

SUMMER INTERNSHIP REPORT

For The Partial Fulfillment of Post Graduate Diploma in Forest Management
(PGDFM)

on

**Monitoring & Evaluation of Forest Area Diversions including the Status of
Compliance Of Approval Conditionalities of Forest Diversion Cases & their
Impact on the Forest & Wildlife - Thermal Power Plants**

Submitted to

Regional MoEF Office, Western Region, Bhopal

Submitted by

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(PFDFM 2009-2011)

DECLARATION BY ORGANIZATION

This is to certify that the project report entitled "Monitoring & Evaluation of Forest Area Diversions Including the Status of Compliance of Approval Conditionalities of Forest Diversion Cases on The Forest & Wildlife - Thermal Power Plants " done by Akanksha Tiwari and Anubhav Sogani (PFM 2009-11) for MoEF is original work. This has been carried out as Summer Internship under my guidance for partial fulfilment of Post Graduate Diploma in Forest Management at Indian Institute of Forest Management, Bhopal.

Place: BHOPAL

Date: 15/06/10


Reporting Officer

Sujoy Banerjee IFS
Deputy Conservator of Forests,
Government Of India
Ministry of Environment and Forests
Regional Office Bhopal

DECLARATION BY STUDENT

We, Akanksha Tiwari and Anubhav Sogani (PFM 2009-11), hereby declare that the project report entitled "Monitoring & Evaluation of Forest Area Diversions Including the Status of Compliance of Approval Conditions of Forest Diversion Cases on The Forest & Wildlife - Thermal Power Plants" is an original work. The contents of the project report have not been published before and reflect the work done by us during our Summer Internship of the Post Graduate Diploma in Forest Management at Indian Institute of Forest Management, Bhopal from 05 April 2010 to 11 June 2010 with MoEF.

Place: BHO PAL

Date: 15/06/10


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EXECUTIVE SUMMARY

Power sector plays a very vital role in overall economic growth of any country. For Indian perspective, the power sector needs to grow at the rate of at least 12% to maintain the present GDP growth of about 8%. As per the Ministry of Power report, the per capita consumption of electricity is expected to grow to 1000 kWh / year by the year 2012 which during the year 2004 – 2005 was 606 kWh/year. To meet the per capita consumption of 1000 kWh/year by the year 2012 the capacity augmentation requirement is about 1,00,000 MW. Presently there is a significant gap between the demand and supply of power. The energy deficit is about 8.3% and the power shortage during the peak demand is about 12.5%.

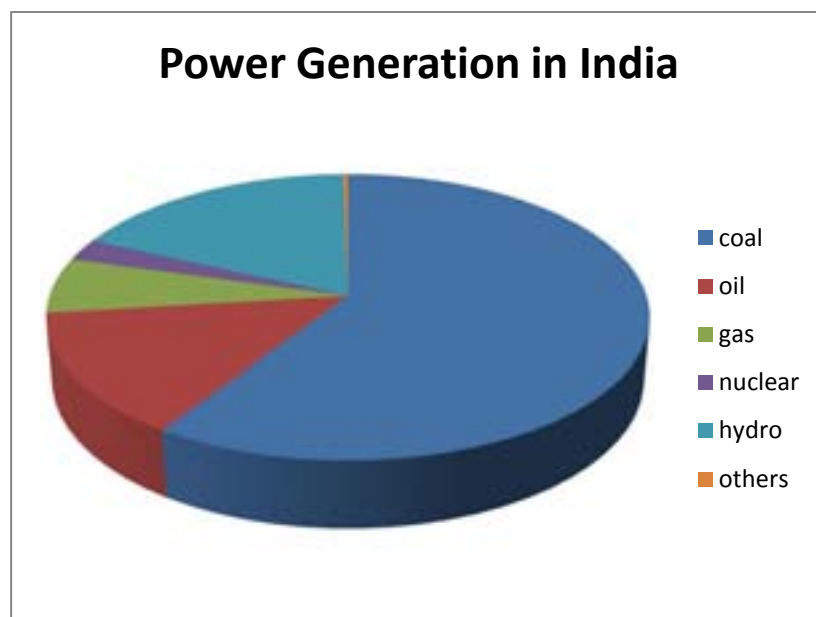


Figure 1 Power generation sources in India

The MoEF assigned five projects to check the compliance of certain conditionalities by the thermal power plants which come they are required to follow since forest land diversion is involved for the set up of the project units.

The following five thermal power projects were assigned to study the compliance of the conditionalities (land as well as environmental):

- 1) Satpura Thermal Power Plant, Sarni, M.P.
- 2) Sasan Ultra Mega Power Project, Sasan, M.P.
- 3) Korba (east) Thermal Power Station, Korba, C.G.
- 4) Hasdeo Thermal Power Station, Korba, C.G.
- 5) Mundra Ultra Mega Power Project, Mundra, Gujarat

The other power plants that were visited due the proximity with the assigned projects are as follows and were studied for environmental compliances:

- 1) NTPC, Singrauli, M.P.
- 2) NTPC Sipat, Bilaspur, C.G
- 3) NTPC, Korba, C.G.
- 4) APL, Mundra, Gujarat

The following conditionalities were verified with the five power plants visited:

1. Transferring of cost of C.A. and its maintenance to the SFD
2. Payment of NPV to the SFD
3. Ash disposal followed as per plan
4. Flora and fauna Conservation
5. Rehabilitation and resettlement plan
6. Green belt development
7. Plantations to be carried out each year

The site visits were accompanied with collection of data from various sources and various governmental departments viz.,

- State Forest Departments
- State Pollution Control Board
- Regional MoEF office
- Headquarter of MoEF

Though no questionnaires were used as no surveying was involved but, various documents related to the above user agencies were studied including FCA clearances, FMP, EMP, DPR, EIA, Location maps

Sl. No.	Observations	Recommendations	Remarks
1.	Compensatory Afforestation and NPV payment were found in compliance with all TPPs visited.	Time gap should be reduced in CA plantation done and the land getting diverted.	PPP model or private entrepreneurs should be invited to reduce the gap between exploitation of forest land diverted and the new CA plantation carried out.
2.	Land Related Problems faced by SASAN, UMPP due to the dispute between Forest Department and the Revenue Department for the ownership of the given land to TPP	State govt. should certify dispute free land before the land being diverted for any project so that project can keep its pace.	In this case still SASAN, UMPP has not got around 165 ha of their land cleared out of 320.938 ha got diverted by them for their UMPP Project.
3.	As per the conditionalities TPPs have to provide staff members with alternate energy resource like fuel wood which were found to be in compliance.	TPPs should come up with sustainable alternative source of energy of small capacity	HTPS has already set up a mini Hydel power plant and Mundra UMPP is testing the potential of wind and Hydel power to set up an alternative source of energy
4.	Visibility problems in Satpura TPP	Proper maintenance of ESP must be done with regular maintenance of boilers and furnaces.	Since the plant is main source of power for M.P., shutting down of the plant will lead to power deficiency because of which regular maintenance cycles cannot be organised for the plant
5.	Reclamation of old ash bund in consultation with SFD by Satpura power plant has developed a plantation on the abundant ash dyke.	–	Trees like Sal, Karanj etc are being grown which contributes in increasing the green cover of the forest
6.	Farmers quitting their profession in Korba		Due to the presence of more than a dozen power plants in Korba, farmers are quitting their traditional profession and becoming labours in the plants to earn quick money which is resulting descending agricultural practises in the area.
7.	Ash utilisation problems faced by majority of the plants	The plants must follow the gazetted amendment by MoEF of using fly ash made bricks in the radius of 100 km of the plant	People are unaware of the advantages of fly ash and its uses and thus they must be made known to the benefits of using products like fly ash brick over red bricks, cement mix etc.
8.	Increment in number of birds in Mundra due to the plantations		Mangrove plantations done in Mundra, Gujarat has

	carried out by Mundra UMPP &APL		been able to attract an inflated number of migrant birds to the area.
9.	Jaggery distribution is carried out by all the power plants to their employees and their families		this is done to protect the people from diseases like Asthma
10.	New innovation – pitcher technology implemented by Mundra UMPP		this technology allows them to grow indigenous as well as exotic species in the area while decreasing the water requirement
11.	–	TPPs should inculcate Zero Carbon Footprint practice	This is a practise being inculcated by the employees of Mundra UMPP
12.		CO2 and Ozone must be considered in EMPs as both of them significantly contribute to global warming in some form.*	Though ground level ozone reacts with NO _x and form hazardous oxides, it is not monitored in India and thus its impact cannot be quantified

*(Source: A study conducted by National Environmental Engineering Research Institute (NEERI) in Feb 2006).

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We are thankful to various dignitaries of the user agencies, DFOs, SDOs, Range Officers and whole of the forest department of districts of Betul, Singrauli, Bilaspur, Korba and Mundra who helped and rendered their valuable time, knowledge and information and whose suggestions and guidance has enlightened on the subject.

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Akanksha Tiwari

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(PGDFM 2009-2011)

LIST OF ABBREVIATIONS USED

1. AAQ	Ambient Air Quality
2. APL	Adani Power Limited
3. BHEL	Bharat Heavy Electricals Limited
4. BOD	Biological Oxygen Demand
5. BOO	Built Operate And Own
6. BOT	Built Operate And Transfer
7. CA	Compensatory Afforestation
8. CAMPA	Compensatory Afforestation Fund Management & Planning Authority
9. CG	Chhattisgarh
10. CHP	Coal Handling Plant
11. COD	Chemical Oxygen Demand
12. CSEB	Chhattisgarh State Electricity Board
13. CSR	Corporate Social Responsibility
14. DO	Dissolved Oxygen
15. EBM	Environmental Baseline Methodology
16. EIA	Environment Impact Assessment
17. EMP	Environment Management Plan
18. EMS	Environment Management System
19. ESP	Electrostatic Precipitator
20. ETP	Effluent Treatment Plant
21. FCA	Forest Conservation Act
22. FGD	Flue Gas Desulphurization
23. GDP	Gross Domestic Product
24. GHG	Green House Gases
25. GOI	Government Of India
26. GW	Giga Watt
27. HTPS	Hasdeo Thermal Power Station
28. JV	Joint Venture
29. Kcal	Kilo Calories
30. km	Kilometers
31. KTPS	Korba Thermal Power Station
32. KW	Kilo Watt

33. kWh	Kilo Watt Hour
34. LCA	Life Cycle Assessment
35. M.H.	Maharashtra
36. MoEF	Ministry of Environment And Forest
37. MP	Madhya Pradesh
38. MPEB	Madhya Pradesh Electricity Board
39. MW	Mega Watt
40. NPV	Net Present Value
41. NTPC	National Thermal Power Corporation
42. PCB	Pollution Control Board
43. PFC	Power Finance Corporation Limited
44. R&D	Research & Development
45. R&R	Rehabilitation & Resettlement
46. SFD	State Forest Department
47. SPM	Suspended Particulate Matter
48. TIFAC	Technology Information, Forecasting And Assessment Council
49. TPP	Thermal Power Plant
50. UMPP	Ultra Mega Power Project
51. WTP	Water Treatment Plant

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CHAPTER 1

INTRODUCTION

1.1 An Introduction to the MoEF

The Ministry of Environment & Forests (MoEF) is the nodal agency in the administrative structure of the Central Government for the planning, promotion, co-ordination and overseeing the implementation of India's environmental and forestry policies and programmes.

The primary concerns of the Ministry are implementation of policies and programmes relating to conservation of the country's natural resources including its lakes and rivers, its biodiversity, forests and wildlife, ensuring the welfare of animals, and the prevention and abatement of pollution. While implementing these policies and programmes, the Ministry is guided by the principle of sustainable development and enhancement of human well-being. The Ministry had brought out revised guidelines under Forest Conservation Act 1980 in October 1992. (source: <http://moef.nic.in/index.php>)

Setting up of any thermal power project also needs to get clearances from the ministry. If it involves forest area diversion then FCA conditionalities are applied. The user agency needs to pay a certain amount along with a written assurance to follow appropriate conditionalities that it will fulfill during various phases of the project in written to the ministry.

1.2 About the SI Project

Under the provision of Forest (Conservation) Act, 1980, prior approval of the Central Government is essential for diversion of forest lands for the non forestry purposes. In the general social and national interest and in the interest of future generations, this Act, therefore, regulates the cases of diversion of forest lands to non forestry purposes. The basic objective of the Act is, to regulate the indiscriminate diversion of forest lands for non forestry uses and to maintain a logical balance between the developmental needs of the country and the conservation of natural heritage. While diverting the land for non forestry purposes the MoEF imposes certain conditionalities on the user agencies which need to be monitored after commencement of such projects on the regular basis.

The project intends to evaluate the extent to which such conditionalities are being addressed by the user agencies as per the requirement of FCA and also to assess the impact of the project on the forests and wildlife.

The project was implemented under the guidance of the Forest Conservation Division of the Ministry and its Regional Office, Bhopal as nodal office for the guidance of summer internship logistics, technical guidance and finances of the project were sourced by MoEF.

1.3 Objectives

The primary objective of the project was as follows:

“Monitoring and Evaluation of Forest Area Diversions including the Status of Compliance of Approval Conditionalities and the Impact of the Forest Diversion cases on the Forest and Wildlife.”

The secondary objectives were as follows:

- The study, analysis and interpretation of the status of approval conditionalities for the approved and projects that are approved in principle including the forest area diversion for setting a Thermal Power Plant.
- The Ecological impact analysis of the projects on the forest and wildlife of the concerned areas and its surroundings.

1.4 Steps involved in obtaining clearance

There is a procedure that every user agency follows to obtain final approval to initiate the project and then to continue the operation without any legal consequences which may disrupt the smooth operation of the power plant.

There are two main aspects related to approvals of any thermal power plant which are as follows:

- Land related concerns
- Environment related concerns

1.4.1 Land Related Concerns

The land related concerns involve consents from two departments – forest department and/or revenue department according to the category of the land requested for by the user agency.

If the land requested is a private ownership or is government owned then revenue department is the agency that handles the request for approval. The forest department gives approvals to the requests for land diversions that are forest lands.

The procedure followed is shown in the flow chart below:

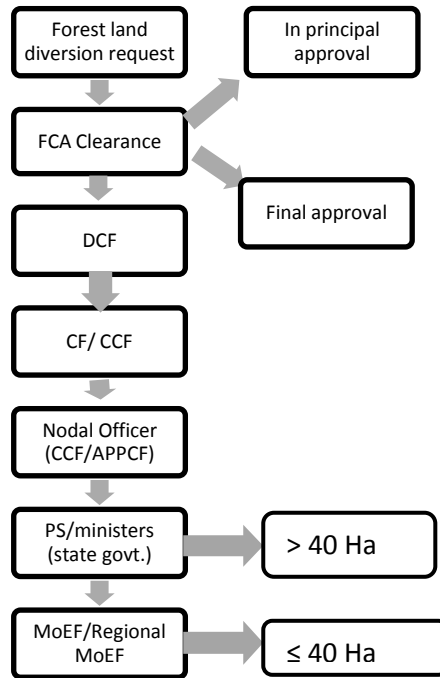


Figure 2 flow chart depicting land acquisition procedure (Pers. Comm. Mr. Alok Pathak)

A system of barter exchange is involved while handling the requested forest land to the user agencies. The exchange of the following is to be performed in lieu of the land:

- 1) Equivalent Compensatory Afforestation land (must be non forest land) is provided to the SFD by the user agency to carry on CA plantations on the land.
- 2) Cost of Compensatory Afforestation and maintenance is paid by the user agency to the SFD
- 3) Net present value (NPV), which is calculated according to the type of forest and trees which are present on the land requested for non- forestry use by the agency, is to be paid by user agency.
- 4) And certain other conditions

On agreeing to the conditionalities, the user agency is given the **In Principal approval** following which the agency has to pay the money and fulfil other conditionalities to obtain the **Final approval**.

1.4.2 Environmental Concerns

After the land related concerns are handled by the Ministry, the environmental concerns are looked upon. Figure 2 depicts the procedure followed.

The environmental concerns are first handled by the IA division of MoEF which are then transferred to the pollution control board which provides CTE (consent to establish) for one to five years after which if the user agency is found to comply all the required environmental conditionalities it is provided CTO (consent to operate) which is reviewed every five years.

The pollution control board is concerned with the following aspect of the environmental disturbances caused by the power project:

1.4.2.1 Sources of Pollution

The major sources of pollution from the thermal power plant are:

- Boiler ash
- Boiler flue gases containing suspended particulate matter (SPM), Sulphur dioxide (SO₂), Oxide of nitrogen (NO_x) etc.
- Fugitive dust generated during coal/solid fuel handling and processing
- Effluents from the chemical water treatment plant

Thus, these pollution sources are specially monitored regularly and the discharge statistics are continuously being recorded to check the performance of the same. (ECOSMART, 2009)

1.4.2.2 Some Pollution Control Measures to be implemented according to the PCB

A. AIR

- Electrostatic precipitators (ESP) must be installed at the exit of boilers to limit the suspended particulate matter (SPM) in the flue gas to less than 100 mg/N cum.
- Control of ground level concentration of SO₂ emitted by the power plant should be achieved by providing a stack of sufficient height for pollutant dispersion. The height of boiler stack should be determined during engineering stage in line with the regulations of Central Pollution Control Board (CPCB)
- Formation of NO_x and CO is closely linked to boiler furnace design and combustion control system and thus levels of these pollutants should be minimized by adopting suitable design.

B. DUST SUPPRESSION

- Dust extraction systems must be provided at all material transfer points between fuel stockyard and boiler area.
- For open yard operations, provision should be made to spray water to reduce the dust generation during handling operation.
- Adequate green belt must be provided to contain the fugitive emissions around the fuel storage and handling area

C. WATER

- The acidic effluents generated during different processes of the plant must be led into a neutralization pit
- Cooling tower blow down must be reused for dust suppression in fuel handling areas and balance for green belt development.

D. SOLID WASTES

Ash Handling and Disposal System

- Primary collection of fly ash in dry form and transporting by trucks for commercial purposes.
- Disposing the bottom ash in the form of slurry to the ash dykes should be done

E. NOISE

- The Plant and equipment must be designed and specified with a view to minimize noise pollution.
- Major noise-producing equipments such as turbo-generator, compressors must be provided with suitable noise abatements.

- Wherever necessary, insulation must be provided for reducing heat loss and noise pollution. Noise levels must be kept below 85 dBA at a distance of 1 m from the rotating equipment. Employees in high noise areas must be provided with ear protection devices.

