a) the unit size of the power plant is assumed to be 660 MW, requiring 6 units of 660 MW for the 4000MW capacity. The final bidder may choose 5 x 800 MW, 4 x 1000 MW or 8 x 500 MW unit combinations. These will have significant implications on layout and usage of space, which in turn can have an impact on drainage patterns and hazard contours, and possibly even on water requirements.
- b) the EIA consultant has assumed the use of Reverse Osmosis technology for desalination of sea water. The quantum of raw water/wastewater and the characteristics of the wastewater can vary significantly depending on the technology adopted.
- c) the source of coal is not known despite the fact that a Ministry of Environment & Forests circular requires projects “based on imported coal to furnish a copy of the firm MOU signed between the coal supplier and the project proponent.”⁹ Characteristics of coal – such as moisture, ash content, sulphur content and heavy metal content – can vary widely depending on the specific mine of origin. While the Ministry of Environment & Forests stipulates certain minimum characteristics – such as 8 to 12 percent ash content, the proponent has performed its studies assuming a 10 percent ash content. Any variation from design assumptions can make assessed impacts and management plans irrelevant.

These assumptions on critical factors relating to technology, land use and water use are crippling shortcomings in the EIA.

EIA Terms of Reference

The TORs for the power plant and the captive port EIAs contain several references with implications on ground and surface water regimes. These impacts relate both to physical aspects of the hydrology – such as quantum, drainage and flooding or related risk assessment – and chemical aspects such as pollution or other related impacts.

The TOR for the captive port specifically requires the project proponent to “Examine and submit the details of impacts on nearby water bodies and other eco-sensitive areas in the vicinity and impact due to the project.” The TOR for the power plant too similarly requires the proponent to provide “Information regarding surface hydrology and water regime and impact of the same, if any due to the project.”