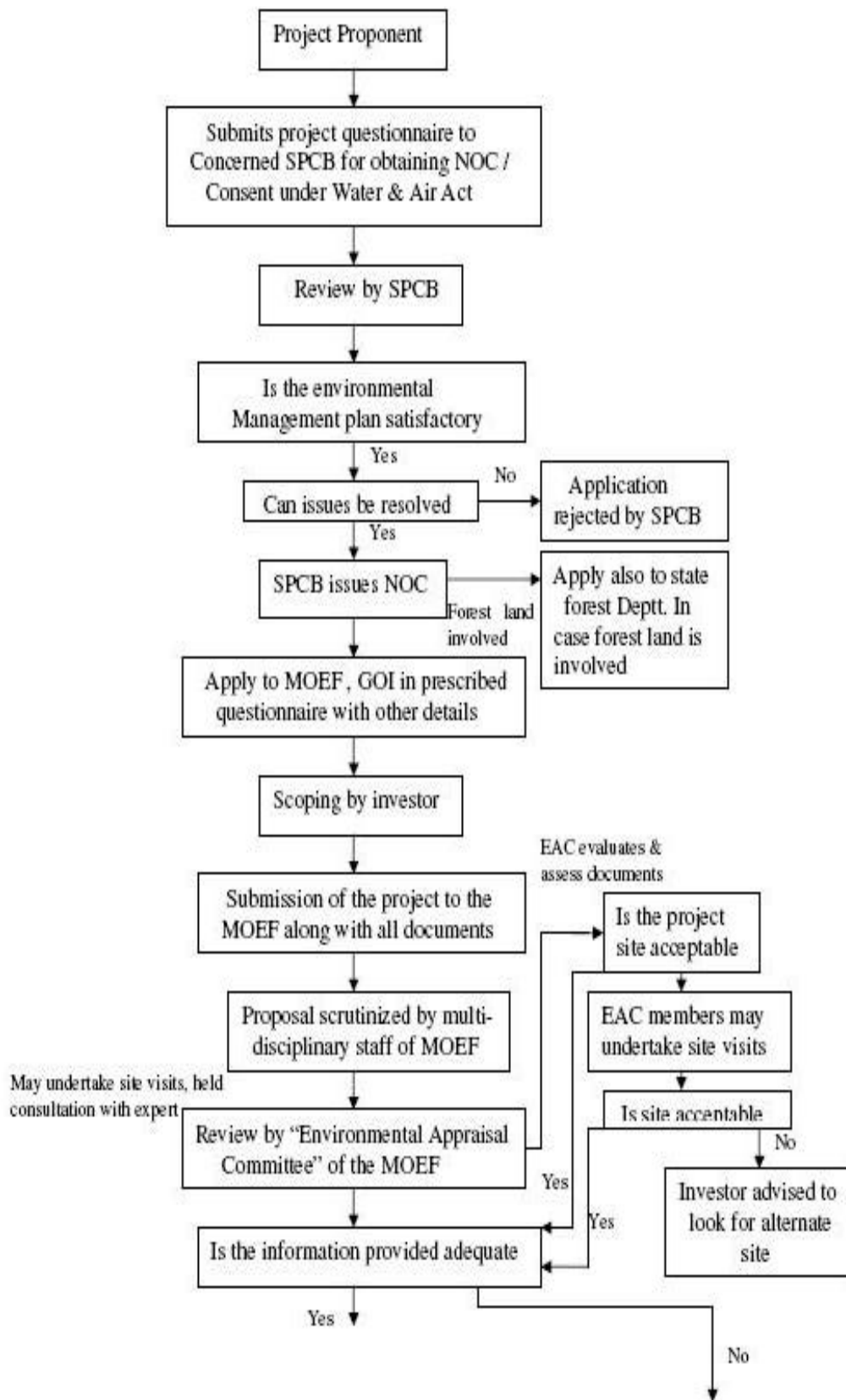


Figure 3: Flow chart depicting environmental clearance procedure

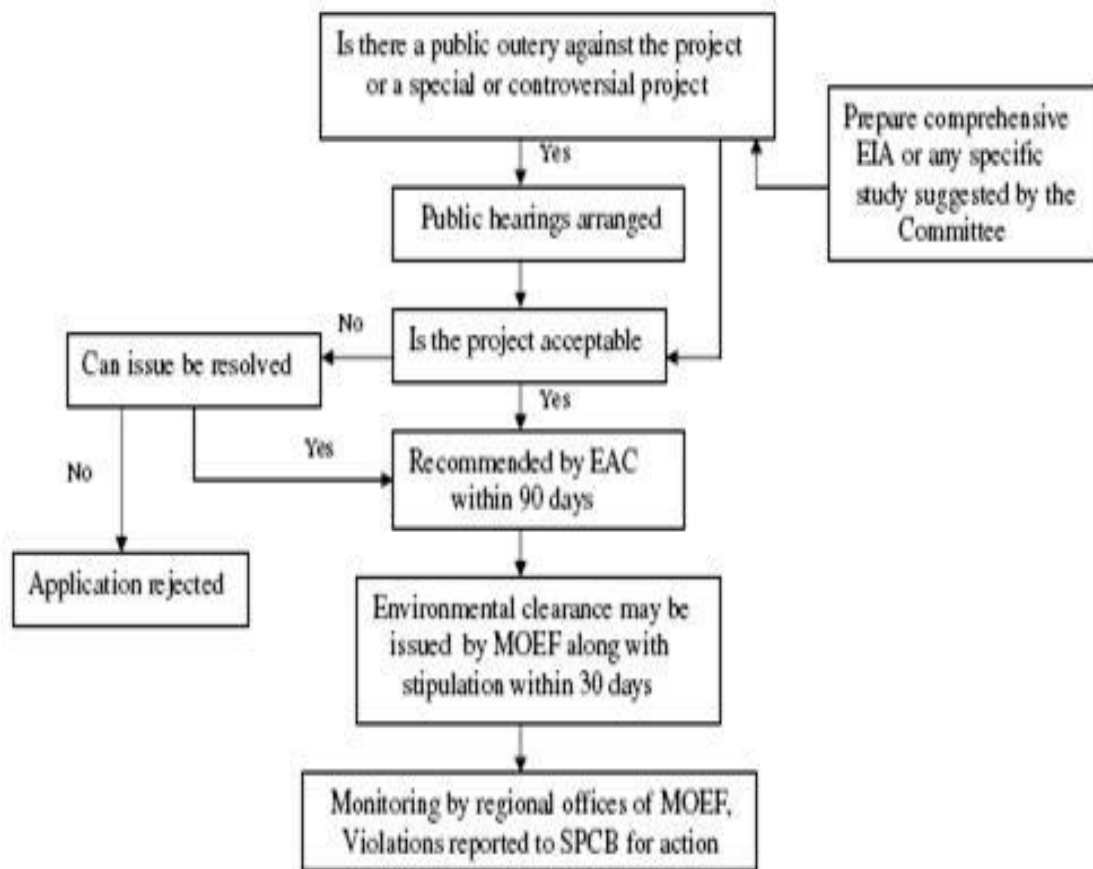


Figure 4 Flow chart depicting environmental clearance procedure

CHAPTER 2

SCOPE OF WORK & METHODOLOGY

2.1 Scope of Work

The assessment covered the following aspects :

2.1.1 Compliances Followed by the Power Plant

The compliance of conditionalities mentioned in the approval of the TPPs was verified by studying the progress files and visiting the sites where applicable.

2.1.2 Profile of the Project Area

The profile of the thermal power plant was assessed and the following was asked for:

- Site map
- Site location details

2.1.3 Environmental Management Plan

The existing environmental management plan of the power plant was studied which included the following:

- Objectives and Scope of Environmental Management
- Organization for Project Environmental Management
- Monitoring, Evaluation, and Reporting
- Occupational Health and Safety Management

2.1.4 Baseline Methodology

The following aspects were covered:

- Legal
- physical and
- environmental

2.1.5 Anticipated Environmental Impacts and Mitigation Measures

The following aspects were studied for the impacts due to the setting up of the plant and the mitigation measures that must be followed if the impact is derogatory in nature:

- Water
- Air
- Solid waste management
- Economic development of the area
- Health and safety

2.1.6 Ash Disposal Management

The methods adopted in fly ash disposal were studied along with the impact of the ash produced during the process and the mitigation strategies that are followed to reduce the impact of fly ash on the environment.

2.1.7 Recommendations for Forest and Environment Related Concerns

Certain recommendations concerning forest & environment issues regarding TPPs were made to the organization some of which would be implemented.

2.2 Methodology

The methodology mainly involved the following:

- Site visits
- Collection of data from various sources –
 - State Forest Departments
 - State Pollution Control Board
 - Regional MoEF office
 - Headquarter of MoEF
- Study of various documents –
 - FCA clearances
 - Forest Management Plan (FMP)
 - Environment Management Plan (EMP)
 - Detailed Project Report (DPR)
 - Environment Impact Assessment (EIA)
 - Location maps
- no questionnaires were used as no surveying was involved

- The following conditionalities were verified with the five power plants visited:
 - Transferring of cost of C.A. and its maintenance to the SFD
 - Payment of NPV to the SFD
 - Ash disposal followed as per plan
 - Flora and fauna Conservation
 - Rehabilitation and resettlement plan
 - Green belt development
 - Plantations to be carried out each year

CHAPTER 3

OVERVIEW OF THE PROJECT

3.1 Power Sector

Power sector plays a vital role in overall economic growth of the country. Power development in India was first started in 1897 in Darjeeling, followed by commissioning of a hydropower station at Sivasamudram in Karnataka during 1902 (India 2007). While India has made enormous strides in electricity growth, power availability in India falls far short. Lack of power availability is widely seen as a setback to India's industrial development as the country aims to rapidly increase its pace of economic growth (World Bank, 1999). According to Planning Commission of India, an installed capacity of nearly 800 Gigawatt (GW) by 2030 is required to maintain an average annual GDP growth of 8% (Planning Commission Report, 2006)

Table 1 Shows sources of electricity produced by three countries

Source	India (%)	Japan (%)	U.S (%)
Coal	59.2	21.2	51.8
Oil	13.9	16.6	03.1
Gas	06.3	22.1	15.7
Nuclear	02.5	30.0	19.9
Hydro	17.8	08.2	07.4
Others	00.3	01.9	02.2

(Source: Pandey, Tyagi, & Sengupta, 2006)

3.1.1 Key features of the Indian electricity sector:

- The power sector needs to grow at the rate of at least 12% to maintain the present GDP growth of about 8%.
- As per the Ministry of Power report, the per capita consumption of electricity is expected to grow to 1000 kWh / year by the year 2012 which during the year 2004 – 2005 was 606 kWh/year. To meet the per capita consumption of 1000 kWh/year by the year 2012 the capacity augmentation requirement is about 1,00,000 MW.
- Presently there is a significant gap between the demand and supply of power. The energy deficit is about 8.3% and the power shortage during the peak demand is about 12.5%.

3.2 Thermal Power Plants

Thermal Power Plants convert the energy content of an energy carrier into either electricity or heat. The type of power plant employed depends on the source of energy and the type of energy being produced. (ECOSMART, 2009)

Possible fuel sources include:

- Fossil fuels (coal, petroleum products and natural gas)
- Residual and waste materials (domestic and industrial refuse)
- Fissionable material

3.2.1 Working of a Thermal Power Plant

The flow diagram as shown in Figure depicts the working of a thermal power plant. In any power project the following components affects the functioning of the plant:

- Grade of coal
- Installation and maintenance of ESPs
- Disposal of ash produced
- Maintenance of every machine and their parts

The priority issues of immediate concern include

- Meeting the growing demand for electricity at affordable cost
- Ensuring the security of primary energy supply through an appropriate mix of sources
- Minimizing the environmental impacts and also
- Complying with the climate change needs.

To meet the projected power requirement by 2012, an additional capacity of 1,00,000 MW is required during the 10th & 11th Five-Year Plans. A capacity of nearly 1,00,000 MW is required during the 10th & 11th Five-Year Plans.

41,110 MW was targeted to be set up in the Tenth Plan and the remaining in the Eleventh Plan with a thermal generation of 25416.24 MW.

However, coal is the only well-proven significant domestic resource to increase energy security in the country, the technology choices will be impacted by the quality of the domestic coal reserves but still preference should be for high-efficiency.

(ECOSMART, 2009)

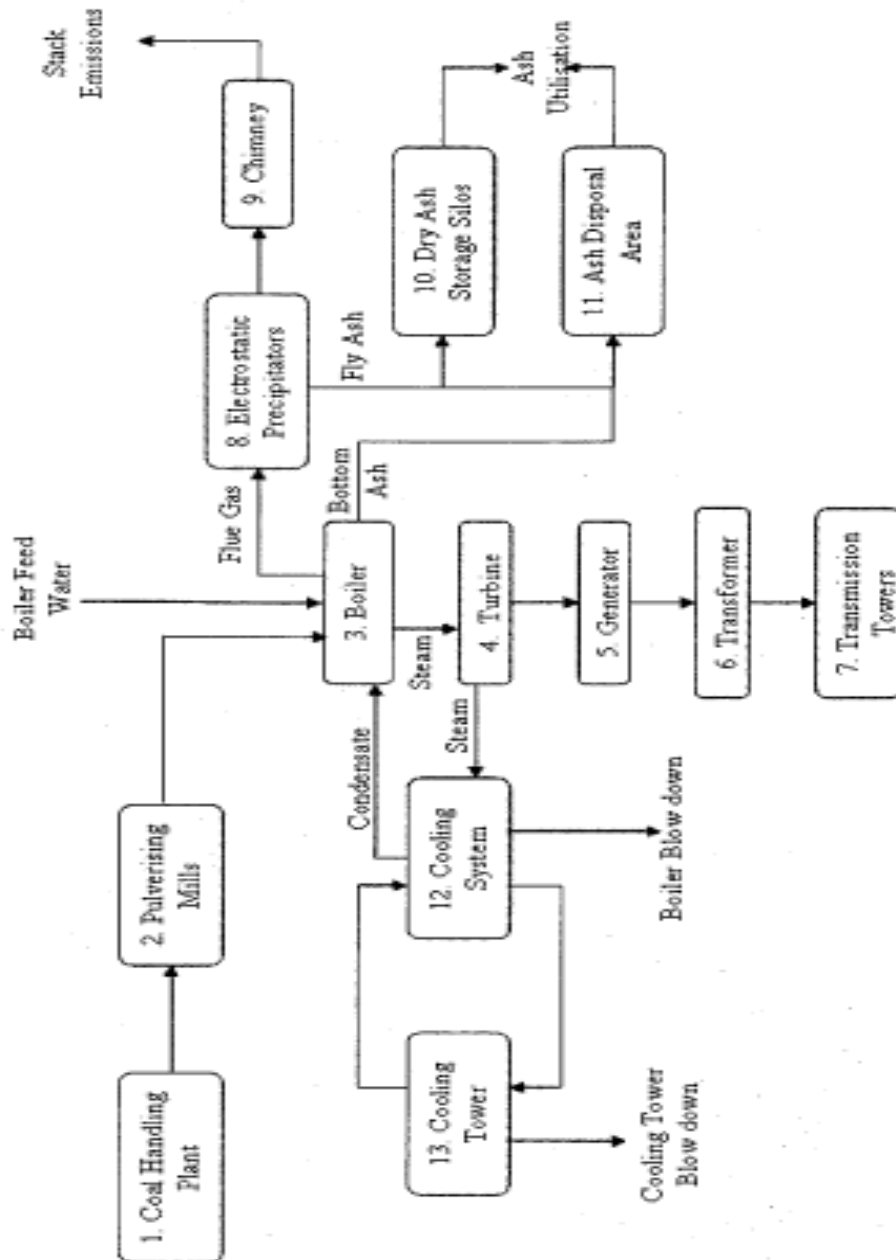


Figure 5 Working of a Power Plant (EIA REPORT FOR VINDHYA NAGAR NTPC SINGRAULI, 2008)

3.2.2 Coal quality & availability constraints

Indian coal has general characteristics of the Southern Hemisphere Gondwana coal which is of low calorific value and high ash typically has the following qualities (Sachdev, 1998; IEA, 2002a):

- Ash content ranging from 40-50%
- Moisture content between 4 – 20%
- Sulphur content between 0.2 – 0.7%
- Gross calorific value between 2500 – 5000 kcal/kg, with non-coking steam coal being in the range of 2450 – 3000 kcal/kg (Visuvasam et al., 2005).
- Volatile matter content between 18 – 25%.

It is quite clear that the quality of Indian coal is poor and has gotten worse over the past decades as ash content increased from 25% (calorific content 4700 kcal/kg) to 45% (3000 kcal/kg). On an average, the Indian power plants consume about 0.7 kg of coal to generate a kWh (Coal requirements in Thermal power plants, CEA Report 2004).

The properties and composition of Indian coals used for electricity generation vary metals. Ash composition depends on the coal properties, combustion technology and combustion conditions. Usually very small amount of ash is released to air after ash control technology. The major emissions to air include carbon dioxide (CO₂), water vapour, carbon monoxide (CO), oxides of nitrogen (NO_x), and sulphur dioxide (SO₂) and water vapour.

Table 2 Pollutions caused by Coal based TPPs in the country

Pollutants	Emissions (tonnes/day)
CO ₂	424650
SPM	4374
SO _x	3311
NO _x	4966

(Source:MANAGEMENT OF THERMAL POWER PLANTS IN INDIA, 2006)

3.2.3 Guidelines for site selection of coal-based thermal power stations set by the MoEF

Locations of thermal power stations are avoided within 25 km of the outer periphery of the following:

- Metropolitan cities
- National park and wildlife sanctuaries
- Ecologically sensitive areas like tropical forest, biosphere reserve, important lake and coastal areas

rich in coral formation

- The sites should be chosen in such a way that chimneys of the power plants does not fall within the approach funnel of the runway of the nearest airport
- Those sites should be chosen which are at least 500 m away from the flood plain of river system
- Location of the sites are avoided in the vicinity (say 10 km) of places of archaeological, historical, cultural/religious/tourist importance and defence installations
- Forest or prime agriculture lands are avoided for setting up of thermal power houses or ash disposal

(Technical EIA Guidance Manual for Thermal Power Plants, 2009)

3.3 Thermal power plants visited

In total three states (figure 6) were covered and five places namely – Betul, Singrauli, Bilaspur, Korba and Mundra



Figure 6 TPPs visited

(Source: www.googlemaps.com)

The following five thermal power projects were assigned to study the compliance of the conditionalities (land as well as environmental):

- 1) Satpura Thermal Power Plant, Sarni, M.P.
- 2) Sasan Ultra Mega Power Project, Sasan, M.P.
- 3) Korba (east) Thermal Power Station, Korba, C.G.
- 4) Hasdeo Thermal Power Station, Korba, C.G.
- 5) Mundra Ultra Mega Power Project, Mundra, Gujarat

The other power plants that were visited due the proximity with the assigned projects are as follows:

- 1) NTPC, Singrauli, M.P.
- 2) NTPC Sipat, Bilaspur, C.G
- 3) NTPC, Korba, C.G.
- 4) APL, Mundra, Gujarat

The power plants will be dealt with, in this report, state wise

3.4 Madhya Pradesh

3.4.1 Satpura Thermal Power Plant, Sarni, M.P.

The Satpura Thermal Power Plant is the largest power plant in MP contributing to approximately 70% of total electricity supply of Madhya Pradesh. The plant is owned by the state electricity board and the project commissioned in the year 1967.