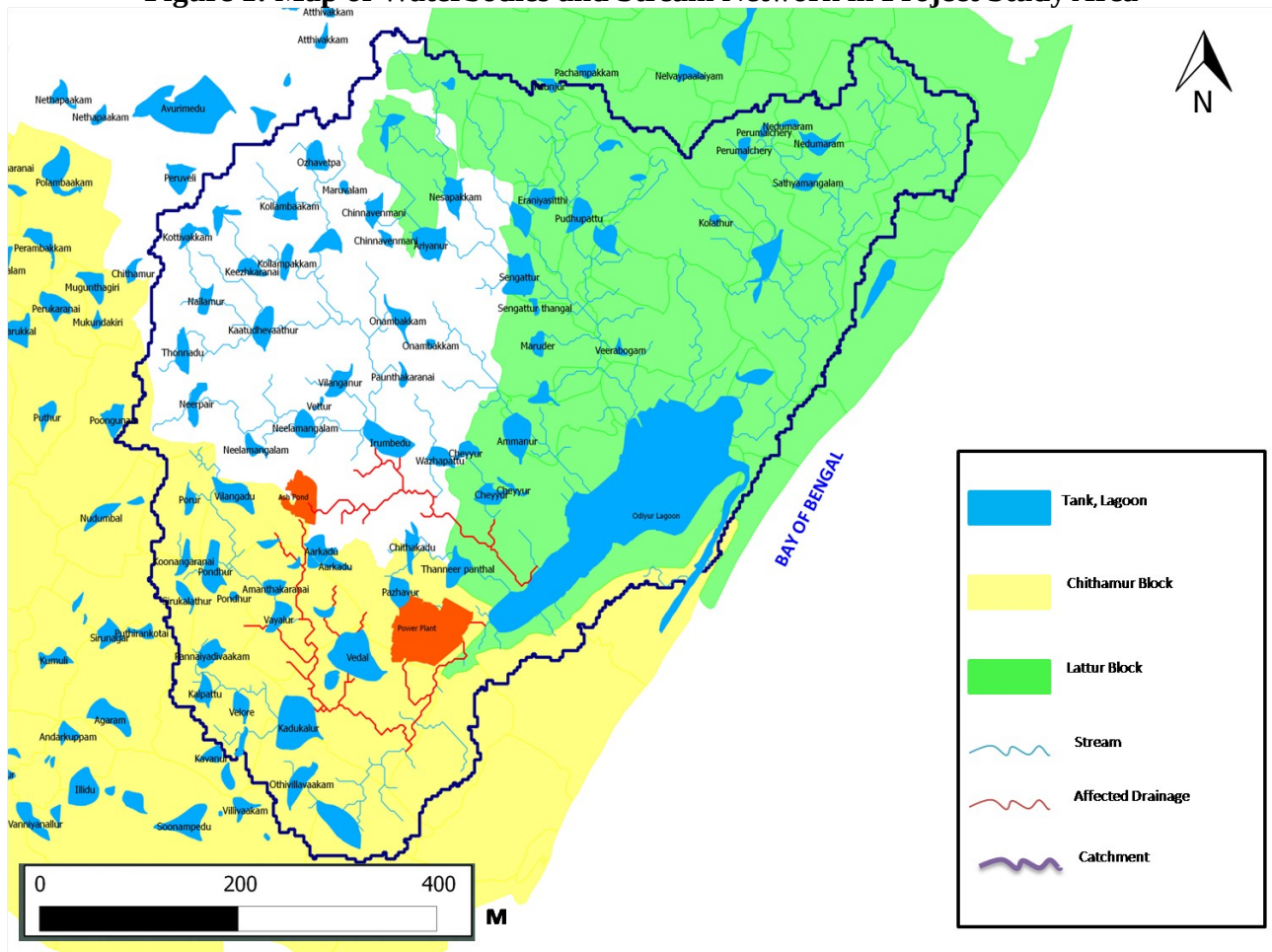
HYDROLOGY OF PROJECT AND STUDY AREAS

Kancheepuram district has a hot and humid climate. While the district receives rainfall under both monsoons, most of the rainfall occurs during the Northeast monsoon. Rainfall decreases from west to east and ranges between 1000 and 1200 mm.

The land slopes from the west to the east with a maximum elevation of 100 metres to the west and dipping down to sea level at the shoreline of the Bay of Bengal. The undulating terrain between the low hills and the seashore contain numerous depressions. These have been developed as irrigation tanks (*eris*) and dug-out ponds (*ooranis*).

Cheythur taluk is sub-divided into the Chittamur and Lathur blocks. According to the Public Works Department, Government of Tamil Nadu, there are 81 irrigation tanks in these two blocks with an *ayacut* (command area) of 6564.78 hectares. Some tanks such as the Vedal Peria eri (big tank) are said to be contemporaneous with the 10th century Vadavumugagniswarar temple located on its tank bund. Most of these tanks are of historical importance as well since they were built during the Chola and Pallava regimes. The Kancheepuram district profile by the Central Ground Water Board (CGWB) cites Government of Tamil Nadu records to note that tank irrigation covered 7720 hectares of the net sown area in Cheythur.¹⁰

Figure 1: Map of Waterbodies and Stream Network in Project Study Area



The CGWB district profile also notes that groundwater in the Chittamur and Lathur blocks in the immediate vicinity of the project area are over-exploited. Considering the fact that Cheythur is a

¹⁰ District Ground Water Brochure: Kancheepuram. Central Ground Water Board. 2007