(Source:http://en.wikipedia.org/wiki/Sarni,_India#Satpura_thermal_power_plant)



Figure 7 Satpura Power Station, Sarni

3.4.1.1 Capacity of the plant

Its total capacity is 1142.5 MW and the construction work for the new 500MW has already started. The operating capacity is 650 MW. The plant has feeders from Itarsi, Koradi, Seoni and Indira Sagar Project.

3.4.1.2 Conditionalities followed

A. Transferring of cost of C.A. and its maintenance to the SFD

The plant had requested for 111 Ha of forest area diversion by the forest department, which has been approved in the year 2009, to be used as ash dyke for the existing unit of the plant.

As per the conditionalities, the plant administration has provided a land of area 222 Ha in the Barwara range, Katni (MP) to the State Forest Department (SFD) to carry out compensatory afforestation plantations which will be carried out in the near future.

B. Payment of NPV to the SFD

The plant has paid the required amount of Net Present Value (NPV) to the SFD which has been deposited into the CAMPA account.

C. Ash disposal followed as per plan

The ash disposal plan developed by the Satpura Thermal Power Plant is being followed as per the conditionality. The plant disposes off 90% of its ash produced in the form of slurry to the ash dyke which has been built at a particular distance from the plant.

The figures 8, 9, 10 & 11 show ash dyke of the power plant. Proper reverse channels have been developed for letting the water, which overflows after the settling of the slurry in the pond, back from the dyke to the plant. The dyke filling results in raising of the level of the ground which is then declared abundant after a few years and plantations are carried out on that abundant ash bund.



Figure 8 Pipelines from plant to the ash dyke



Figure 9 Power plant's ash dyke



Figure 10 Ash dyke, Sarni



Figure 11 Dyke on the verge of getting abundant

Satpura Power Plant has well maintained ash dykes. The abundant ash dykes of the plant are been taken care of properly (see findings).

D. Flora and fauna Conservation

Since the plant was established nearly more than 50 years, there were no conditionalities at that point. So the plant has no defined policy of flora and fauna conservation, but the administration of the plant is taking care of the trees existing in the area and has managed to maintain the tree cover. They claim to have developed around 80% of the forest area around the plant which was observed on the field by us also.



Figure 12 Forest area, Sarni

E. Rehabilitation and resettlement plan

This conditionality is not applicable for Satpura Power Plant.

F. Green belt development

The plant has been able to develop a good channel of green belt in and around the plant and is maintaining it finely. The green belt has been developed in around 33% of the plant area

G. Plantations to be carried out each year

The plant administration along with its horticulture division has been able to plant around 15000 saplings every year with a survival rate of about 80%. Species like Karanj (*Pongamia pinnata*), *Acacia Auriculiformis* etc are been planted every year (Pers. Comm.¹ Mr. Thakur)

3.4.1.3 Coal consumption statistics

Around 22000 tonnes coal per day is consumed (Pers. Comm. Mr.Bagadhre) in producing

¹ Pers. Comm.. stands for personal communication with the person indicated. These people are the employees/ heads of various departments in the thermal power plants.

electricity for the state which consists of 40% ash content due to which 8000 tonnes of fly ash is produced everyday.

The coal source for the plant is the Western Coal Field Limited and the areas that provide coal to the plant are as follows:

- Pathakheda, M.P.
- Kanhan, M.P.
- Pench, M.P.
- Nagpur, M.H.
- Chandrapur, M.H.
- Wani, M.H.

(source: <http://westerncoal.nic.in/>)

The grade obtained is a blend of D, E & F with ash content of 40%.

3.4.1.4 Water consumption statistics

The source of water for the Satpura Thermal Power Plant is the Tawa Dam with lake area of 283 Acres. The plant is able to recycle only 48% of water. The following are the water consumption statistics for the month of February and March

- domestic water consumption:
 - Feb:215998 m³
 - Mar:232722 m³
- ash water consumption:
 - Feb:1547752 m³
 - Mar:1515078 m³
- DM water consumption
 - Feb: 101775 m³
 - Mar:83744 m³

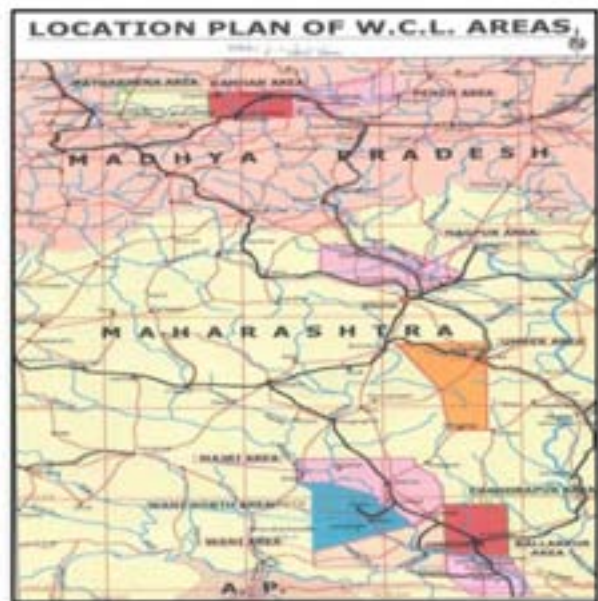


Figure 13 Map depicting coal mines



Figure 14 Emissions through chimney,Sarni

3.4.1.5 Air emission statistics

- SPM
 - Standard: 150 mg/Nm
 - Actual: 590 mg/Nm
- SO_x
 - Standard:150 mg/Nm
 - Actual: 590 mg/Nm
- NO_x
 - Standard: 150 mg/Nm
 - Actual: N.A.
- CO
 - Standard: 100 mg/Nm
 - Actual : < 100 mg/Nm

The emissions were found to be higher than the permissible limits due to lack of maintenance. The ESP at the time of visit was not in working condition but the administration claims that the ESP usually works at the efficiency of 96%.



Figure 15 Boiler chamber of TPP

The power plant is suffering from lack of maintenance since the plant can not be shut down since this is the major power producing unit for the state of Madhya Pradesh which is already facing problems of power insufficiency. Although the plant administration claims that when the two new units will be fully functional (Nov'11) then unit 1 will be shut down and unit 3 will be renovated by BHEL which may solve the problem of excessive emissions and lack of maintenance.

3.4.2 Sasan Ultra Mega Power Project, Singrauli, M.P.

Ultra Mega Power projects (UMPP) are a series of ambitious power projects planned by the GoI. With India being a country of chronic power deficits, the GoI has planned to provide 'power for all' by the end of the eleventh plan (2012). This would include the creation of an additional

capacity of at least 100,000 MW by 2012. The Ultra Mega Power projects, each with a capacity of 4000 megawatts or above, are being developed with the aim of bridging this gap.

The UMPPs are seen as an expansion of the MPP (Mega Power Projects) projects that the Government of India undertook in the 1990s, but met with limited success. The Ministry of Power, in association with the Central Electricity Authority and Power Finance Corporation Ltd., has launched an initiative for the development of coal-based UMPP in India. These projects were awarded to developers on the basis of competitive bidding. (http://pfc.gov.in/brief_umpp.pdf)

The Sasan UMPP is one of these government planned UMPPs which is wholly owned by Reliance Power Ltd implementing the 4000 MW. It is the largest integrated pit head coal based power project in India and one of the largest in the world.

A landmark in country's project finance history since Indian banks and institutions have appraised an integrated coal mine cum power project of this scale on project finance basis for the first time in the country.

This UMPP is a super-critical technology based power generating plant and the project includes the development of associated captive coal mines.

(source: [http://en.wikipedia.org/wiki/Ultra_Mega_Power_Plants_\(India\)](http://en.wikipedia.org/wiki/Ultra_Mega_Power_Plants_(India)))

The Sasan UMPP is first-of-its-kind large integrated Power-cum-Coal Mining project financed on "project finance" basis. The estimated project cost of Rs 19,400 crore (USD 4 Billion) is funded on a 75:25 debt equity ratio.

(source: http://www.mynews.in/News/Sasan_ultra_mega_power_project-an_important_initiative_to_generate_energy_N41996.html)

Sasan Power will supply power at a historic low level tariff of Rs 1.196 / kWh to benefit over 35 crore Indians and will be supplied to 14 utilities in 7 states which are as follows:

- Madhya Pradesh
- Punjab
- Haryana
- Uttar Pradesh
- New Delhi
- Rajasthan
- Uttarakhand

The location of the Sasan Project has the advantage of low population density in the area, proximity to the Coal Blocks, water reservoir, transmission lines and load centres in Northern as well as Western regions.

Reliance Power believes in developing clean green power and the project will utilize environmentally friendly super-critical technology, which would help reduce pollution and also ensure optimized utilization of country's coal resources.

3.4.2.1 Capacity of the plant

The capacity of the plant is 4000 MW

3.4.2.2 Conditionalities followed

A. Transferring of cost of C.A. and its maintenance to the SFD

The plant had requested for 320.938 Ha of forest area diversion by the forest department, which has been approved in the year 2009. As per the conditionalities, the plant administration has provided a land of area 642 Ha in Singrauli, (MP) to the SFD to carry out compensatory afforestation plantations which will be carried out in the near future.

The following are the photographs of the C.A. plantation site that has been selected and around 15000 plants will be planted in the monsoon of the year 2010.



Figure 16 C.A site, Singrauli



Figure 17 C.A site, Singrauli

B. Payment of NPV to the SFD

The plant has paid the required amount of NPV to the SFD which has been deposited into the CAMPA account.

C. Ash disposal followed as per plan

The plant is under construction thus there is no plan of ash disposal developed currently.

D. Flora and fauna Conservation

The plant is doing its bits to save the current flora in the surrounding area and is developing plans to maintain the current species as well as will be planting to increase the indigenous species of the area.



Figure 18 REL saving the existitng well in the site area



Figure 19 REL has changed plot maps to save trees that exist on the site area

E. Rehabilitation and resettlement plan

The plant has developed an R&R colony for the tribals residing in the village of Sasan. Following are the photographs of the colony and other structures developed by REL



**Figure 20 R&R colony developed by Sasan
UMPP**



Figure 21 Roads developed by Sasan



Figure 22 Houses developed by Sasan UMPP



Figure 23 Primary health center developed by Sasan UMPP



Figure 25 Community centre



Figure 24 Temple developed by UMPP



Figure 26 Primary health centre developed by UMPP



Figure 27 Haat bazaar developed by UMPP



Figure 28 Roadside plantations developed and managed by UMPP

F. Green belt development

The administration will be developing 33% of the area of the plant as green belt.

G. Plantations to be carried out each year

The plant administration will be planting around 15000 saplings every year in cooperation with the SFD and will be planting species like mango, amla etc. (Jain)

3.4.2.3 Coal consumption statistics

Not applicable as the plant is under construction

3.4.2.4 Water consumption statistics

Not applicable as the plant is under construction

3.4.2.5 Air emission statistics

Not applicable as the plant is under construction

3.4.3 NTPC, Vindhya Nagar, Singrauli, M.P.

The Vindhya Super Thermal Power Plant is owned by NTPC Limited in North-west of Rihand reservoir (Gobind Ballabh Pant Sagar) at Vindhyanagar in Singrauli district of M.P.

(source: EIA REPORT FOR VINDHYA NAGAR NTPC SINGRAULI, 2008)

3.4.3.1 Capacity of the plant

The installed capacity of the plant is 4260 MW (6X210, 2X500, 2X500, and 2X500) and the operational capacity is 3260 MW.

3.4.3.2 Conditionalities followed

Since the plant involves no forest area diversion thus it has been studied for the environmental concerns.



Figure 29 NTPS, Singrauli

3.4.3.3 Coal consumption statistics

The NTPC thermal power plant is a 22 year old project which approximately utilizes 55000 tonnes (Source: Sr. chemist NTPC Singrauli) of coal per day a mix blend of grade C and D with ash content 30-40%. The coal sources for the plant are the NCL mines - Nigahi and Dhudhichua being dedicated to the plant.

3.4.3.4 Water consumption statistics

The source of water for the plant is the Rihand reservoir. Water requirement per month of the plant on an average is 11304000 m³ (Source: Sr. chemist NTPC Singrauli) and the plant claims to recycle 100% of water (neglecting the evaporated water)

3.4.3.5 Air emission statistics

- SPM
 - Standard: 150 mg/Nm
 - Actual: <150 mg/Nm

- SO_x
 - Standard:100 mg/Nm
 - Actual: <100 mg/Nm

- NO_x
 - Standard: 100 mg/Nm
 - Actual: <100 mg/Nm

The ESPs of the plant are working with approx. 99.99% and thus the plant is able to maintain a clean environment. (Pers. Comm. Mr. Tripathi)

The plant has developed very fine green belt in and around the plant area. Below are some photographs showing the same



Figure 30 Green belt



Figure 31 Plantations in the plant area



Figure 32 Green belt developed by plant



Figure 33 Around the plant

The ash generated by the plant is disposed off in two ways – in the form of slurry in the ash dykes and secondly, through a silo which is then transported to the cement industries through trucks. The figures below show the ash dyke and the silos of the plant.



Figure 34 Ash dyke, NTPC, Singrauli



Figure 35 Ash silos, NTPC, Singrauli

3.5 Chhattisgarh

3.5.1 Korba (east) Thermal Power Station (KTPS)

KTPS is being owned by the Chhattisgarh State Electricity Board (CSEB) is one of the three CSEB owned power stations situated in Jamnipali, Korba, C.G. The power generated from this power plant is consumed by the following states:

- Madhya Pradesh
- Chhattisgarh
- Maharashtra
- Gujarat and
- Goa

3.5.1.1 Capacity of the plant

The capacity of the plant has an installed capacity of 540 MW and 440 MW operational capacities.

3.5.1.2 Conditionalities followed

A. Transferring of cost of C.A. and its maintenance to the SFD

The plant had requested for 111.761 Ha of forest area diversion by the forest department, which has been approved in the year 2005, to be used in the construction of a new unit of the plant.

As per the conditionalities, the plant administration has provided a land of area 222 Ha to the SFD to carry out compensatory afforestation plantations which will be carried out in the near future. The C.A. plantation got delayed as the funds were withheld in the CAMPA account since eight years.

B. Payment of NPV to the SFD

The plant has paid the required amount of NPV to the SFD which has been deposited into the CAMPA account.

C. Ash disposal followed as per plan

As told by the officials, the ash produced is fully converted into slurry and disposed off in the ash dyke. The plant is building ash silos which will be functional in the near future enabling the plant to provide fly ash to the cement industries or brick kilns present in the vicinity of the plant.

D. Flora and fauna Conservation

No particulars plans were seen.

E. Rehabilitation and resettlement plan

This conditionality is not applicable for KTPS.

F. Green belt development

The green belt has been developed in and around 33% of the plant area

G. Plantations to be carried out each year

The plant administration along with its horticulture division has been able to plant around 15000

saplings every year with a survival rate of about 95%. Species like Sal, Neem, Babool etc are been planted every year

3.5.1.3 Coal consumption statistics

Around 9000 tonnes coal per day is consumed in producing electricity for the state which consists of 47% ash content. The coal source for the plant is the South Eastern Coal Field Limited Gevra Mines being the mine area that provide coal to the plant. (Source: Pers. Comm. Mr. Agrawal)

3.5.1.4 Water consumption statistics

The water source is the Hasdeo River. No recycling of water is followed by the plant.

3.5.1.5 Air emission statistics

- SPM
 - Standard: 150 mg/Nm
 - Actual: N.A
- SO_x
 - Standard:150 mg/Nm
 - Actual: 300 mg/Nm
- NO_x
 - Standard: 100 mg/Nm
 - Actual: 200 mg/Nm
- CO
 - Standard: 100 mg/Nm
 - Actual: 20 mg/Nm

The plant administration claims that the ESP works at an efficiency of 99.7% - 99.8%

3.5.2 Hasdeo Thermal Power Station (HTPS)

HTPS is being owned by the Chhattisgarh State Electricity Board (CSEB) is one of the three CSEB owned power stations situated in



Figure 36 Hasdeo Thermal Power Station, Korba

Korba, C.G. The power generated from this power plant is consumed by the following states:

- Madhya Pradesh
- Chhattisgarh
- Maharashtra
- Gujarat and
- Goa

3.5.2.1 Capacity of the plant

The capacity of the plant has an installed capacity of 840 MW and 840 MW operational capacity.

3.5.2.2 Conditionalities followed

- A. Transferring of cost of C.A. and its maintenance to the SFD

The plant had requested for 83.494 Ha of forest area diversion by the forest department, which has been approved in the year 2009, to be used in the construction of ash dyke for an existing unit of the plant since the ash dyke that is currently in use is on the verge of being abundant. (Source: Pers Comm. Mr.Sharma)



Figure 37: Ash dyke being developed for which HTPS has requested land diversion

As per the conditionalities, the plant administration has provided a land of area 167 Ha to the SFD to carry out compensatory afforestation plantations which will be carried out in the near future. The C.A. plantation got delayed as the funds were withheld in the CAMPA account since eight years.

- B. Payment of NPV to the SFD

The plant has paid the required amount of NPV to the SFD which has been deposited into the CAMPA account.

C. Ash disposal followed as per plan

The ash produced is fully converted into slurry and disposed off in the ash dyke. The plant is building ash silos which will be functional in the near future which will enable them to provide fly ash to the cement industries or brick kilns present in the vicinity of the plant. The ash dyke layout has been attached in the APPENDIX section.



Figure 38 Ash dyke HTPS

D. Flora and fauna Conservation

No particulars plans were seen.

E. Rehabilitation and resettlement plan

This conditionality is not applicable for HTPS.

F. Green belt development

The green belt has been developed in and around 33% of the plant area

G. Plantations to be carried out each year

The plant administration along with its horticulture division has been able to plant around 15000 saplings every year with a survival rate of about 90%.

3.5.2.3 Coal consumption statistics

Around 14000 tonnes coal per day is consumed in producing electricity for the state which consists of 40% ash content. The coal source for the plant is the South Eastern Coal Field Limited which provides coal of grade F.

3.5.2.4 Water consumption statistics

The water source is the Hasdeo River. No recycling of water is followed by the plant.

3.5.2.5 Air emission statistics

- SPM
 - Standard: 50 mg/Nm
 - Actual: N.A

- SO_x
 - Standard: 150 mg/Nm
 - Actual: 250-290 mg/Nm

- NO_x
 - Standard: 100 mg/Nm
 - Actual: 90-100 mg/Nm

- CO
 - Standard: 100 mg/Nm
 - Actual: N.A.

The plant administration claims that the ESP works at an efficiency of 99.9%

3.5.3 NTPC, Sipat, Bilaspur, C.G.

This plant is owned by NTPC Limited in Sipat in Bilaspur district of C.G.