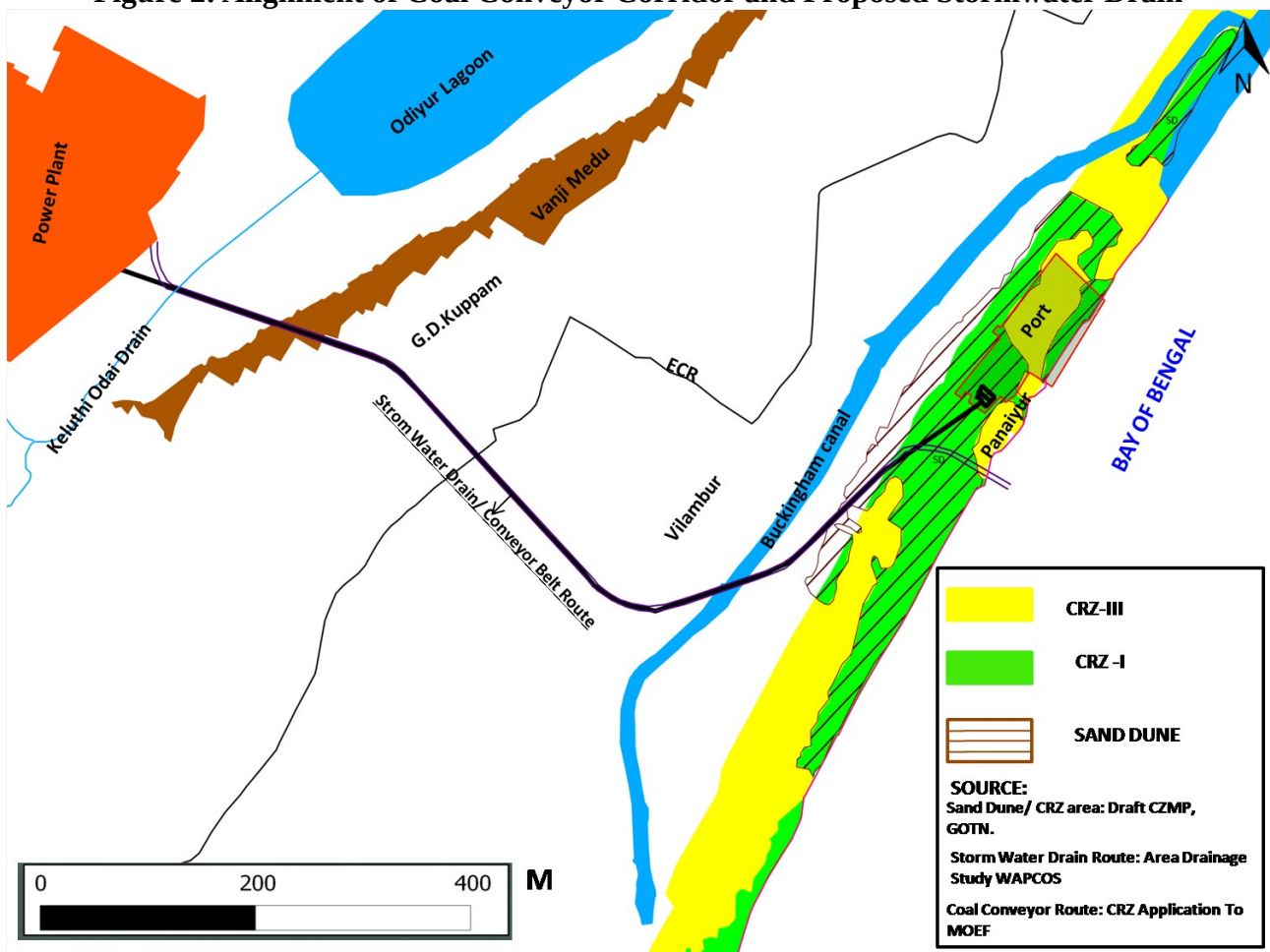
coastal taluk, the groundwater condition holds out a real threat of sea water intrusion.

The study area of 10 km around the project sites have two estuaries. The Alhambrai estuary to the south drains an area falling almost entirely within Villupuram district and Pondicherry. Mudaliarkuppam estuary drains the Cheyyur lagoon which receives its freshwater from a catchment area that includes irrigation tanks (eris) due west, south and southwest of the lagoon.

The ash pond lies upgradient of several irrigation tanks and the Cheyyur lagoon. The ash pond site slopes from 32 metres above mean seal level in the southwest to 22 metres in the northeast. The power plant site further southeast slopes from 14 metres above MSL in the south to 2 metres in the Northeast.¹¹ The area where the ash pond and power plant are located drain towards the Cheyyur lagoon through a network of streams. A visual depiction of the sub-basin containing the ash pond, power plant and stream network, including the streams likely to be impacted by the ash pond (shown in red), is in **Figure 1**.

The captive jetty and coal storage yard are located about 5 km due east of the power plant site. The coal storage yard and associated land-based facilities are located on a site that has a maximum elevation of 7 metres and a minimum elevation of 3.5 metres at a site where a natural drainage forms a seasonal pool during monsoons.¹²

Figure 2: Alignment of Coal Conveyor Corridor and Proposed Stormwater Drain



The conveyor belt and water intake/outfall pipelines, if built, will traverse several rows of sand

11 CEIA for the Main Plant. WAPCOS. December 2012. Tables 2.4A and 2.4B

12 Area Drainage Report Additional Assignment of Technical Studies at Port Site for Cheyyur Ultra Mega Power Project, Tamil Nadu. December 2012. Exhibit 1

dunes, the Buckingham Canal, the East Coast Road, yet another ancient sand dune called the Vanjimodu and run across plains and a key drainage called Keluthi *odai* from the Vedal tank to the lagoon to reach the power plant. No contour details of this alignment have been provided as part of the project submissions. No drainage assessment seems to have been done for the coal conveyor alignment. (See Figure 2)

The stormwater drain proposed to be constructed to drain the rainwater falling on the plant site runs from the plant site along the alignment of the conveyor corridor until a point after the Buckingham Canal after which it turns due east and runs across formidable sand dunes to empty into the Bay of Bengal at a point just south of the boundary of Panaiyur Periakuppam. No drainage assessment seems to have been done for this component either.