Figure 39 NTPC, Sipat

3.5.3.1 Capacity of the plant

In NTPC power plant Sipat, Bilaspur currently operational capacity is 1000 MW and rest 1918 MW (3x660) is under construction. (Source: Pers. Comm. Mr. Jha)

3.5.3.2 Conditionalities followed

Since the plant involves no forest area diversion thus it has been studied for the environmental concerns.

3.5.3.3 Coal consumption statistics

Around 700 tonnes of coal per hour is utilized in the power plant for the production of around 870 million units. The coal source for the plant is the South Eastern Coal Field Limited which provides coal of grade F with 40% ash content (Source: Pers. Comm. Mr. Dahiya)

3.5.3.4 Water consumption statistics

Water requirement per month of the plant on an average is 2368800 m³ and the plant claims to recycle 100% of water (neglecting the evaporated water) with zero discharge compliance. The plant has also developed an overflow lagoon which takes the water back to the plant for reuse after treatment when the slurry settles in the ash pond.



Figure 40 Reverse channel developed by NTPC, Sipat

3.5.3.5 Air emission statistics

- SPM
 - Standard: 150 mg/Nm
 - Actual: <150 mg/Nm

- SO_x
 - Standard:100 mg/Nm
 - Actual: <100 mg/Nm

- NO_x
 - Standard: 100 mg/Nm
 - Actual: <100 mg/Nm

The ESPs of the plant are working with approx. 99.99% and thus the plant is able to maintain a clean environment. The plant has developed very fine green belt in and around the plant area. Below are some photographs showing the same



Figure 41 Green belt around the plant



Figure 42 Green belt

The ash generated by the plant is disposed off in two ways – in the form of slurry in the ash dykes and through silos. The figures below show the ash dyke of the plant.



Figure 43 Ash dyke, NTPC, Sipat



Figure 44 ash dyke

3.5.4 NTPC, Korba, C.G.

NTPC power plant, Korba stands first amongst all the other power plants belonging to NTPC and has second amongst all the other power plants in the country. It has managed to produce 17955.471 million unit of power and thus has gained a PLF of 97.61%.



Figure 45 NTPC, Korba

3.5.4.1 Capacity of the plant

NTPC Korba is working on its full capacity of 2100 MW

3.5.4.2 Conditionalities followed

Since the plant involves no forest area diversion thus it has been studied for the environmental concerns.

3.5.4.3 Coal consumption statistics

Around 48000 tonnes of coal per day is utilized in the power plant. The coal source for the plant is the South Eastern Coal Field Limited which provides coal of grade F with 40% ash content. The plant has a 64 km dedicated railway line for the purpose of transporting coal to the plant from the mine.



Figure 46 Railway line to bring coal to the plant

3.5.4.4 Water consumption statistics

Water consumption statistics for this plant are unavailable. The plant has developed an overflow lagoon like its counterpart in Sipat which takes the water back to the plant for reuse after treatment when the slurry settles in the ash pond.

3. 5.4.5 Air emission statistics

- SPM
 - Standard: 150 mg/Nm
 - Actual: <150 mg/Nm

- SO_x
 - Standard: 100 mg/Nm
 - Actual: <100 mg/Nm

- NO_x
 - Standard: 100 mg/Nm
 - Actual: <100 mg/Nm

The ESPs of the plant are working with approx. 99.99% and thus the plant is able to maintain a clean environment. The plant has checked the emissions by optimizing the use of the ESPs installed up to 99.99% efficiency and have brought down the emission rate to 50 mg/m³ flue gas where the upper cap is 100 mg/m³. The power plant claims to have planted around 17,01,200 trees around the power plant. Also, four ambient air quality monitoring stations have been established to ensure the proper working of the plant and at the same time bringing down the pollution level at its minimum level as possible.

(Source: Pers. Comm. Mr. Janardhan Kar)



Figure 47 Green belt developed by NTPC, Korba

The ash generated by the plant is disposed off in two ways – in the form of slurry in the ash dykes and through silos.



Figure 48 Ash dyke, NTPC, Korba

The plant has utilized 74.14% of the ash produced in the FY 2009-10.

The plant is also planning to set up a solar based power plant of 12 MW. Currently, through a 70 kV project based on four biomass gasifier based power plant, power is being provided to about 500 families belonging to four remote villages. (Source: Pers. Comm. Mr. Nayak)

3.6 Gujarat

3.6.1 Mundra UMPP, Mundra, Gujarat

The Project, owned by TATA Power is one of the ultra mega power projects (UMPPs) planned by the Government to ease India's current and pending electric power deficits. The Project will be one of the new generation of cleaner coal projects. The Project will contribute significantly to reducing power shortages in the country.

The project is being developed near Tundawanda village, Mundra Taluka in Kutch district, in the state of Gujarat.

The plant will sell electricity to state-owned utilities in 5 states ([http://en.wikipedia.org/wiki/Ultra_Mega_Power_Plants_\(India\)\)](http://en.wikipedia.org/wiki/Ultra_Mega_Power_Plants_(India)))



Figure 49 Mundra UMPP

- Gujarat
- Maharashtra
- Haryana
- Rajasthan and
- Punjab

3.6.1.1 Capacity of the plant

The Project is to construct, operate, and maintain a 4,000 MW coal-fired power plant with five units of 800 MW each, incorporating supercritical technology (Source: Pers. Comm. Mr. Shah)

3.6.1.2 Conditionalities followed

A. Transferring of cost of C.A. and its maintenance to the SFD

The plant had requested for 130 Ha of forest area diversion by the forest department, which has been approved in the year 2009. As per the conditionalities, the plant administration has provided a land of area 130 Ha in Buchau district of Gujarat to the SFD to carry out compensatory afforestation plantations which

will be carried out in the near future.

B. Payment of NPV to the SFD

The plant has paid the required amount of NPV to the SFD which has been deposited into the CAMPA account.

C. Ash disposal followed as per plan

The plant will be importing coal from countries like Indonesia which will have 3-4% of ash only. Thus, ash handling will not portray a serious problem for the plant. Moreover, the plant authorities are already planning to export the ash produced to the Gulf countries where it is in demand.

D. Flora and fauna Conservation

The plant is not only trying to preserve the indigenous species but is also planning to grow certain exotic species and medicinal plants which will be discussed later.

E. Rehabilitation and resettlement plan

This conditionality is not applicable for the plant

F. Green belt development

The administration is developing 33% of the area of the plant as green belt.

G. Plantations to be carried out each year

The plant administration has started planting indigenous species like Babool and Mangroves, along with some exotic species like Sheesham in the area to fulfil this conditionality with the help of a Delhi based NGO INTACH. Both in collaboration have planted around 10000 plants and are implementing a new technology which will be discussed later in the report. (Source: Pers. Comm. Mr. Tiwari)



Figure 50 Plantation done by Mundra UMPP



Figure 51 Nursery prepared for plantations

3.6.1.3 Coal consumption statistics

Not applicable as the plant will come into function in the year 2011. But according to estimates up to 11.7 million tons (t) of coal will be required per annum. CGPL is to make arrangements to bring imported coal to the project site. This includes development of a jetty, unloading and handling of imported coal, and transport to the site.

3.6.1.4 Water consumption statistics

Infrastructure for processing seawater to meet in-plant water requirements, including intake and discharge to the sea, water intake pipeline, and a desalination plant, is being built.

3.6.1.5 Air emission statistics

Not applicable

3.6.2 Adani Power Limited, Mundra, Gujarat

Adani Power Limited, a subsidiary of Adani Enterprises Limited, is developing number of power projects along with its dedicated transmission station system.

APL is presently executing 400 KV D/C transmission line of about 431 KM distance from Mundra to Dehgam. APL is also executing ± 500 KV Bi-Pole HVDC transmission line of about 800 KM distance from Mundra to Haryana for transmitting 2500 MW. (<http://www.adanipower.com/>)

3.6.2.1 Capacity of the plant

Adani Power Limited is setting up a 4620 MW Mundra Thermal Power Station in following stages:

- Stage1: 660MW
- Stage2: 660MW
- Stage 3: 1320 MW
- Stage 4: 1980 MW

3.6.2.2 Conditionalities followed

Since the plant involves no forest area diversion thus it has been studied for the environmental concerns.

(Source: Pers. Comm. Mr. Engineer)

3.6.2.3 Coal consumption statistics

By the virtue of its location, APL is importing coal from countries like Australia which is very low in ash content that constitutes only 4-5% and requires 6000 tonnes per day currently with only one of its unit functional. (Source: Pers. Comm. Mr. Joshi)

3.6.2.4 Water consumption statistics

Due to the implementation of FGD technology, APL is able to recycle the water completely which leads to minimum exploitation of the water resource present near the plant

3.6.2.5 Air emission statistics

- SPM
 - Standard: 150 mg/Nm
 - Actual: <150 mg/Nm

- SO_x
 - Standard: 100 mg/Nm
 - Actual: 15.1 mg/Nm

- NO_x
 - Standard: 50 mg/Nm
 - Actual: 3.4 mg/Nm

The ESPs of the plant are working with approx. 99.99% and thus the plant is able to maintain a clean environment. (Source: Pers. Comm. Mr. Jain)

The plant has developed very fine green belt in and around the plant area. Below are some photographs showing the same



Figure 52: Green Belt, APL



Figure 53: Road side plantation, Mundra



Figure 54 Roadside plantation, APL, Mundra

Plantations done by APL has resulted in an increment in the number of migrant birds that visited the area during winters (see findings) (Pers. Comm. Mr. Bhavesh Dodi)



Figure 55: Green Belt plantation, CGPL, Mundra



Figure 56 Mangrove Plantation, Mundra

CHAPTER 4

OBSERVATIONS AND FINDINGS

4.1 Observations and Findings related to Forest Land Clearance (under FCA, 1988):

- **Land related problem faced by SASAN TPP:**

SASAN TPP owned by Reliance Energy situated in Singrauli, M.P. is facing a problem related to the ownership of land. SASAN UMPP has got 320.938 ha of forest land diverted for their plant operation; also they have got all kinds of clearance through Supreme Court and local Forest Department for their land. But, having all those permission also they have got only about 147 ha of the land cleared till date and rest around 165 ha is still under the dispute between Forest Department and Revenue Department. Out of 320.938 ha land SASAN UMPP on paper only 8.11 ha land was under revenue department and rest is under Forest Department (FD), but Revenue Department had distributed Pattas to the local (tribals) people residing there in that 165 ha of land stating that that land belongs to them and FD has declared those people residing on that land as Encroachers. Thus REL is facing a huge problem to get their land as FD is claiming that those people residing there on their land are encroachers and they can remove them to get their land. Hence, because of the conflicts between Forest Department and Revenue Department SASAN UMPP is not being able to keep their pace for the completion of their construction of Power Plant. (Source: Pers. Comm. Mr. M. K Jain.)

- **As per the proposal of reclamation of old ash bund in consultation with SFD, Satpura power plant has developed a plantation on the abundant ash dyke:**

Referring to fig. 56 and 57 as shown below we observed that Satpura TPP, Sarni (Betul), has done a good plantation on its earlier abundant ash dyke. As it is visible in pictures shown below that how an ash dyke look does **before** and **after** its abundant. Again referring to Appendix 1 under the conditionalities of this TPP it is mention that they have to reclaim their abundant ash bunds and hence we found it in compliance with their conditionalities.



Figure 57: Abundant Ash Dyke, Korba



Figure 58: Abundant Ash Dyke, HTPS, Korba



Figure 59: Plantation done on abundant ash dyke, Sarni



Figure 60: Plantation done on abundant ash dyke by Satpura TPP

- **Mundra UMPP - proposing to go for Alternate energy using micro turbine Hydel power plant and are also testing wind energy potential:**

Referring to Appendix 1 under the conditionalities of Mundra UMPP owned by TATA POWER at Mundra, Gujarat, it was mentioned that they have to provide free alternate energy resources to their staff members. Thus in compliance with that conditionality TATA Power is providing all its employees with fuel wood as an alternate energy and also testing the potential of both Hydel Power and Wind Energy to ensure a sustainable and more environment friendly alternative. (Source: Pers. Comm. Mr. Shah)

- **HTPS – has set up a mini hydel power plant of 80 kW:**

Similar to the observation above it was also mention in the conditionalities of Hasdeo Thermal Power Station (HTPS), Korba that they have to provide free alternate energy to their labourers and employees and we found them in compliance with their conditionality as they had already installed an 80 KW Hydel Power Plant to provide a sustainable alternative source of energy to their employees. (Source: Pers. Comm. Mr. Sharma)

4.2 Observations and Findings related to Environment Clearance:

- **Farmers quitting their profession in Korba :**

Korba is known as Power Hub of India as there are currently 17 TPPs are in operation because of this farming is getting a back step here as most of the farmers had quit their profession to take job as daily wage labourers in these TPPs.

Due to easy availability of jobs and quick money farmers are not opting to go for farming and hence farming is suffering a great loss in the vicinity area of Korba which ultimately have an adverse effect on vegetation and climatic condition there. (Source: Pers. Comm. Mr. Dwivedi)

- **Visibility problems in Satpura TPP, Sarni:**

Visibility problem was very easily evident there in Sarni, Betul especially at dusk. Some of the reasons behind it were:

- During our visit there we found that ESP was not in operation which when we asked to officials they claimed that due to the maintenance is shut down.
- Emissions in the air through TPP Chimney were found to be far more than the stipulated limit.
- Lack of protection from fugitive emissions like fly ash or others through transportation as the working was going on for the construction of new units.

- **Jaggery distribution:**

This is one of the interesting finding in which we found that more or less each and every TPP use to distribute Jaggery to each of its employees on regular basis as a precautionary step to combat lung related diseases such as Asthma. This goes down as one of the positive finding which helps in maintaining a good health of the employees.

- **Increment in number of birds in Mundra:**

During our study we found that in Mundra, Gujarat, due to the Mangroves plantation carried out by CGPL and APL the sighting of migrant birds has increased substantially. Though these birds migrate regularly to these areas of Gujarat during the winter season but it has increased in number in the recent years due to the increase in the Mangrove population and hence is a positive sign from wildlife point of view. (Source: Pers. Comm. Mr. Dodi)



Figure 61: Sighting of Flamingos in Mundra



Figure 62: Migrant Flamingos, Mundra

- **New innovation – pitcher technology:**

CGPL, Mundra alongwith INTACH (a Delhi based non-profit organization) has come up with a new innovative technology of planting both indigenous as well as exotic species using Pitcher Technology. In this method, as shown in fig below each plant is planted along with a pitcher in its vicinity so as to ensure a constant supply of water directly to the roots of the plant. As it is

evident, that it is very difficult to plant any species in coastal region apart from Mangroves, Babul and of same kind.

Advantages of using this technology are as follows:

- Using this technology enables TATA Power to plant some exotic species like Sheesham and other medicinal plants also. It is shown in fig. below a Sheesham plantation is done.

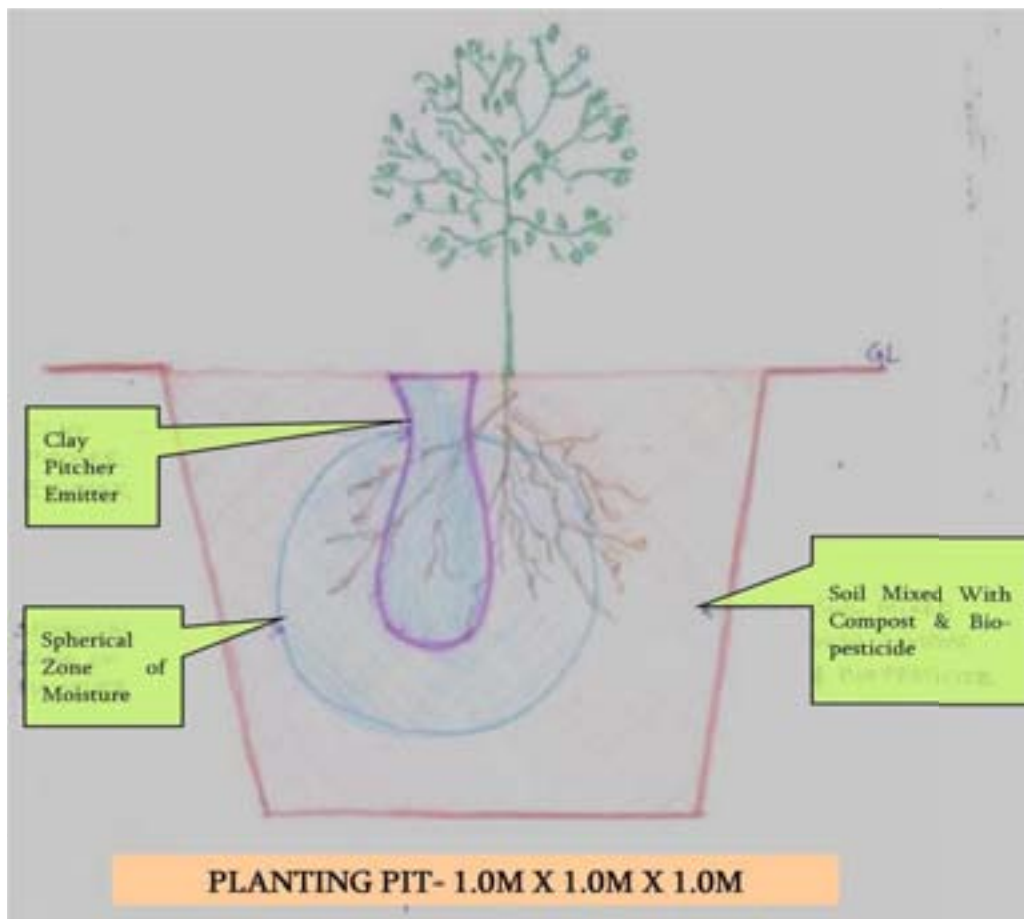


Figure 63: Pitcher Technology



Figure 64: Planting exotic species

- Another advantage of using this technology is that it requires water to fill in the pitcher in an interval of around 5-7 days and thus it helps in preserving water resource as the wind velocity is very high in coastal places and thus it becomes very impossible to save water content within the roots. Hence this Pitcher innovation helps in retaining water in the roots because of its porosity as well as avoids water to lose to the atmosphere through evaporation.



Figure 65: Pitcher plantation

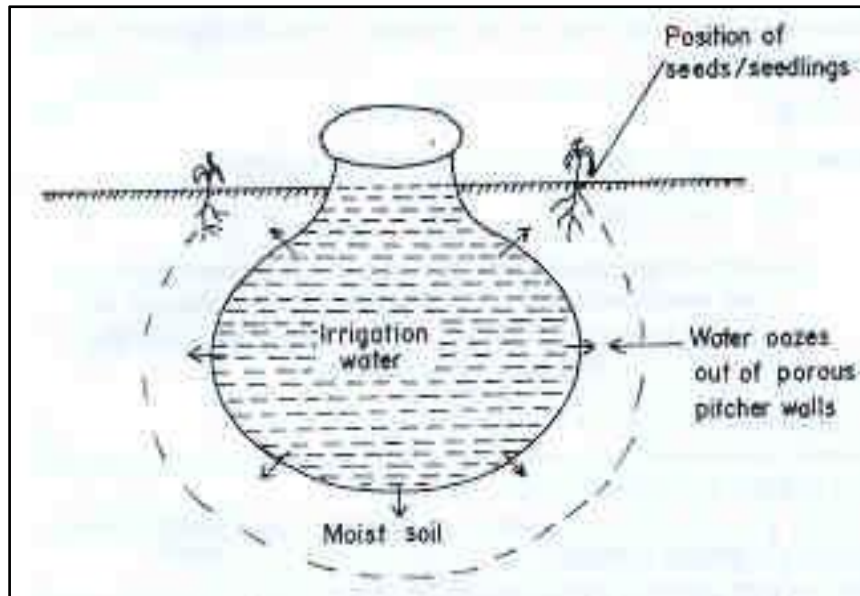


Figure 66: Pitcher Mechanism



Figure 67: Plant with Pitcher

- Another advantage of using this technology is that it provides a huge employment opportunity for the native people as also shown in fig. below. CGPL UMPP

Mundra had organized time to time training camps to the people in the vicinity area to enable them to make pitchers and thus helps them to earn an employment which helps in their socio-economic gain.



Figure 68: Generating Employment, CGPL, Mundra



Figure 69: Generating Employment, Mundra



Figure 70: Training Camp organized by CGPL



Figure 71: Training Camp for local people, Mundra

- Also, TATA Power is looking forward to plant some medicinal species as shown in fig. below, which ultimately going to favour them as they will be promoting medicinal planting for their benefits.

Few Proposed Medicinal Plants





- **Ash disposal problems:**

The problem of Ash Management (Disposal & Utilization) in India is complicated due to the sheer amount of ash content in our coal.

Table 3 Comparison of Coal Quality

Coal Data	India	USA/ European Countries
Ash content	35-45%	8-10%
Calorific value (Kcal / Kg)	3000-4000	6000-7000
Ash production (per unit of electricity)	220 gms	40 gms

Note: Ash Production in India is 5-6 times more per Kwh.

(Pandey, Tyagi, & Sengupta, 2006)

ASH DISPOSAL SYSTEM

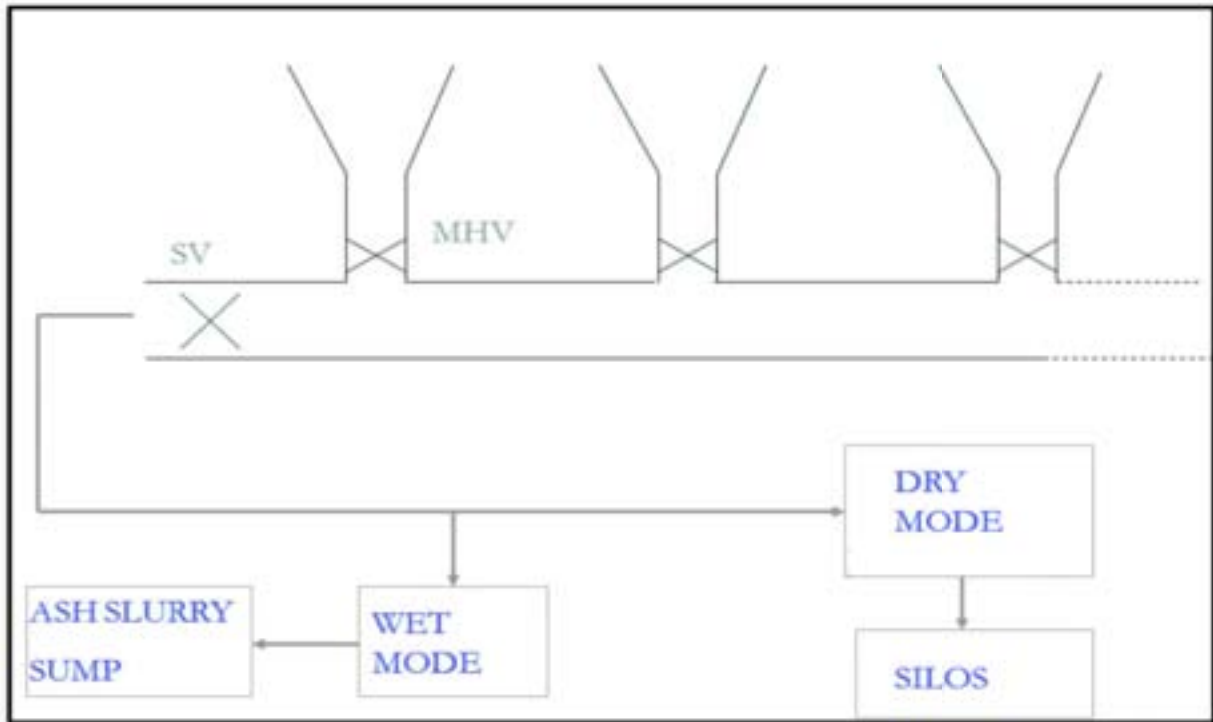


Figure 72: Ash Disposal System

- **Wet disposal system-** in most of the TPPs the system of disposal of ash is done in wet disposal form and then it is carried out in the form of ash slurry through pipes to dispose off in Ash Ponds. (Pandey, Tyagi, & Sengupta, 2006)



Figure 73: Wet Ash Disposal System

- **Dry system-** another form of disposal of ash is done through dry system in which ash is collected directly through ESPs to the Silos in solid form and then gets dispatched to the vicinity area bricklins or cement manufacturing units. TPPs use to generate ash in this form in small quantity and that too when it is there in demand. If for some TPPs this form is not in demand then they use to make all the ash in bottom ash or wet form and use to dispose it in the ash ponds.



Figure 74: Dry Ash Disposal System

- **HIGH CONCENTRATION SLURRY DISPOSAL (HCSD) SYSTEM-** this is the latest form of ash disposal system in which ash is collected in bottom ash form only but while disposing it off through ash slurry it requires a huge quantity of water usually in the ratio of 1:20, which can be reduce to say around 1:8 using HCSD system. This is possible because it uses induced draught fan and a mechanism which helps in suction of ash slurry and hence reducing the content of water drastically.
- **Ash Disposal Problem Comparisons:**
Following table shows a brief description of how much percentage of Ash content in coal generates quantity of ash and requires land to dispose it off. Table 3 shows how much water will be require disposing of the ash produce.

Table 4 Ash Generation & Land Requirement for Disposal of Ash

Ash %	Raw Coal Requirement (MTPA)	Ash Generated (MTPA)	Land Requirement (Ha)
41	3.77	1.55	400
36	3.33	1.20	310
34	3.19	1.09	281
32	3.07	0.98	254
30	2.97	0.89	229

Table 5 Water Requirement for Ash Disposal

<u>Ash %</u>	<u>Disposable Ash (Million Tonnes)</u>	<u>Water Req. (Million m³/annum)</u>
41	1.55	17.05
36	1.20	13.20
34	1.09	11.66
32	0.98	10.78
30	0.89	9.79

(Pandey, Tyagi, & Sengupta, 2006)

4.2.1 Fly ash utilization plans

Following fig. shows different ways of fly ash being utilized all across the TPPs in India during the year 2006-07:

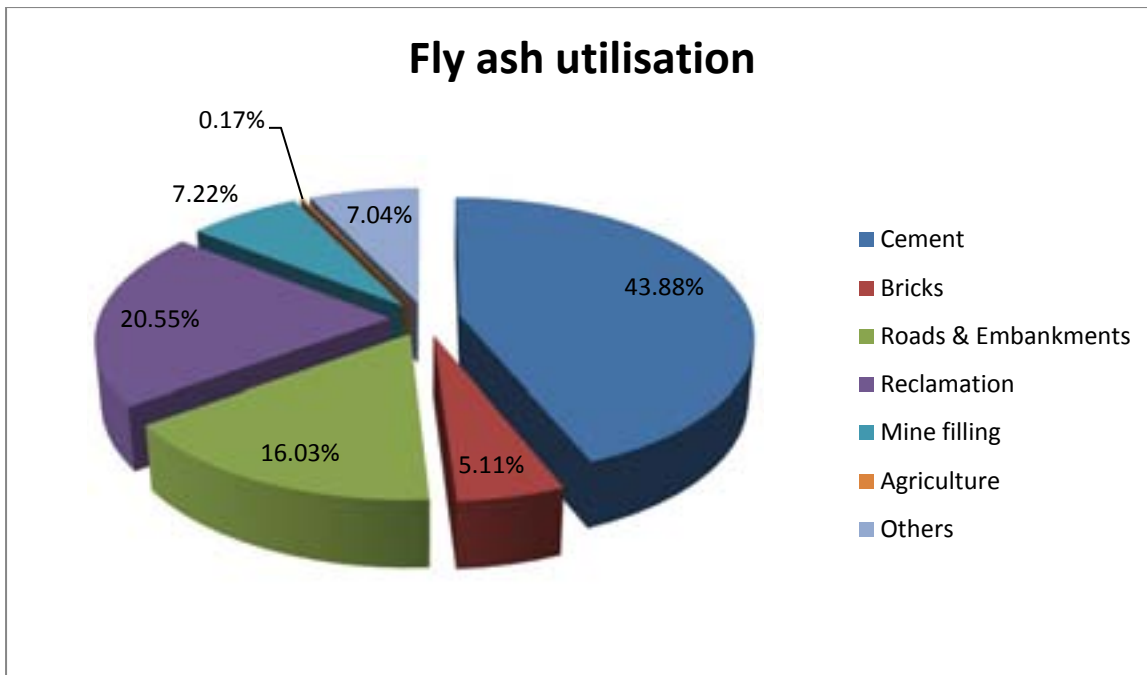


Figure 75 Fly Ash Utilization in Various Modes during 2006-07 (Mode, Quantity Utilized in Million Tonnes and Percentage) (Total Fly Ash utilized = 55.01 MT)

(ECOSMART, 2009)

The different forms of Ash collected are as follows:

1. FLY ASH

- Collected in ESP's.
- Fine in size
- Possess Pozzolanic Properties.

2. BOTTOM ASH

- Collected at the bottom of furnace.
- Coarse in size.
- Useful as drainage material.

3. POND ASH

- Fly Ash or bottom ash or a mixture of Bottom ash & Fly Ash in any proportion
- Conveyed in the form of water slurry
- Collected in ash Pond.

4. MOUND ASH

- Fly Ash or bottom ash

- Conveyed in dry form & deposited dry (Pandey, Tyagi, & Sengupta, 2006)

4.2.2 Salient Features of MoEF NOTIFICATION (DTD.14.09.1999):

In the Gazette Notification, directives are in three parts:

- Use of fly ash, bottom ash or pond ash in manufacture of bricks or tiles or blocks for use in construction activities
- 100% utilization of Ash by all thermal power stations in
 - 15 years for existing stations
 - 9 years for new stations
- Specifications for use of Ash Based Products :
 - Use at least 25% Ash in Manufacturing of Clay Bricks or tiles or blocks within a radius of 50 kms from thermal power station.
 - Power Plants to issue ash free of cost for ten years.
 - Construction Industry to use Ash and ash based products in construction works as per specifications.

4.2.3 Salient Features Of Amendment (dated. 27-08-03) to MoEF Notification:

- Radius for Use of ash for brick increased from 50 kms to 100 kms.
- Buildings within a radius of 50 to 100 Kms to use ash based bricks /blocks /tiles in phase manner i.e.
 - 25% by 31stAugust 2004
 - 50% by 31stAugust 2005
 - 75% by 31stAugust 2006
 - 100% by 31stAugust 2007
- It is responsibility of the construction agency either undertaking the construction or approving the design or both to ensure the implementation of the above provision
- Buildings within a radius of 50 Kms to use ash based bricks / blocks /tiles in phased manner i.e.:
 - 50% by 31stAugust 2004.
 - 100% by 31stAugust 2005.
- Road / Flyover within 100 kms Radius of a Thermal Power Station to follow IRC SP:58 specifications
- Soil required for top / side covers for embankments of roads / flyovers shall be excavated from the embankment site
- Voids of borrowed area to be filled up with Ash

- Reclamation of low lying areas within a Radius of 100 km of a thermal Power Plant to be done only with Pond Ash

Above mention are the notification details provided by MoEF to all TPPs for the utilization of ash disposal which in most of the cases were found not to be followed. As it is clear from above that ash bricks should be use in a radius of around 100 kms from TPP but it was observed that red bricks were being used for construction of buildings in radius less than 50 kms.

CHAPTER 5

RECOMMENDATIONS

5.1 At the time of proposal state should certify dispute free lands:

This comes in reference to the problem (mentioned in previous chapter) faced by SASAN UMPP that to avoid any such kind of land related problem it would be helpful if before the allotment of the land for such kinds if State Govt. certifies dispute free land to ensure a smooth working for the plants coming there.

5.2 Reduce the gap between operation of TPPs and the Compensatory Afforestation (CA):

With reference to Appendix 1 the prime conditionality for any diversion of forest land is that they have to pay for alternate non forest land or double degraded land for a compulsory CA to be carried out.

We therefore, recommends that a policy framework should be changed such that the time gap between the utilization of a particular forest land and developing a CA site by concerned state forest department should be reduced, so as to reduce both the environmental and biotic impact.

For this same purpose we would like to suggest that if possible private players should be allowed either alone or through PPP² model such that if forest land gets diverted for any such purpose another set of such land would be available to avoid any carbon sequestration loss to the environment.

5.3 Fly Ash Utilization

The options of ash utilization including the ash-based products are at developmental stage and need to be made more environment friendly by bringing in ash revolution. Some of the areas of application include:

- Brick/Block/Tiles Manufacturing
- Cement Manufacturing
- Roads and Embankment Construction
- Structural Fill for Reclaiming Low Lying Areas
- Mine-Filling
- Agriculture, Forestry and Waste-land
- Part Replacement of Cement in Mortar, Concrete and Ready Mix Concrete Hydraulic
- Structure (Roller Compacted Concrete)

² Public Private Partnership Model in which both the private and govt. combines together to carry out a project.

- Ash Dyke Raising
- Building Components - Mortar, Concrete,
- Concrete Hollow Blocks, Aerated Concrete Blocks
- Other Medium and High Value Added Products (Ceramic Tiles, Wood, Paints)
- Pavement Blocks, Light Weight Aggregate, Extraction of Alumina, Cenospheres

5.3.1.1 Clay-ash Bricks and Fly ash lime / cement bricks.

- Clay ash and fly ash lime / cement bricks / blocks are of better quality than traditional clay bricks
- Fly ash lime / cement bricks / blocks can be manufactured as per the strength requirements and at construction site also.
- To comply with the gazette notification, builders can set up their own fly ash bricks manufacturing plants

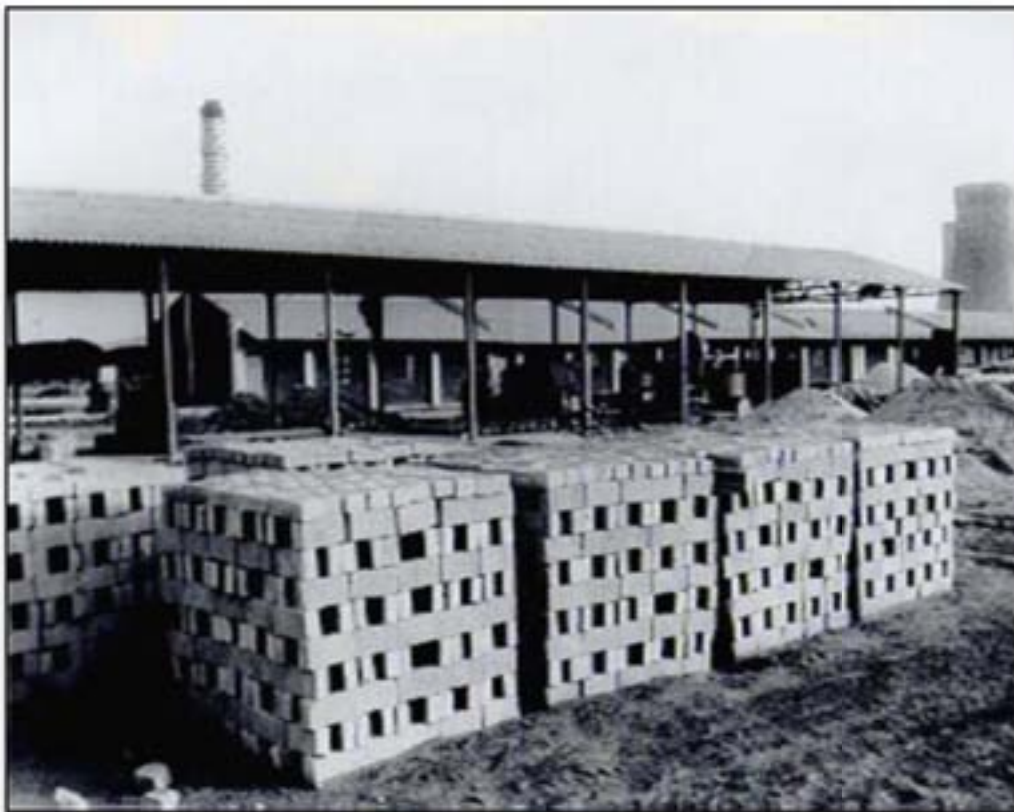


Figure 76 Stacks of Fly Ash Bricks



Figure 77 Floor Tiles





Figure 78: Building of Fly Ash Bricks

5.3.1.2 Use of Fly Ash in Cement & Concrete:

Advantages of use of fly ash in cement & concrete

- Increased strength
- Increased impermeability and durability
- Higher resistance against chemical attack
- Reduction in cracking, better appearance
- Reduction in thermal stress due to low heat of hydration
- Lower cost

As per Bureau of Indian standard IS-1489, fly ash up to 35% by weight conforming to IS 3812 can be used in manufacture of PPC. As per IS 456-2000, fly ash (conforming to IS: 3812) up to 35% by weight of cement can be used as Cementitious content in RCC works. Fly ash is, therefore, used in manufacture of Portland Pozzolana Cement (PPC) & as ingredient in concrete with Ordinary Portland Cement (OPC).