1. Does the applicant accurately depict the hydrological situation in project and study areas?

The project documents fail to record the presence of the two lagoon and estuaries to the north and south, and the numerous tanks and waterbodies in the study area. In the two Form 1 applications made by CTNPL for initiating the process to obtain Environmental Clearance for the Power Plant, and CRZ clearance for the port, the company was required to answer whether or not the following features exist in the study area (10 km around project site):

1. Areas which are important or sensitive for ecological reasons – Wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains or forests.
2. Areas containing important, high quality or scarce resources (ground water resources, surface resources, forestry, agriculture, fisheries, tourism, minerals).

CTNPL has answered in the negative for both despite the fact that the study area is demonstrably rich in surface water resources.

In its TORs compliance note, CTNPL states that it has dealt with the “surface hydrology and water regime and impact on the same” in Chapter 9 of the EIA report for the power plant. Chapter 9, though, is merely a summary of the Area Drainage Study. Neither this section, nor the Area Drainage Study records the presence of the various waterbodies in the study area.

Waterbodies can be affected by encroachments in their waterspread area, or by human intervention and encroachments in their catchment. The project proponent's submissions contain no assessment of the catchments of various waterbodies, the sub-basin or the stream network in the study area.

2. Do the EIAs and other reports adequately and accurately assess the impacts on the hydrology of the study area?

It would be appropriate to deal with this question by considering three critical aspects of impacts assessment -- physical, chemical and disaster.

a) Physical:

This dimension includes the quantitative aspect and the issue relating to drainage. How will the project affect the **quantity** of water (groundwater, surface water, water flows into and out of water bodies)? How will the project affect overall **drainage** in the region?

Quantity

The Form 1 Application for CRZ clearance indicates that the port will require 15 mld of freshwater

which will be obtained from Cheyyur village. There is no indication of the source of water for the construction of the port, jetty and coal yard. The impacts of drawal of 15 mld water and its transportation from Cheyyur have not been assessed in the EIA.

The Form 1 Application for Environmental Clearance for the power plant mentions that between 864 mld and 11,520 mld of seawater will be consumed – depending on whether the project proponent opts for a “recirculation system” or a “once-through” system for cooling. There is limited treatment of the impacts of the “recirculation system” but no assessment of the impacts of the “once-through” system.

The Project Information Report for the power plant states that desalinated water will be used for constructing the power plant.¹³ However, neither this report nor any of the other project submissions indicate the quantum and source of water for constructing the desalination plant, or the impacts of extraction, transportation and disposal of the same. Further, given that the technology for the desalination plant is undecided, the water requirements for desalination can be expected to vary significantly from the design parameters if any technology other than Reverse Osmosis is used.

Drainage

Two area drainage reports have been submitted. Both reports concentrate only on the drainage within the project sites – namely, power plant and captive port-cum-coal storage yard. Even this limited treatment is not accorded to the ash pond, stormwater drain, coal conveyor corridor. Since there is no mention of the route identified for the railway line and access roads in the publicly available documents, the question of assessing drainage impacts of these two critical infrastructure does not arise.

The proposed project will import coal through the sea route. A coal storage yard of 310,000 tonnes is proposed to be constructed atop an area classified as sand dune (CRZ 1) by the Institute of Remote Sensing, Anna University. Flattening of the sand dune can accelerate salinity ingress into the hinterland.

It is accurate to state that no impact assessment or drainage modelling has been done.

Interfering with drainage has two important effects:

- a) Altering inflow into waterbodies
- b) flooding of certain regions

The sub-basin containing the power plant, ash pond and captive port straddles three blocks – Maduranthakam, Chitamur and Lathur, and encompasses about 53 irrigation tanks. Rainwater falling within the sub-basin remains within this sub-basin, and drains to the sea through the Cheyyur/Odiyur lagoon and the river mouth south of Paramankeni through the Mudaliarkuppam estuary. **(See Figure1)**

This sub-basin is bounded on the North by the Palar basin, and to the South by the Kaliveli-Alhambrai estuary sub-basin.

The area's catchment depicted in Figure 1 was modelled using GRASS GIS' “r.watershed” module. This model delineates sub-basin watersheds and stream networks within it based on the contours and models water flows accurately. For the purposes of this study, the stream networks emanating from and influenced by the ash pond and power plant have been highlighted to indicate the sphere of influence through surface water flows.

13 “Project Information Report: Cheyyur Ultra Mega Power Project.” WAPCOS. November 2012.

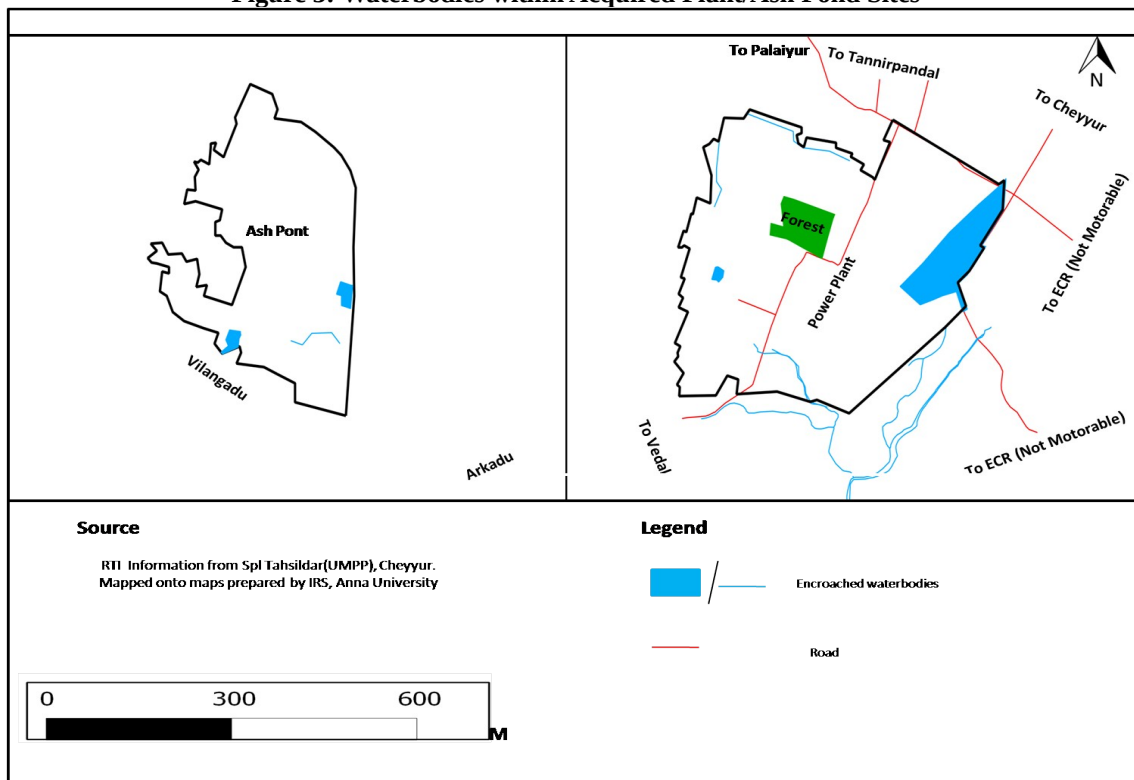
Encroaching on waterbodies

While considering the project proposal for grant of Terms of Reference for EIA, the Expert Appraisal Committee (Thermal) of the Ministry of Environment & Forests had first returned the proposal asking for reworking of the site plan. The EAC had noted: It was observed that the proposed site is close to the lagoon and may as well affect the drainage, which discharges into the lagoon. It was desired that the site boundaries may be reworked leaving sufficient distance from the lagoon and without affecting the drainage discharging into the lagoon.”¹⁴

The proponent accordingly resubmitted a revised plan. However, the revised plan too does not comply with the requirements that the drainage should not be affected, as the power plant and ash pond locations not only interfere physically and chemically with the drainage, but actually encroach on a significant area of water bodies, including backwaters.

Revenue records obtained through Right to Information reveal that the power plant site encroaches on at least 150 acres of lands classified as waterbodies – including as backwaters, channels and streams.