Table 6 PORTLAND POZZOLANA CEMENT SCENARIO (Qty. in Million Tonnes)

Year	Total Cement Prod ⁿ	PPC Prod ⁿ	% PPC Prod ⁿ	Fly ash Utiliz ⁿ
1988-89	81.67	15.57	19.07	03.90
1999-00	94.27	21.30	22.61	05.32
2000-01	93.61	24.50	26.17	06.13
2001-02	102.40	32.29	31.53	08.07
2002-03	111.35	43.08	38.69	10.77
2003-04	117.50	52.12	44.36	11.35
2004-05	127.57	60.23	47.21	12.07
2005-06	141.81	74.04	52.19	16.28

Source: NTPC, Korba

5.3.1.3 Use of Ash in Mines Filling:

Ash can gainfully utilized as:

- Stowing material in Underground Mines
- Filling material for reclamation of abandoned mines
- Filler material along-with overburden of an operating mines

5.3.1.4 Use of Ash in Roads & Embankment Construction:

Ash can be used in the following applications

- Cores fill material for road/ rail embankment constructions
- As reinforced fill material
- Stabilization of soil sub-grade
- Sub-base / base course of flexible pavements
- Construction of semi-rigid / rigid pavements

The above applications of fly ash in road and embankment construction are possible because of the following similarities of it and soil:

Table 7 Soil& Fly Ash Characteristics

Parameter	SOIL (%)	Fly ash (%)
SiO ₂	61.2	61.0
Al ₂ O ₃	14.1	24.8
Fe ₂ O ₃	3.2	4.9
CaO	0.6	1.8
MgO	0.3	0.2

5.3.1.4.1 Advantages of Using Ash in Road Embankment:

- Lower density than earth resulting in lower over burden pressure, advantageous in weak/ clayey sub-soil
- Hardly any measurable settlement over time due to low compressibility of compacted ash
- Speed of construction is faster as it can be compacted in wide range of moisture content
- Work can be taken up even in rainy season due to quick draining properties of loose ash
- Assured availability free of cost
- Eco-friendly since it replaces soil being taken from agriculture lands

5.3.1.5 Use of ash in agriculture and wasteland development:

- Fly Ash Doses of 50 to 200 tonnes per Hectare every five years helps to:
 - Improve Soil Texture
 - Reduces bulk density of soil
 - Improves water holding capacity.
 - Optimizes pH value.
 - Improves soil aeration.
 - Reduces crust formation.
 - Provides micro nutrients like Fe, Zn, Cu, Mo, B etc.
- Improves the yield by 10 to 40%

5.3.1.6 Use of Ash for Controlled Low Strength Fill Material (CLSM):

- Fly ash can be used in the manufacture of Controlled Low Strength Material (CLSM)
- CLSM is a fluid mixture made of 90-95% fly ash & 5-10% Portland Cement and sufficient quantity of water
- Can be poured in “All difficult to reach” cavities
- Settles within 24 hours

- No settlement after initial settlement

5.3.1.7 Use of Fly Ash as Cenospheres:

A small proportion of the pulverized fuel ash (PFA) produced from the combustion of coal in power stations is formed as Cenospheres. Cenospheres are made up of silica, iron and alumina. Cenospheres have a size range from 1 to 500 microns. (source: <http://en.wikipedia.org/wiki/Cenosphere>)

The main characteristics are:

- Hollow spheres with spherical morphology
- Particle sizes ranging from sub-micron to millimeters in size.
- Ultra low density
- Low thermal conductivity
- High particle strength
- Resistant to acids
- Low water absorption

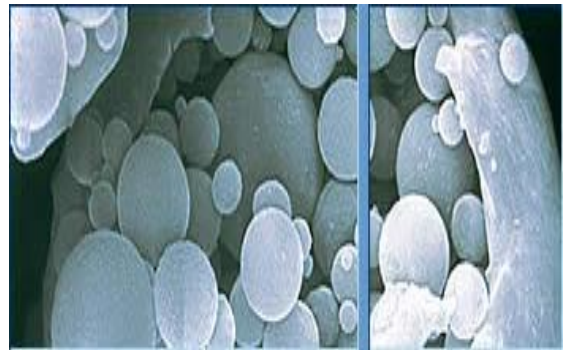


Figure 79: Structure of Cenosphere Molecule

Application of cenospheres in plastics and paints is well accepted. There is abundant availability of raw material from thermal power plants and has huge market potential in the following ways:

- Ceramics — Refractories, Castables, Tile, Fire Bricks, Aluminum Cement, Insulating Materials, Coatings
- Plastics — BMC, SMC, Injection Molding, Extruding, PVC Flooring, Film, Nylon, High Density Polyethylene, Low Density Polyethylene, Polypropylene
- Construction — Specialty Cements, Mortars, Grouts, Stucco, Roofing Materials, Acoustical Panels, Coatings, Shotcrete, Gunite
- Recreation — Marine Craft, Flotation Devices, Bowling Balls, Surf Boards, Kayaks, Golf Equipment, Footwear, Lawn & Garden Décor
- Automotive — Composites, Undercoatings, Tires, Engine Parts, Brake Pads, Trim Molding, Body Fillers, Plastics, Sound Proofing Materials.
- Energy & Technology — Oil Well Cements, Drilling Muds, Industrial Coatings, Grinding Materials, Aerospace Coatings & Composites, Explosives, Propeller Blades

5.4 TPPs should inculcate Zero Carbon Footprints:

Considering the case of CGPL, Mundra owned by TATA Power, we found that TATA Power is calculating the carbon footprints of its each employee and also works a lot on reducing an individual

carbon footprint. The technology they are using for the TPP will emit very less emissions and thus they will calculate overall footprints emitted by them. To reduce the carbon footprints emitted by them overall they are planting the number of trees which will sequester the amount of carbon they have emitted and thus they will come up as a ZERO CARBON FOOTPRINT organization.

The above example of TATA Power should be encouraged to be followed by others TPPs also as not only it is going to be an environmental friendly but also they are going to fetch other financial benefits through CDM³.

CDM offers opportunities to developed nations to undertake Clean Energy Programs in Developing Nations (developing nations do not have emission deduction obligation) and take credit of such emission reduction to their account and comply with the protocol. Thus carbon has become a tradable commodity. Carbon emission, a major cause of global warming is primarily due to use of fossil fuels such as coal Thermal Power Plants. Therefore any project undertaken to improve the energy efficiency in the utilities, or renewable sources of energy or clean energy projects supporting emission reduction qualify carbon credit.

To get certified potential CDM projects need to undergo series of following steps:

STEP I (Preparation of PDD)

Upon identifying eligible project, the project developer has to prepare a Project Design Document (PDD) in the prescribed format.

STEP II (Approval by DNA)

Submit the PDD to Designated National Authority (in this case it is Ministry of Environment and Forest (MoEF)) for approval.

STEP III (Validation)

Then submit these documents (PDD and approval from DNA) to a third party agency known as Designated Operational Entity (DOE) for Validation. There are few DOEs in India like DNV, TUV, JQA, and SGS.

STEP IV (Registration)

After validation, the DOE forwards its reports to the Executive Board, which normally registers the project as a CDM project within eight weeks.

STEP V (Monitoring)

Monitoring is the systematic surveillance of project performance by the project developer. For this purpose, a transparent and reliable monitoring plan must be specified to collect and archive all data

³ Clean Development Mechanism (CDM), in which projects (green) can get benefited financially as they are emitting less than stipulated limit, under Kyoto Protocol.

needed to estimate GHG emission occurring within the project boundary, determine the baseline emissions, and determine leakage.

STEP VI (Verification)

Verification is the periodic independent review and ex post determination by the DOE of the monitored emission reductions resulting from the CDM project.

STEP VII (Certification)

Certification is the written assurance by the DOE that the project has achieved the emissions reductions as verified.

STEP VIII (Issuance of CER)

Within fifteen days of the DOE making its certification report public, the Executive Board issues the necessary CERs. A registry for the issuance and tracking of CERs is under development by the Executive Board.

(Pers. Comm. Mr. Rahul Saxena)

5.5 Installation of coal washery in every TPP:

In order to minimize fly ash generation, it was recommended to use beneficiated⁴ coal in the power plants. This will enable TPPs to reduce the ash content in their coal and also will reduce the burden for disposing a huge quantity of fly ash.

Advantages of beneficiated coal:

- Reduction in tonnage (MT)
- Saving in transport cost (INR)
- Saving in Diesel consumption (KL)
- Reduction in Bottom Ash (MT)
- Reduction in Fly Ash (MT)
- Reduction in CO₂ (MT)

⁴ **Gazette notification has been issued under EPA, 1986, stating that :**“On and from the 1st day of June 2002, the following coal based thermal power plants shall use beneficiated coal with ash content not exceeding thirty four percent”

References

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4. http://www.mynews.in/News/Sasan_ultra_mega_power_project-an_important_initiative_to_generate_energy_N41996.html.
5. [http://en.wikipedia.org/wiki/Ultra_Mega_Power_Plants_\(India\)](http://en.wikipedia.org/wiki/Ultra_Mega_Power_Plants_(India)).
6. <http://www.adanipower.com/>.
7. <http://moef.nic.in/index.php>.
8. <http://www.googlemaps.com>.

PERSONAL COMMUNICATION (Pers. Comm.)

9. Mr. Agrawal, Civil depts, KTPS, Korba.
10. Mr. Shailendra Bagadhre, Civil depts, Satpura TPP, Sarni.
11. Mr. Sudhir Dahiya, Environment Cell, NTPC, Sipat
12. Mr. Dwivedi, Chief Horticulturist, KTPS, Korba.
13. Mr. Niranjana Engineer, Head, Corporate Affairs, APL, Mundra
14. Mr. Bhavesh Dodi, Dy. Manager, Corporate Affairs, APL.
15. Mr. Amol Jain, Horticulturist, APL, Mundra
16. Mr. Vineet Kumar Jain, DGM, RPL.
17. Mr. A.K. Jha, DGM, HR, NTPC, SIPAT.
18. Mr. J. Kar, GM, NTPC Korba.
19. Mr. Joshi, APL
20. Mr. Dilip Mishra, Senior Chemist, NTPC, Singrauli
21. Mr. Ashutosh Nayak, NTPC, KORBA

22. Mr. Alok Pathak, APL, Mundra
23. Mr. Vishal Shah, Mundra UMPP
24. Mr. Sharma, HTPS, KORBA.
25. Mr. A. K. Thakur, Horticulturist, SATPURA TPP, SARNI
26. Captain Tiwari, CGPL, Mundra
27. Mr.S.N. TRIPATHI, DGM, T&S, NTPC, Singrauli

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29. Planning Commission Report, (2006).
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31. (2008). *EIA REPORT FOR VINDHYA NAGAR NTPC SINGRAULI*. KOLKATTA:
ENVIROTECH EAST PVT LTD.
32. Pandey, G. K., Tyagi, S. K., & Sengupta, B. (2006) "MANAGEMENT OF THERMAL POWER PLANTS IN INDIA"

APPENDIX

APPENDIX 1	COPY OF CONDITIONALITIES AND REPLIES OF THE COMPLIANCES FOLLOWED BY EACH POWER PLANT
APPENDIX 2	MAP OF KTPS ASH BUND
APPENDIX 3	KTPS PLANTATION DETAILS
APPENDIX 4	EXCERPTS OF REPORT BY NEERI

Appendix 1

FC-20
BY
13/3
T 3 MAR 2009

F. No. 8-23/2008-FC
Government of India
Ministry of Environment and Forests
(F.C. Division)

34

Paryavaran Bhawan,
CGO Complex, Lodhi Road,
New Delhi - 110003.
Dated: 02nd March, 2009.

To

The Principal Secretary (Forests),
Government of Madhya Pradesh,
Bhopal.

Sub: Diversion of 111.00 ha of forest land for construction of Naveen Ash Bund in Dist Betul, Madhya Pradesh for Satpura Thap Vidyut Grih in favour of M. P. Power Generating Company Ltd. Madhya Pradesh.

Sir,

I am directed to refer to Government of Madhya Pradesh's letter No. F-4/2/26/2007/10-11/Vidhyut/546 dated 28.02.2008 on the above mentioned subject, wherein prior approval of the Central Government for the diversion of 111.00 ha of forest land for construction of Naveen Ash Bund in Dist Betul, Madhya Pradesh for Satpura Thap Vidyut Grih in favour of M. P. Power Generating Company Ltd. Madhya Pradesh, in accordance with Section 2 of the Forest (Conservation) Act, 1980. The said proposal has been examined by the Forest Advisory Committee constituted by the Central Government under Section 3 of the aforesaid Act.

2. After careful consideration of the proposal of the State Government of Madhya Pradesh and on the basis of the recommendations of the Forest Advisory Committee, the Central Government hereby agrees **in-principle** for the diversion of 111.00 ha of forest land for construction of Naveen Ash Bund in Dist Betul, Madhya Pradesh for Satpura Thap Vidyut Grih in favour of M. P. Power Generating Company Ltd. Madhya Pradesh, subject to the fulfillment of the following conditions:-

1. Compensatory Afforestation shall be raised and maintained over equivalent area of non-forest land (i.e. 111.00 ha) identified and provided by the State Government. The User Agency shall transfer the cost of Compensatory Afforestation and its maintenance (incorporating the current wage structure) over equivalent non-forest land to the State Forest Department of Madhya Pradesh.
2. The non-forest land so identified for Compensatory Afforestation shall be transferred and mutated in favour of the State Forest Department.
3. The non-forest land so identified for raising Compensatory Afforestation shall be notified as Reserve forest /Protected Forest under the provisions of the Indian Forest Act, 1927, by the State Government immediately.
4. The State Government shall charge the Net Present Value of the forest area diverted under this proposal from the User Agency as per the orders of the Hon'ble Supreme Court of India dated 30.10.2002, 01.08.2003, 28.03.2008, 25.04.2008 and 09.05.2008 in IA No. 566 in WP(C) No. 202/1995 and as per the guidelines issued by this Ministry vide letters No. 5-1/1998-FC (Pt.II) dated 18.09.2003, as well as letter No. 5-2/2006-FC dated 03.10.2006 in this regard.
5. Additional amount of the NPV of the diverted forest land, if any, becoming due after finalisation of the same by the Hon'ble Supreme Court of India shall be charged by

- 35
- the State Government from the User Agency. The User Agency shall furnish an undertaking to this effect.
6. All the funds received from the User Agency under the project shall be transferred to in CAMPA Account No. 344901010070191 in Union Bank of India, Sunder Nagar, New Delhi.
 7. Detailed proposal for reclamation of old ash pond / bund with good plantation and other measures shall be prepared and implemented in consultation with the State Forest Department at the user agency's cost. The cost of reclamation shall be deposited with the forest Department and after reclamation the area will be transferred back.
 8. A comprehensive wildlife plan shall be made for the Division in consultation with Wildlife Institute of India at the User Agency's cost. The cost of implementation of the plan shall be borne by the User Agency.
 9. The proper muck disposal plan if required, should be prepared and implemented in consultation with the State Forest Department at the user agency's cost so that these mucks do not get washed away to river. A detailed plan shall be made before final approval.
 10. Trees shall be felled only when it becomes necessary and that too under strict supervision of State Forest Department, and at the cost of the project.
 11. No labour camps shall be established on forest land.
 12. The User Agency shall provide fuel-wood preferably alternate fuel to the labourers working at the site to avoid damage/felling of trees.
 13. The forest land shall not be used for any purpose other than that specified in the proposal.
 14. All other conditions proposed by the State Government of Madhya Pradesh at the time of submission of the proposal to the Central Government.
 15. All other conditions under different rules, regulations and ~~guidelines~~ including environmental clearance and rehabilitation and resettlement shall be complied with.

After receipt of the compliance report on the fulfillment of the above mentioned conditions contained in Para 2 above, from the State Government of Madhya Pradesh, formal approval will be issued in this regard under Section-2 of the Forest (Conservation) Act, 1980. The transfer of forest land to the User Agency shall not be affected by the State Government till formal orders approving the diversion of forest land are issued by the Central Government.

Yours faithfully,


(B.K. Singh)

Sr. Assistant Inspector General of Forests

Copy to:-

1. The Principal Chief Conservator of Forests, Government of Madhya Pradesh, Bhopal.
2. The Nodal Officer, Forest Department, Government of Madhya Pradesh, Bhopal.
3. The CCF(Central), Regional Office, Bhopal.
4. User Agency.
5. Monitoring Cell, FC Division, MoEF, New Delhi.
6. Guard File.


(B.K. Singh)

Sr. Assistant Inspector General of Forests

4 June 2009 कार्यालय प्रधान मुख्य वन संरक्षक(भू-प्रबंध) मध्य प्रदेश भोपाल

FC-III

40

क्रमांक/एफ-4/2/26/2007/10-11/विद्युत/

भोपाल दिनांक

प्रेषक,

डॉ० अनिमेष शुक्ला (भा.व.से.)
अपर प्रधान मुख्य वन संरक्षक (भू-प्रबंध)
म०प्र० भोपाल

2786
8-6-08

प्रति,

4/6/09

श्री बी०के० सिंह (भा.व.से.)
सहायक वन महानिरीक्षक (एफ.सी.)
भारत सरकार, पर्यावरण एवं वन मंत्रालय,
सी०जी०ओ० काम्पलेक्स, लोधी, रोड,
नई दिल्ली ।

विषय:-

बैतूल जिले में सतपुड़ा ताप विद्युत गृह सारणी के लिये "नवीन ऐश बंड"निर्माण हेतु
111,000 हेक्टेयर वन भूमि म.प्र. पावर जनरेटिंग कंपनी लिमिटेड, को उपयोग पर
देने बाबत ।

संदर्भ:-

आपका पत्र क्रमांक / 8-23/2008- एफ.सी. दिनांक 02.03.2009

कृपया उपरोक्त संदर्भित पत्र का अवलोकन करने का कष्ट करें, जिसके द्वारा आपने
विषयावित्त प्रकरण की प्रथम चरण सैद्धांतिक शर्त स्वीकृति जारी की गई थी। प्रथम चरण
स्वीकृति पत्र में उल्लेखित शर्तों का पालन प्रतिवेदन निम्नानुसार है:-

शर्त क्रमांक -1 के पालन में आवेदक विभाग ने भूमि बैंक के हस्तांतरित खसरों पर
तैयार की गई क्षतिपूरक बनीकरण योजना की लागत राशि रूपयें 3,00,20,597/- वन
मंडलाधिकारी सामान्य वन मंडल बैतूल को जमा कर दी गई है, छायाप्रतियां संलग्न है।

शर्त क्रमांक -2 के पालन में क्षतिपूरक वैकल्पिक वृक्षारोपण हेतु प्रस्तावित किये गये
क्षेत्र को तत्कालीन कलेक्टर जबलपुर द्वारा भूमि बैंक के अंतर्गत अपने पत्र क्रमांक/रा.मो.
/93/2858 दिनांक 26 मार्च 1993 द्वारा हस्तांतरित एवं नामांतरित कर दिये गये हैं एवं वर्तमान में
उक्त भूमि विभाग के अधिपत्य में है, आदेश की छायाप्रति संलग्न है।

C-MPA-0011/08

शर्त क्रमांक-3 के पालन में वन विभाग के नाम हस्तांतरित एवं नामांतरित उक्त गैर
भूमि को भारतीय वन अधिनियम, 1927 की धारा-29 में संरक्षित वन घोषित करने की कार्यप्रणाली
की जा रही है।

शर्त क्रमांक-4 के पालन में आवेदक विभाग ने प्रकरण में प्रत्यावर्तित होने वाली वन
भूमि 111.00 हेक्टेयर की नेट प्रजेन्ट वैल्यू (एन.पी.व्ही.) की राशि रुपये 8,70,32,010/-
वनमंडलाधिकारी (सामान्य) वन मंडल उत्तर बैतूल को जमा कर दी गई है, छायाप्रति संलग्न है।

शर्त क्रमांक-5 के पालन में आवेदक विभाग ने नेट प्रजेन्ट वैल्यू की दर के
उर्ध्वगामी/उर्ध्वमुखी के पुनरीक्षण की स्थिति में वचन पत्र प्रस्तुत किया गया है, छायाप्रति संलग्न है।

शर्त क्रमांक - 6 के पालन में प्रकरण में जमा की गई समस्त राशि को कैम्पा के
अंतर्गत दिल्ली में जमा की जा चुकी है जिसकी छायाप्रति संलग्न प्रेषित है।

शर्त क्रमांक - 7 से 15 तक के पालन में आवेदक विभाग ने वचन पत्र प्रस्तुत किये हैं,
जो संलग्न प्रेषित है।

अतः उपरोक्तानुसार प्रथम चरण स्वीकृति में अधिरोपित समस्त शर्तों का पालन पूर्ण
हो गया है। कृपया विषयांकित प्रकरण के प्रस्ताव की औपचारिक स्वीकृति प्रदान करने का कष्ट
करें।

संलग्न:- उपरोक्तानुसार।

भवदीय

(डॉ० अनिमेष शुक्ला)

भोपाल दिनांक 3-6-09

पू०क्रमांक/एफ-4/2/26/2007/10-11/विद्युत/1191

प्रतिलिपि:-

1. मुख्य वन संरक्षक (केन्द्रीय) भारत सरकार, पर्यावरण एवं वन मंत्रालय, क्षेत्रीय कार्यालय,
पश्चिम क्षेत्र, भोपाल म०प्र० की ओर सादर सूचनार्थ।
2. वन संरक्षक बैतूल/जबलपुर वृत्त म०प्र०।
3. वन मंडलाधिकारी सामान्य वन मंडल उत्तर बैतूल/कटनी म०प्र०।
4. अतिरिक्त अधीक्षण यंत्री (सिविल) निर्माण एवं रखरखाव संभाग-1, सतपुड़ा ताप विद्युत गृह
मध्यप्रदेश पावर जनरेटिंग कंपनी लिमिटेड सारनी मध्यप्रदेश।
की ओर सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।

अपर प्रधान मुख्य वन संरक्षक(भू-प्रबंध)
मध्यप्रदेश भोपाल

28 APR 2009

कार्यालय प्रधान मुख्य वन संरक्षक(भू-प्रबंध) सतपुड़ा भवन म0प्र0 भोपाल

67

क्रमांक/एफ-4/11/25/2007/10-11/विद्युत/ ~~734~~

भोपाल दिनांक ~~11/11/09~~

प्रेषक,

FC-III
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डॉ० अनिमेष शुक्ला(भा.व.से.)
अपर प्रधान मुख्य वन संरक्षक(भू-प्रबंध)
म0प्र0 भोपाल

प्रति,

श्री वी०के० सिंह,
सहायक वन महानिरीक्षक (एफ.सी.)
भारत सरकार, पर्यावरण एवं वन मंत्रालय,
पर्यावरण भवन, सी.जी.ओ. कॉम्प्लेक्स,
लोधी रोड, नई दिल्ली.

1937
8-4-09

विषय:- सीधी जिले में सासन अल्ट्रा मेगा पावर परियोजना के प्लांट हेतु 312.828 हेक्टेयर वन भूमि एवं 8.110 हेक्टेयर राजस्व वन भूमि कुल 320.938 हेक्टेयर भूमि सासन पावर लिमिटेड को उपयोग पर देने बाबत।

संदर्भ:- आपका पत्र क्रमांक / 8-53/2007- एफ.सी. दिनांक 03.12.2008

कृपया उपरोक्त संदर्भित पत्र का अवलोकन करने का कष्ट करें, जिसके द्वारा आपने विषयांकित प्रकरण की प्रथम चरण सैद्धांतिक शर्त रवीकृति जारी की गई थी। प्रथम चरण रवीकृति पत्र में उल्लेखित समस्त शर्तों का पालन प्रतिवेदन निम्नानुसार है:-

शर्त क्रमांक - (i) के पालन में आवेदक विभाग ने वर्तमान मजदूरी दर पर क्षतिपूरक बनीकरण योजना की लागत राशि रुपये 14,95,86,000/- वन मंडलाधिकारी सामान्य वन मंडल पूर्व सीधी को जमा कर दी गई है, छायाप्रति संलग्न है।

शर्त क्रमांक - (ii) के पालन में आवेदक विभाग ने प्रकरण में प्रत्यावर्तित होने वाली वन भूमि 320.938 हेक्टेयर के लिये नेट प्रजेन्ट वेल्यू (एन.पी.वी.) की राशि 6.26 लाख प्रति हेक्टेयर की दर से रुपये 20,09,07,188/- वन मंडलाधिकारी (सामान्य) पूर्व सीधी को जमा कर दी गई है।

शर्त क्रमांक- (iii) के पालन में प्रकरण में जमा की गई समस्त राशि को कंपनी के अंतर्गत दिल्ली में जमा करने की कार्यवाही की जा रही है, छायाप्रति संलग्न प्रेषित है।

6/11/09

शर्त क्रमांक- (iv) के पालन में आवेदक विभाग ने नेट प्रेजेन्ट वैल्यू की दर के उर्ध्वगामी/उर्ध्वमुखी के पुनरीक्षण की स्थिति में वचन पत्र प्रस्तुत किया गया है, छायाप्रति संलग्न है।

शर्त क्रमांक- (v से xii) के पालन हेतु आवेदक विभाग द्वारा सहमति व्यक्त की गई है एवं वचन पत्र प्रस्तुत किया गया है, जिसकी छायाप्रति संलग्न है।

शर्त क्रमांक- (xiii) के पालन हेतु आवेदक विभाग द्वारा सहमति व्यक्त की गई है।

शर्त क्रमांक- (xiv) के पालन में आवेदक विभाग द्वारा प्लान तैयार कर जिलाध्यक्ष सिंगरौली को प्रस्तुत किया गया है। (अधिरूपित जेल्फ)

शर्त क्रमांक- (xv) के पालन में आवेदक विभाग द्वारा तैयार प्रस्तुत प्लान की छायाप्रति संलग्न है।

शर्त क्रमांक- (xvi से xxiii) के पालन हेतु आवेदक विभाग द्वारा सहमति व्यक्त की गई है।

अतः उपरोक्तानुसार प्रथम चरण स्वीकृति में अधिरूपित समस्त शर्तों का पालन पूर्ण हो गया है। कृपया विषयांकित प्रकरण के प्रस्ताव की औपचारिक स्वीकृति प्रदान करने का कष्ट करें।

संलग्न:- उपरोक्तानुसार।

भवदीय

(डॉ० अनिमेष शुक्ला)

भोपाल दिनांक 4-4-09

पु0क्रमांक/एफ-4/11/25/2007/10-11/विद्युत/735

प्रतिलिपि:-

1. मुख्य वन संरक्षक (केन्द्रीय) भारत सरकार, पर्यावरण एवं वन मंत्रालय, क्षेत्रीय कार्यालय, पश्चिम क्षेत्र रविशंकर नगर भोपाल की ओर सादर सूचनार्थ।
2. मुख्य वन संरक्षक रीवा वृत्त रीवा मध्यप्रदेश।
3. वन मंडलाधिकारी सामान्य वन मंडल पूर्व सीधी मुख्यालय सिंगरौली मध्यप्रदेश।
4. मुख्य कार्यपालक, सासन पावर लिमि. C-51, NH-1, NTPC कालोनी, पोस्ट विंध्य नगर जिला सीधी मध्यप्रदेश।

की ओर सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।

अपर प्रधान मुख्य वन संरक्षक(भू-प्रबंध)
मध्यप्रदेश भोपाल

24 APR 2009

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F. No. 8-18/2007-FC
Government of India
Ministry of Environment & Forests
(FC Division)

Paryavaran Bhawan, C.G.O Complex,
Lodhi Road, New Delhi - 110510.

Dated: 15th April, 2009

To
The Principal Secretary (Forests),
Government of Chhattisgarh,
Raipur.

Subject: Diversion of 83,494 ha of forest land for construction of Ash Bund for Hasdeo Thermal Power Station (HTPS), Korba West (Unit-I&II) of Rajya Vidut Mandal in District Bilaspur, Chhattisgarh.

Sir,

I am directed to refer to the State Govt. letter no. F - 5 - 35 / 06 / 10 - 2 dated 05.02.2007 on the above mentioned subject seeking prior approval of the Central Government in accordance with Section-2 of the Forest (Conservation) Act, 1980. After careful consideration of the proposal by the Forest Advisory Committee constituted under Section-3 of the said Act, in-principle approval for construction of Ash Bund was granted vide this Ministry's letter of even number dated 18.12.2007 subject to fulfillment of certain conditions. The State Government has furnished compliance report in respect of the conditions stipulated in the in-principle approval and has requested the Central Government to grant final approval.

In this connection, I am directed to say that on the basis of the compliance report furnished by the State Government vide letter no. Bhuprabandh/vidyut/2154 dated 22.09.2008, and letter no. Bhuprabandh/Vidyut/9430/436 dated 17.02.2009, approval of the Central Government is hereby granted under Section-2 of the Forest (Conservation) Act, 1980 for diversion of 83,494 ha of forest land for construction of Ash Bund for Hasdeo Thermal Power Station (HTPS), Korba West (Unit-I&II) in favour of M/s Chhattisgarh Rajya Vidut Mandal in District Bilaspur, Chhattisgarh subject to fulfillment of the following conditions:

1. Legal status of the diverted forest land shall remain unchanged.
2. (i) Compensatory Afforestation shall be raised and maintained over 167.00 ha of revenue forest land by the State Forest Department at the project cost.
(ii) The revenue forest land identified for raising Compensatory Afforestation shall be notified by the State Government as RF under Section-4 or PF under Section-29 of the Indian Forest Act, 1927 or under the relevant Section(s) of the local Forest Act, as the case may be, within a period of six months. The Nodal Officer (Forest Conservation) shall report compliance in this regard.
3. (i) Fencing, protection and regeneration of the safety zone area (50 metres strip all along the outer boundary of the ash bund area) shall be done at the project cost.
(ii) Wherever possible and technically feasible, the User Agency shall undertake afforestation measures in the blanks within the lease area, as well as along the roads outside the lease area diverted under this approval, in consultation with the

C. K. L. Anand / 08

State Forest Department at the project cost.

4. The period of diversion under this approval shall be twenty (20) years subject to possession of valid lease under MMDR Act, 1957.
5. No damage to the flora and fauna of the adjoining area shall be caused.
6. The lease area shall be demarcated on ground at the project cost, using four feet high RCC pillars, with each pillar inscribed with the serial number, forward and backward bearings and distance between two adjacent pillars.
7. The forest land shall not be used for any purpose other than that specified in the proposal.
8. The user agency shall abide by the guidelines regarding fly ash utilization issued by the Central / State Government from time to time.
9. After exhaustion of the Ash bund, the area shall be reclaimed by creating a green cover after covering the top surface with suitable layer of soil by the user agency at the project cost under the supervision of the State Forest Department.
10. The user agency shall abide by the relevant conditions under various provisions of Central / State Acts and Rules made on the subject.
11. Any other condition that the CCF (Central), Regional Office, Bhopal, may impose from time to time for protection and improvement of flora and fauna in the forest area, shall also be applicable.

Yours faithfully,

(C.D. Singh)

Sr. Assistant Inspector General of Forests

Copy to:-

1. The Principal Chief Conservator of Forest, Chhattisgarh for information.
2. The Nodal Officer (FCA), Office of the PCCF, Chhattisgarh for information.
- ✓ 3. The Chief Conservator of Forests (Central), Regional Office, Bhopal.
4. The User Agency
5. Monitoring Cell.
6. Guard File.

(C.D. Singh)

Sr. Assistant Inspector General of Forests

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कार्यालय प्रधान मुख्य वन संरक्षक, छत्तीसगढ़, अरण्या भवन, मेडिकल कॉलेज रोड, रायपुर
(मुख्य वन संरक्षक - मू-प्रबंध)

दूरभाष: 0771 - 2552233

ई-मेल: ccfm_cg@yahoo.com

कठ/मू-प्रबंध/विद्युत/9/2324

रायपुर, दिनांक 4/11/2009

प्रति,

वन महानिरीक्षक (एफ. सी)
भारत सरकार, पर्यावरण एवं वन मंत्रालय
कक्ष क्रमांक - 115, प्रथम तल
पर्यावरण भवन, सी.जी.ओ. कॉम्प्लेक्स, लोधी रोड
नई दिल्ली - 110001

11379
13/11/09

विषय: Diversion of 83.494 ha of forest land for construction of Ash Bund for Hasdeo Thermal Power Station (HTPS), Korba west (unit - I & II) of Raja Vidyut Mandal in District Bilaspur, Chhattisgarh.

संदर्भ: - भारत सरकार पर्यावरण एवं वन मंत्रालय का पत्र क्रमांक F No 8-18/2007-FC दिनांक 15.04.2009.
- वन मंडल अधिकारी, कटघोरा वनमंडल का पत्र क्रमांक/मा.वि./820, दिनांक 17-09-2009.

× × × × ×

विषयान्वित भारत सरकार पर्यावरण एवं वन मंत्रालय, नई दिल्ली के उपरोक्त संदर्भित पत्र द्वारा Ash Bund for Hasdeo Thermal Power Station (HTPS), Korba west (unit - I & II) निर्माण के लिए वनिकी कार्य हेतु 83.494 हेक्टेयर की प्रथम चरण स्वीकृति प्रदान की गई है। प्रथम चरण स्वीकृति का पालन प्रतिवेदन वनमंडल अधिकारी, कटघोरा वन मंडल के माध्यम से इस कार्यालय को प्रस्तुत किया गया है जो निम्नानुसार है:-

शर्त	शर्त का पालन प्रतिवेदन	
1	Legal status of the diverted forest land shall remain unchanged.	आवेदक संस्थान को मान्य है एवं इस हेतु आवेदक संस्थान का पत्र क्र. 939 दिनांक 25.08.09 संलग्न है।
2 (i)	Compensatory afforestation shall be raised and maintained over 167.00 Hact of Revenue, Forest land by the State Forest Department at the project cast.	आवेदक संस्थान का पत्र क्र. 939 दिनांक 25.08.09 संलग्न है। इसके अतिरिक्त शक्तिपूर्ति वृक्षारोपण की अंतर की राशि रुपये 38,67,963/- युनियन बैंक ऑफ इण्डिया रायपुर से खाता क्रमांक 540901010050423 को माध्यम से सीधे आवेदक विभाग द्वारा जमा की गई है।
2(ii)	The revenue forest land identified for raising Compensatory Afforestation shall be notified by the State Government as RF under Section - 4 of PF under Section - 29 of the Indian Forest Act, 1927 or under the relevant Section(s) of the local Forest Act, as the case may be, within a period of six months. The Nodal Officer (Forest Conservation) shall report compliance in this regard.	वन मंडल अधिकारी कटघोरा का पत्र क्र./मा. वि./674 27.2007 एवं 113 दिनांक 02.02.2007 द्वारा अधिसूचना प्रस्ताव बनाकर भेजा गया है। असीमांकित संरक्षित वन में वैकल्पिक वृक्षारोपण हेतु अधिसूचना प्रस्ताव 1927 की धारा 4 (i) के अंतर्गत प्रस्ताव शासन को प्रस्तुत किया गया है।
3(i)	Fencing, protection and regeneration of the safety zone area (50m strip all along the outer boundary of the ash bund area) shall be done at the project cast.	आवेदक संस्थान का पत्र क्र. 939 दिनांक 25.08.09 संलग्न है जिसे वनमंडल अधिकारी, कटघोरा के कार्यालयीन पत्र क्रमांक / मा. वि./5824 दिनांक 16.09.2009 से राशि 67,59,099/- द्वारा क्र. 734101 दिनांक 02.09.2009 के द्वारा राज्य सौम्य फंड में जमा किया गया है।

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F.No.8-100/2004-FC
Government of India
Ministry of Environment & Forests
(FC Division)

सं. १७-२-०५
६४५

Paryavaran Bhawan
CGO Complex, Lodhi Road
New Delhi-110 003

Dated: 9th February 2005

To

The Secretary (Forests)
Government of Chhattisgarh
Raipur.

Sub: Diversion of 111.761 ha (modified to 111.811 ha) of forest land for construction of Korba (West) 2x(250-300 MW) Thermal Power Station in Korba District, Chhattisgarh.

Sir,

I am directed to refer to your letter No. F-5-25/04/10-2 dated 04.11.2004 on the above mentioned subject whereunder the above proposal was submitted seeking prior approval of the Central Government in accordance with Section-2 of the Forest (Conservation) Act, 1980.

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2. The proposal was considered by the Advisory Committee in its meeting of 25.01.2005. Based on the recommendations of the Committee, and after careful consideration of the proposal of the State Government, the Central Government hereby agrees in-principle for diversion of 111.811 ha of forest land for construction of Korba (West) 2x(250-300 MW) Thermal Power Station in Korba District, Chhattisgarh, subject to fulfilment of following conditions :-

- (i) The Compensatory Afforestation shall be raised and maintained over double the extent of orange areas at the cost of the user agency. The cost of Compensatory Afforestation shall be transferred to the State Forest Department by the user agency. The orange areas for Compensatory Afforestation may be identified, and a suitable scheme for Compensatory Afforestation may be prepared and submitted to the Ministry, before formal approval is issued.

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F. No. 8-100/2004-FC
Government of India
Ministry of Environment & Forests
(FC Division)

Paryavaran Bhawan
CGO Complex, Lodhi Road
New Delhi-110 003

Dated : 9th August 2005

3912-
28-8-05

To
The Secretary (Forests),
Government of Chhattisgarh,
Raipur.

Subj: Diversion of 111.761 ha (modified to 111.811 ha) of forest land for construction of Korba (West) 2x(250-300 MW) Thermal Power Station in Korba District, Chhattisgarh.

Sir,
I am directed to refer to your letter No. F-5-26/04/10-2 dated 04.11.2004 and subsequent letter of Chief Conservator of Forests (Land Management), Chhattisgarh vide No. LM/11/Electricity/2020 dated 24.07.2005 on the above mentioned subject whereunder the above proposal and the compliance report was submitted seeking prior approval of the Central Government in accordance with Section-2 of the Forest (Conservation) Act, 1980.