Figure 3: Waterbodies within Acquired Plant/Ash Pond Sites



Encroachment into the water spread areas and the catchment will have the long-term effect of dessicating the tanks and rendering them unfit for agricultural use or as reservoirs for water supply in the future. Given that such waterbodies also serve to recharge groundwater, the drying up of tanks is likely to make the area more vulnerable to salinity intrusion. It is to be noted that the Central Ground Water Board has found that two of the three blocks (Chitamur and Lathur) are already over-exploiting their groundwater reserves.

Stormwater Drain and its Impacts

CTNPL proposes to construct a stormwater drain from the power plant's eastern edge to the Bay of

14 Summary Record of the 40th Meeting of Reconstituted Expert Appraisal Committee on Environmental Impact Assessment of Thermal Power and Coal Mine Projects. Ministry of Environment & Forests. January 12-13, 2009.

Bengal south of Panaiyur Periakuppam village. The drain's route traverses the following natural features:

1. The rainwater channel (Keluthi *Odoi*) draining several important waterbodies to the south and west of the power plant into the Cheyyur/Odiyur lagoon.
2. Private *patta* agricultural lands and orchards in Gangadevankuppam and Panaiyur villages.
3. The Vanjimodu sand dune rising in height to nearly 20 metres in Gangadevankuppam village.
4. The East Coast Road
5. Buckingham Canal
6. A vast network of sand dunes sprawling from Buckingham Canal all the way to the sea.

The impacts of this massive engineering proposal have not been assessed by the project proponent. This is a serious lapse considering that a spate of ill-conceived engineering projects have already begun affecting drainage and altering ecosystems. During rainy season, this drain will divert water from reaching the lagoon. Starved of freshwater, this brackish water lagoon that is a resting and feeding place for migratory birds, and a biologically productive ecosystem that is crucial for the region's fisheries economy will be harmed.

Diversion of rainwaters through the proposed drain which runs through agricultural, horticultural and residential areas potentially increases the risk of flooding and flood-related damages to life and property. Further, the point at which the drain empties into the Bay of Bengal is a natural egress for water from a much smaller catchment. Diverting the stormwater flows from a major portion of the Chitamur block through this small egress could cause serious erosion of the seashore near Periakuppam village.

b) Chemical:

Coal plants can exert a substantial effect on surface water quality over several tens of kilometres depending on the size of the plant, the height of the smokestack and the prevailing wind conditions. Also, contamination of ground water can occur due to run-off from contaminated surfaces in the power plant, coal storage yard and ash dump.

Besides carbon, coal contains sulphur and a variety of trace elements including arsenic, mercury, lead, cadmium, chromium, polonium, selenium, thorium and uranium. Even though, these toxic metals are present in trace quantities, the fact that CTNPL will burn between 12 and 14 million tonnes of coal every year.

Sulphur is emitted predominantly to the air as sulphur dioxide (SO₂). SO₂ is acidic and can return to earth as acid rain. Such rains can alter the pH of waterbodies with consequences to fisheries and agricultural economies. The project documents do not assess the possibilities and extent of acid emissions related problems on local waterbodies.

Trace metals like arsenic, cadmium, selenium etc are either embedded in the bottom ash or are dust-borne and are trapped as flyash by the electrostatic precipitator devices attached to the smokestack. The flyash and bottom ash are transported in slurry form through a 3.5 km pipeline that runs against the gradient to the ash pond in Vilangadu village. The power plant will generate 3420 tonnes of ash every day, according to the Comprehensive EIA for the power plant. (page 2-37).

The EIA documents do not assess the impact of any spillage of ash slurry from the pipeline conveyor on ground or surface water quality. Therefore, no management measures have been recommended for any such eventuality. However, it is observed that the pipeline route traverses the catchment of several down-gradient tanks, including the Vedal Periaeri, Palaiyur eri, Chittarkadu eri and Thaneerpanthal eri.

The EIA documents do not assess the impact of run-off from the ash storage pond spread over 223 acres in Vilangadu village. As already mentioned, the ash storage pond is located at heights of 21 to 31 metres above sea level. Surface runoff from the ash pond will have to necessarily follow the contours and flow down through several waterbodies to the Cheyyur/Odiyur lagoon. Such runoff will carry with it the toxic contaminants present in the ash spreading it over farmlands and waterbodies. Further, the ash is transported as a slurry using used coolant water (seawater). Introducing such large quantities of seawater, and storing that in ash ponds located in a predominantly freshwater regime (ground and surface) is certain to cause salinisation of water resources rendering them unfit for agriculture or drinking.