2. After careful consideration of the proposal of the State Government, the Central Government hereby conveys its approval under Section-2 of Forest (Conservation) Act, 1980 for diversion of 111.811 ha of forest land for construction of Korba (West) 2x(250-300 MW) Thermal Power Station in Korba District, Chhattisgarh, subject to fulfilment of following conditions :-

- (i) Legal Status of the land shall remain unchanged.
- (ii) Compensatory Afforestation shall be raised and maintained over orange areas twice in extent to the forest land proposed to be diverted, at the project cost.
- (iii) The orange areas identified for Compensatory Afforestation shall be declared as Reserved Forest under Indian Forest Act, 1927.
- (iv) The State Government shall transfer funds for Compensatory Afforestation, NPV and other funds to Compensatory Afforestation Management and Planning Authority (CAMPA). Till such time, the CAMPA intimates the Head of Account for deposition of funds, the funds

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F. No. 8-17/2007-FC
Government of India
Ministry of Environment & Forests
(FC Division)

21

Paryavaran Bhawan, CGO Complex,
Lodhi Road, New Delhi-110 003
Dated: 9th January, 2008

To
The Principal Secretary (Forests),
Government of Gujarat,
GANDHINAGAR, GUJARAT

332
18-1-08

Sub: **Diversion of 130.00 ha of forest land (Section-4 - Forest Land) for the construction of 4000 MW Ultra Mega Power Project at Village- Kandagra, Taluka-Mundra in Kutch District of Gujarat.**

Sir,

I am directed to refer to your letter no. FCA-1007/ (10-18)/SF.14K dated 29.03.2007 where under the above mentioned proposal was submitted seeking prior approval of the Central Government in accordance with Section-2 of the Forest (Conservation) Act, 1980 and to say that the above proposal was examined by the Forest Advisory Committee (FAC) constituted under Section-3 of the Act.

2. After careful consideration of the proposal of the State Government, and on the basis of the recommendations of the FAC, the Central Government hereby agrees **in-principle** for the **diversion of 130.00 ha of forest land (Section-4 - Forest Land)** for the construction of 4000 MW Ultra Mega Power Project at Village- Kandagra, Taluka-Mundra in Kutch District of Gujarat, subject to fulfillment of the following conditions -

1. (i) The User Agency shall identify an area of **130.00 ha** of non-forest forest land for Compensatory Afforestation.
(ii) The land identified for the purpose of CA shall be clearly depicted on a Survey of India topo sheet of 1:50,000 scale.
(iii) The User Agency shall transfer the cost of Compensatory Afforestation and its maintenance to the State Forest Department. The non-forest land on which Compensatory Afforestation is carried out shall be fenced, as per recommendations of the State Government of Gujarat.
(iv) The non-forest forest land identified for raising Compensatory Afforestation shall be immediately transferred and mutated in favour of the State Forest Department. The non-forest land identified for raising Compensatory Afforestation shall then be notified by the State Government as RF under Section-4 or PF under Section-29 of the Indian Forest Act, 1927 or under the relevant Section(s) of the local Forest Act, as the case may be, within a period of six months, if not already done. The Nodal Officer (Forest Conservation) shall report compliance in this regard.
2. The project area shall be demarcated on the ground at the project cost, using four feet high RCC pillars, with each pillar inscribed with the serial number, forward and backward bearings and distance between two adjacent pillars.
3. The User Agency shall implement the approved Ash Disposal Plan, which shall be monitored regularly by the Regional Office, Ministry of Environment and Forests, Bhopal. The User Agency shall ensure that ash disposal is carried out as per this detailed plan, and is in accordance with all environmental safeguards.
4. The User Agency should give an undertaking that it shall take all measures to prevent pollution by effluents, particulate matters etc at the project cost.
5. Wherever possible and technically feasible, the User Agency shall undertake by

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involving local community, the afforestation measures in the blanks within the lease area as well as along the roads outside the lease area diverted under this approval. The User Agency shall submit a plan to raise plantations and their maintenance on vacant patches inside the project area at the project cost. The cost shall be transferred to the State Forest Department.

6. (i) The State Government shall charge the Net Present Value of 130.00 ha of the forest area diverted under this proposal from the User Agency as per the Orders of the Hon'ble Supreme Court of India dated 30.10.2002 and 01.08.2003 in IA No. 566 in WP (C) No. 202/1995, and as per the guidelines issued by this Ministry vide letters No. 5-1/1998-FC (Pt. II) dated 18.09.2003 and 22.09.2003 and No. 5-2/2006-FC dated 03.10.2006 in this regard.
(ii) At the time of payment of the Net Present Value (NPV) at the present rate, the User Agency shall furnish an undertaking to pay the additional NPV, if so determined as per the final decision of Hon'ble Supreme Court of India.
7. All the funds received from the User Agency under the project shall be transferred to Ad-hoc CAMPA in account number CA 1583 of Corporation Bank, Block-11, CGO Complex, Phase-1, Lodhi Road, New Delhi - 110 003.
8. Since the project is on a Built, Operate And Own Basis, the User Agency shall include a condition in its agreement with the party to whom the Project might be transferred, that the party shall pay all the charges, which might become payable out of the judgements of the Hon'ble Supreme Court of India, after the transfer of the project.
9. The User Agency shall make arrangements for free supply of fuel-wood preferably alternate energy source to labourers and staff working on the project site so as to avoid any pressure on the adjacent forest areas.
10. The tree felling in forest area, so diverted, shall be only as per the actual requirement and with prior permission of the competent authority.
11. The forest land shall not be used for any purpose other than that specified in the proposal.
12. After receipt of the compliance report on fulfilment of the conditions mentioned above, the proposal shall be considered for final approval under Section-2 of the Forest (Conservation) Act, 1980.
13. Transfer of forest land shall not be affected till final approval is granted by the Central Government in this regard.
14. Any other condition that the CCF (Central), Regional Office, Bhopal, may impose from time to time for the protection and improvement of flora and fauna in the forest area.

Yours faithfully,

(A.K. Joshi)

Assistant Inspector General of Forests

Copy to:-

1. The Principal Chief Conservator of Forests, Government of Gujarat, Gandhinagar.
2. The Nodal Officer, Forest Department, Government of Gujarat, Gandhinagar.
3. The Chief Conservator of Forests (Central), Regional Office, Bhopal.
4. User Agency.
5. Guard File.
6. Monitoring Cell of FC Section.

(A.K. Joshi)

Assistant Inspector General of Forests

30. MAR 2009



FC-III
22

GOVERNMENT OF GUJARAT

Forest & Environment Department,
14/8, Sardar Bhavan, Sachivalaya, Gandhinagar-382010.
Ph. 079-23251065. Fax- 079-23252156

No.FCA-1007(10-18)SF-14-k

1800
31-3-09
Date: 12 0 MAR 2009

To
The Assistant Inspector General of Forests(FC)
Government of India,
Ministry of Environment & Forests,
Paryavaran Bhavan, CGO Complex,
Lodhi Road,
NEW DELHI-110 003.

2-3073

Subject: Diversion of 130.00 ha. of forest land (Section-4- forest land) for construction of 4000 MW Ultra Mega Power Project at village- Kandagra, Ta. Mundra in Kutch district of Gujarat

Sir,

Please refer to your letter No. F.No. 8-17/2007-FC. dated 9/01/2008 on the subject cited above.

1. The user agency has transferred mutated equivalent **non-forest land 130.00 ha.** area of village Bambhanka, S.No. 187pt., Ta. Bhachau, Dist. Kutch in favour of Forest Department., from No.-6 & VII in this regard is enclosed as per condition No.1 (i) & (iv).
2. A map showing land identified for Compensatory Afforestation on survey of India Topo sheet of 1:50:000 scale as per condition No.1 (ii)
3. The user agency has deposited **Rs. 99,85,092/-** towards the cost of compensatory afforestation as per condition No.1 (iii)
4. The project area is got demarcated and construction of feet High RCC pillars with each pillar inscribed with serial number, forward and backward bearings and distance between two adjacent pillars, which already has been carried out as per condition No.2.

FCA-2009-13


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5. The user agency has submitted that the Ash Disposal plan will be got approved soon as the orders for allotment of land in favour of CGPL is issued by the Govt. The CGPL also undertakes to have monitoring regularly by Regional office Ministry of Environment and Forest Bhopal, Further the user agency has given an undertaking the company will ensure that ash disposal will be carried out as per detailed plan and in accordance with environmental safeguards as per condition No.3
6. The user agency has given an undertaking to take all measures and to prevent pollution by effluents, particulate matters etc at the project cost as per condition No.4.
7. The user agency has given an undertaking for involving local community, the afforestation measures in the blanks within the lease area, as well as along roads outside the lease area diverted under this approval. The user agency has submitted a plan to raise plantations and their maintenance on vacant patches inside the project area at the project cost as per condition No. 5.
8. The user agency has deposited **Rs. 11,70,00,000/-** as Net Present Value at the rate of 9.00 lac per hectare as per condition No.6(i).
9. The user agency has given undertaking to pay the additional amount in case there is upward revision of the rate of NPV as per condition No. 6(ii).
10. Funds recovered from the user agency has been transferred to the CAMPA fund on dated 3-10-2008 as per Nodal officer, FCA Gujarat State, Gandhinagar's letter No. C/LND/29/89-92/2008-09 as per condition No.7.
11. The user agency will include condition as desired by Forest Department, in the agreement to be executed that to whom the project might be transferred, the party will pay all charges which might become payable out of judgment of the Hon'ble Supreme Court of India, after the transfer of the project.
12. The user agency has given an undertaking to make arrangement for free supply of fuel-wood preferably alternate energy source to labourers and staff working on the project site so as to avoid any pressure on the adjacent forest areas.

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13. The user agency has given undertaking that the tree felling in forest area so diverted shall be only as per actual requirement and with prior approval of the competent authority.
 14. The user agency agrees to the condition that the forest land will not be used for any purpose other than specified in the proposal.
- In light of above compliance, it is requested to issue the formal approval under the Forest (conservation) Act, 1980.

Yours Faithfully,

(P. M. Christian)
Deputy Secretary to the Govt. of Gujarat,
Forest & Environment Department.

copy to

- 1 The Chief Conservator of Forests (Central), Ministry of Environment & Forests, Regional Office, Western region, BHOPAL-462016(M.P.)
- 2 The Nodal officer (FCA), Pr. Chief Conservator of Forest's office, Gujarat State, Gandhinagar, for information.
- 3 The select file.



FAUNA & FLORA CONSERVATION PLAN

for the area within 10 km radius from
Tiroda Thermal Power Station

ANNEXURE 7

ANNEXURE – VII

Summary report of the study on

" Post-Clearance Environmental Impacts and Cost-benefit Analysis of Power
Generation in India"

Conducted by **National Environmental Engineering Research Institute**
February, 2006

INTRODUCTION

Power generating units are mega project, which require not only huge capital investment but also various natural resources like, fossil fuels and water, thus create some impacts on the environment and generate a stress in the local eco system. Although stringent norms have been made by the regulatory agencies to control and mitigate the damages cost to the environment by the power plants, the efficacy and efficiency of the regulatory measures not been studied in detail. Therefore, a study was awarded by the Ministry of Statistics and PI to National Environmental Engineering Research Institute (NEERI). The study includes following three Thermal, one Gas and one Hydroelectric project.

- a. Super Thermal Power Plant in Chandrapur, Maharashtra
 - b. Gandhi Nagar Thermal Power Plant in Gujarat
 - c. 600 MW gas based power plant of National Thermal Power Corporation at Jhenor-Gandhar, Gujarat
 - d. 100 MW Hydro-electric Project at Koyna, Maharashtra
 - e. Super Thermal Power Plant of National Thermal Power Corporation Ltd. at Ramagundam, Andhra Pradesh.
2. The study has assessed the environmental impacts caused by these power plants and has tried to monetise those impacts in order to facilitate a better understanding of the impacts. The external impacts pertaining to the air, water, noise, land, biological and socio-economic components of the environment are enumerated below.

AIR ENVIRONMENT

3. Coal based thermal power plants affect the air quality of the surrounding region more than natural plants. Around the coal based plants the ambient sulphur dioxide concentration was in the range of 20-25 $\mu\text{g}/\text{m}^3$ in and around Ramagundam. In case of Chandrapur Super Thermal Power Station the concentration of SO_2 varied from 3.61-18.9 $\mu\text{g}/\text{m}^3$, NO_x varied from 8.89-26.55 $\mu\text{g}/\text{m}^3$ and SPM from 52.6-193.2 $\mu\text{g}/\text{m}^3$. The concentration of SO_2 , NO_x and SPM varied from 3-37, 5-34, 65-482 $\mu\text{g}/\text{m}^3$ respectively in and around Gandhinagar Thermal Power Plant (GTPP) Ambient NO_x concentration in case of natural gas based power plant was found to be in the range of 5-7 $\mu\text{g}/\text{m}^3$. From the epidemiological data of the area surrounding the Ramagundam coal based plant, it has been observed that around 6.5% of population living within a 2 km radius of the plant suffers from respiratory disorders, while the figure decreases to 3.2% at a distance of 2.5 km and becomes negligible (0.91%) at over 5 km from the plant. Thus it can be inferred that people living within 5 km radius of coal based power plant suffer from respiratory ailments.





FAUNA & FLORA CONSERVATION PLAN

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4. The emission levels depend on the standards specified by the concerned State Pollution Control Board. The health effects attributable to NO_x , the Principal pollutant emitted from a natural gas plant even within a 2 km radius are negligible.
5. Although two other gases, carbon dioxide and ozone are not considered in traditional EMPs, the high amount of carbon dioxide emission (0.9-0.95 kg/kwh) from thermal power plants contribute to global warming leading to climate change is significant enough. Ground level ozone, which is formed due to photolytic reactions of NO_x is not monitored in India and the paucity of accurate models to predict their levels, the impacts due to ozone cannot be quantified.
6. The normal operation of a hydroelectric plant does not affect the air environment. Latest studies have found that the levels of harmful greenhouse gases like methane emitted due to decomposition of vegetation submerged under water can be significant. Detailed research regarding such emissions is still under progress.

WATER ENVIRONMENT

7. The water requirement for a coal-based power plant is about 0.005-0.18 m^3/kwh while that for a natural gas plant is about 0.003 m^3/kwh . At Ramagundam Super Thermal Power Plant (RSTPP) the water requirement has been reduced from about 0.18 m^3/kWh to 0.15 m^3/kwh after the installation of a treatment facility for the ash pond decant. At Chandrapur also major part of treated effluent is utilized for ash slurry preparation, while part of the ash pond overflow is discharged into the river.
8. The waste water treatment facilities adopted by the thermal power plants are generally sufficient to attain the standards stipulated by the concerned regulatory authority, used in the cooling towers is generally disposed off at temperature 4-5 $^\circ\text{C}$ above the prevalent surface water temperature, which can harm the local aquatic biota. In order to avoid such thermal pollution, the power plants dispose off the effluent by means of a long and open channel, due to which the temperature of the effluent comes down to the level of that of the surface water by the time it reaches the receiving body. Therefore, no loss of fisheries or other aquatic biota was observed due to thermal pollution by power plants.
9. Water slurry is used to take the ash from the power plant to the ash pond for disposal. There are two impacts associated with the ash pond decant. The first point is that this water slowly seeps into the ground while carrying with it the ash leachate. The water may contain harmful heavy metals like boron, which have a tendency to leach out over a period of time. Due to this the ground water gets polluted and may become unsuitable for domestic use. This point also could not be determined factually as there was no systematic testing of ground water for the presence of heavy metals. The second factor affecting the water environment is the release of ash pond decant into the local water bodies. At RSTPP, it was found that the ash pond decant leaked into a small natural channel and later joined the Godavari river. This could be because of bad dyke design or a deliberate attempt to dispose off the water without any treatment. Such release of ash pond decant tends to deposit ash all along its path thereby causing fugitive dust nuisance when it dries up. Also when such water mixes with a water body, it increases the turbidity of the water body thereby decreasing the primary productivity. This is harmful to the



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fisheries and other aquatic biota in the water body. Similarly in case of Chandrapur, though efforts have been made to recycle 100%, a part is still discharged into the river. In Gandhingar Thermal Power Plant(GTPP), the treated effluent is discharged into the non-perennial Sabarmati river. However, based on NEERI's studies the authority have put up appropriate environmental management plants to reuse the treated effluent.

10. In the case of hydroelectric plants water environment is affected due to the stagnation of water in the reservoir. If the reservoir accumulates runoff from agricultural fields, the water may contain high amounts of fertilizer and pesticide residues, which may accumulate in the reservoir. However, in the case of Koyna Hydro Electric Project (KHEP), as it was at the upper reaches of its catchment, there were no agriculture fields at its upper reaches. Another point of consideration is that the formation of dam blocks the migratory path of certain fresh water fishes. In the case of Koyna river, since the water flow upto the site of dam was quite rapid, there was very small presence of fisheries. Therefore, there has been no loss to fisheries due to the construction of the dam.

NOISE ENVIRONMENT

11. The exposure of employees to high noise levels is more in the coal based thermal power than in the natural gas based or the hydroelectric plant. In the case of effect of noise levels of the power plants on the local population, it has been observed that based on the stipulated requirements of various environmental bodies, the power plants have taken up sufficient measures like tree plantations to attenuate the noise levels outside their premises. However, the increased transportation activities due to the operation of the power plants have led to an increase in noise levels in the adjacent localities. But since transportation activities do not fall under the purview of the power plants, no specific measures have been taken for the same.

LAND ENVIRONMENT

12. The land requirement per mega watt of installed capacity for coal, gas and hydroelectric power plants is 0.1-4.7 ha., 0.26 ha. and 6.6. ha. respectively. In case of coal based power plants the land requirement is generally near the area to the coal mines. While in the case of gas-based it is any suitable land where the pipeline can be taken economically. Land requirement of hydroelectric power plants is generally hilly terrain and valleys. Loss of agriculture land in case of gas based power plant was 168 ha. and hydroelectric was 230 ha. or 0.13 ha/MW. In case of coal based plants, the site was devoid of any forest while in case of gas-based plant it was primarily agricultural land. Loss of forest for KHEP was 1150 ha.
13. 321 ha., 2616 ha. and 74 ha. of land were used to dispose flyash from the coal based plants at Ramagundam, Chandrapur and Gandhinagar respectively. Due to this there is change in natural soil properties. It becomes more alkaline due to the alkaline nature of flyash.

BIOLOGICAL ENVIRONMENT

14. The effect on biological environment can be divided into two parts, viz. the effect on flora and the effect on fauna. Effect on flora is due to two main reasons land acquisition and due to flue gas emissions. Land acquisition leads to loss of habitat of some species. Loss of such habitat or forests has not been there for the thermal power plants while in the