Table 2 above contains the names and details of *eris* (tanks) and waterbodies that are likely to be affected by discharge from the ash pond. The Area Drainage Study submitted does not contain any information about the ash pond and drainage impacts related to the same.

Table 2: Eris downgradient of Ash Pond and Power Plant

Tank Name	Village (Population)	Area under Irrigation* (acres)	Area under Different Crops (Acres)
Amanthakaranai Periya Eri	1000	1200	Paddy -- 400 Groundnut – 100
Arkadu Eri	--	220	
Chitarkadu Periya Eri	356	900	Paddy – 450 Others – 50
Pazhavur (Palaiyur)	1200	438	Paddy – 120 Sugarcane – 10 Others – 8
Thanneerpanthal Periya Eri	530	381	Paddy –241 Ground Nut – 100
Vayalur Periya Eri	420	474	Paddy – 200
Vedal Periya Eri	2500	1477	Paddy – 800 Ground Nut – 20
Total		5090	

* Information related to irrigated area and area under various crops was collected by Prof. S. Janakarajan from various sources, including government records and interviews with farmers. Information for Arkadu eri was obtained from “Non-system tanks in Cheyyur Taluk,” PWD, Govt of Tamil Nadu, 2013.

The EIA report does not assess the possibility or extent of impact on agriculture or waterbodies as a result of toxic run-off from the ash pond to areas down-gradient of it. The EIA report also does not entertain the natural tendency of ash ponds to leach toxins into the groundwater table. This is a significant lapse considering that the rocky, thorny and undulating terrain over the 223 acre ash pond makes it impractical to provide an engineered impervious lining to contain leachates.

Mercury, another trace element and a potent neurotoxin, is emitted as a gas and is not trapped along with the dust by the electrostatic precipitator. In the absence of any special devices to trap mercury, most of the mercury contained in the coal will be emitted to the atmosphere through the smokestack.

Once released, mercury tends to condense and return to earth where it binds to soil particles and is available for transport by water. It eventually settles down in waterbodies. In aquatic environments, it can be acted upon by microorganisms that will convert some of it into a more toxic and

bioavailable form – that of methyl mercury. From undetectable levels in water or soil, methyl mercury can grow exponentially through the food chain (through the processes of bioaccumulation and biomagnification) to levels in predatory fish that can be lethal to human beings. The quantum of mercury released from the proposed plant is not insignificant. The levels of mercury and other trace metals in coal can vary widely depending on the mine of origin of the coal. North American coal, for instance, contains on average 0.22 mg/kg.¹⁵ If the proposed plant burns North American coal, it will release between 2.6 and 3 tonnes of mercury into Cheyyur's environment annually.

The EIA is silent on air emissions of heavy metals such as mercury and their likely buildup and impacts on the aquatic environment. The issue of managing the impacts does not arise since the impacts have not been acknowledged or discussed.

Coal storage yards too can be a source of ground and surface water pollution. A coal storage yard of 310,000 tonne capacity is proposed to be set up between Panaiyur Periakuppam and Chinnakuppam. The yard is set to come up on highly permeable sandy soil. The nearby villages of Periakuppam, Chinnakuppam and Tharuthazhaikuppam are all partially dependent on sub-surface water extracted through shallow bore hand-pumps for drinking purposes. Coal yard runoff is acidic and can contain many of the toxic contaminants present in coal.

The EIA documents do not present any picture of the dependence of nearby communities on local groundwater. The EIA does not assess the impacts of the coal yard on groundwater.

Seawater Intrusion and salinisation of groundwater are real threats that ought to have been considered in the EIA of this coastal power plant and jetty. Dredging close to the shoreline, shoreline erosion caused by the construction of the jetty and breakwaters, flattening of sand dunes, extraction of groundwater at the coast or inland for the purposes of construction or operation, and the dumping of flyash-laden seawater in the ash dump are all activities that will aggravate salinisation of the groundwater table. This eventuality will increase the dependence of communities on government for drinking and other water, and increase the overall cost to society both in terms of costs for provision of water, and increased disease burdens.

c) Disaster

Ash pond breaches leading to ash spills covering large areas of water and land are commonplace. A very common occurrence with coal-fired power plants, namely, disastrous ash pond breaches, has not been considered in the current proposal. Flyash spills can have debilitating long-term effects on local environment, health and economy. This would be all the more so in agricultural areas.

CTNPL's ash pond is proposed to be located at Vilangadu, upgradient of some of the most fertile paddy growing lands in Cheyyur taluk. Temple records in the possession of the villagers of Vedal indicate that the ash pond is located squarely on the inlet for the massive Vedal *Peria eri*. This tank irrigates some of the most fertile land in Cheyyur taluk. Routine pollution from the ash pond and ash pond breaches can have catastrophic consequences for the local ecology and economy.

In 2008, a massive coal ash spill from the Kingston Fossil power plant in Tennessee discharged enough flyash to cover 3000 acres of land one foot deep. Water samples from a nearby river contained elevated levels of lead and thallium – toxins that can cause birth defects, nervous and reproductive system disorders.¹⁶ In February 2014, a spill from Duke Energy's flyash pond coated

15 "An Introduction to Coal Quality." Chapter C of National Coal Resource Assessment Overview. US Geological Survey Professional Paper 1625-F. 2009.

16 "Tennessee Ash Flood Larger than Initial Estimate." Shaila Dewan. The New York Times. December 26, 2008. http://www.nytimes.com/2008/12/27/us/27sludge.html?_r=0 Downloaded June 24, 2014.

70 miles of the Dan River in USA's North Carolina state.¹⁷ Between September 2013 and April 2014, at least two flyash spills were reported from Singrauli.

It appears that the ash pond site has been identified without proper consideration of the location's impact on surrounding hydrology and the dependent agricultural and fisheries economies. The Risk Assessment and Management Plans do not anticipate such an eventuality, and that further weakens the case for the site selection and approval.

3. Has the site been selected in line with site selection guidelines and hydrological considerations?

The EIA guidance manual for thermal power plants sets out a number of siting criteria covering places preferred and places to be avoided when setting up thermal plants.¹⁸ From a hydrological point of view, these guidelines suggest that power plants should:

- a) be at least 5 km away from “ecologically and/or otherwise sensitive areas”. Such areas include “estuaries rich in mangroves; breeding grounds for specific species. . .natural lakes, swamps.”
- b) be at least 500 metres from floodplain;
- c) avoid prime agricultural land

The plant and port sites are surrounded by ecologically sensitive areas, including estuaries, breeding grounds for fish and water bodies. It has already been mentioned that the lands being acquired for the power plant include 150 acres of waterbodies. Further, nearly 80 percent of the lands being acquired for the power plant is agricultural, according to the Environmental Clearance for the power plant. Another 9.85 hectares of Reserve Forest is shown as being diverted, while an unquantified area of forests lying on private or revenue lands are being diverted for the coal conveyor corridor.

These factors, the discussion above about the inadequacy in impact assessment, and the non-application of mind in the selection of the sites (coal yard on sand dunes; storm water drain traversing through waterbodies and sand dunes; ash pond site which is upgradient of a number of important irrigation tanks and the Cheyyur lagoon) make it evident that this site is not appropriate for hosting a coal-fired thermal power plant of this size.

Persisting in locating the project here will damage the hydrology, and perhaps even irreversibly contaminate ground and surface water reserves and harm agriculture. Not locating the project here keeps open the option of developing this area for its agriculture and hydrological potential. The network of irrigation tanks need to be maintained, not abandoned or diverted for other uses, if Tamil Nadu is interested in some long-term water security for its fast urbanising population.

RECOMMENDATION

1. Relocate the project to a site that complies with the siting guidelines, particularly with respect to hydrological factors.
2. Invest in the upgradation and maintenance of irrigation tanks and related infrastructure within Cheyyur and surrounding areas as a means of maximising water storage and groundwater recharge.
3. Regulate future activities in the region carefully to ensure that any new activity contributes to, and does not compromise, local natural water security.

17 “North Carolina Regulators Side with Duke Energy in Coal Ash Appeal.” Michael Biesecker. Associated Press. Reported in Huffington Post. April 8, 2014.

http://www.huffingtonpost.com/2014/04/08/north-carolina-regulators-duke-energy_n_5111745.html Downloaded June 24, 2014

18 “Technical EIA Guidance Manual for Thermal Power Plants.” Prepared for the Ministry of Environment & Forests, Govt of India. August 2010.