SUMMER INTERNSHIP REPORT

To Study the Status of Compliance of Approval Conditionalities for Forest Land Diversion due to Coal Mining

Organization – Ministry of Environment and Forest, Regional Office Bhopal

Submitted by –
Robin Singh(950)
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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 – Coal Mining** " done by **Robin Singh** and **Sakib Mehraj** (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, **Robin Singh** and **Sakib Mehraj** (PFM 2009-11), hereby declare 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 – Coal Mining** " 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: Bhopal

Date: 15-06-10

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Executive Summary

In India the mining operations have degraded significant area of land and have replaced the ecosystem of the mined out areas with the undesirable waste materials in form of overburden dumps. The process of coal extraction drastically alters the physical and biological nature of the mined out areas, so the land protection becomes an inevitable aspect and should be given the prime importance right from the initial stage of mining operation. However in most of the mining areas in India, large scale exploitation of mineral resources has been carried out since early days of mining without taking due care of the land protection and also without any proper plan for the future use of degraded land. Due to these unscientific mining techniques used earlier large scale degradation of land, subsidence of strata, disturbance of water table, pressure on the nearby forest areas, threat to flora and fauna and many other hazards have taken place. Inspite of the above mentioned drawbacks of coal mining, coal is the main source of energy in most of the developing countries like India which is always short of energy for the purpose of development process and therefore coal mining becomes a necessary trade off to carry forward this development process so the authorities realized that the need of the hour would be to regulate the whole process of coal mining operations and ensure proper clearance and compliance of approval conditionalities of the forest land diversion due to mining. Therefore in order to make a formal process which would be followed by all, a law was made under the provisions of Forest Conservation Act 1980, (FCA) under which prior approval of the Central Government is essential for the diversion of forest lands for any kind of non-forestry purposes. The main objective of the project was to study the status of compliance of the approval conditionalities of forest land diversion for coal mining. These conditionalities are laid by the Ministry of Environment and Forest as per the Forest Conservation Act 1980 and also on the basis of the type of proposal.

Major approval conditionalties of forest land diversion for coal mining as per FCA 1980

• Compensatory Afforestation

• Net Present Value (NPV) of the Environmental Loss

• Demarcation of the Mining Lease Area

• Restoration and Reclamation

• Maintenance of Safety Zone

• Treatment of Water before Discharge

• Free Supply of Coal to Labourers and Staff Members

• Afforestation in Blank Areas

• Managing Surface Subsidence

Observation - Status of Compliance of Approval Conditionalities

• The cost of compensatory afforestation has been realized in all the cases however due to non release of funds from Compensatory Afforestation Fund Management and Planning Authority (CAMPA), the compensatory afforestation was done for two mining projects only. The compensatory afforestation is done over small patches of degraded forest land which are scattered and therefore difficult to manage. These sites are not properly marked therefore its difficult to identify them

• As per the orders of the honb'le Supreme Court the NPV of the environmental losses is being realized from the user agencies of projects involving the forest land diversion since 2002.The NPV of the environmental loss has been realized in all the cases.

• The demarcation of mining lease area is done in all the underground mining projects however this condition is not followed in open cast mining projects. This creates the problem of identifying the lease area from the non lease area and also there is always a possibility of over stepping the lease area

• The restoration and reclamation process of the mined out areas is governed by various statutes like Mineral Conservation and Development Rules 1988, Rule 33.However the national standards for restoration and reclamation are not followed in most of the cases of open cast mines. In some cases backfilling is done but no standard methods are followed for the treatment of toxic substances. Also there are no standards or studies carried out to reduce the hydrological impact over the reclaimed area as in what precautions should be taken to maintain the water content in the overburden dumps and also to improve the landscape of the degraded area.

• The safety zone around the mine lease area is not properly maintained in all the projects

• The water is treated by the process of sedimentation in most of the cases except in two cases where chemical treatment is also done. There are no guidelines for the proper treatment of water discharged from the mined out areas. In a few cases like Gorbi open cast mine at Singraulli, the water left after the

mining had turned acidic due to the pyrites in coal and there were no standards to anticipate or deal with this kind of situation.

• The user agencies are supplying free LPG cylinders per month to every labourer and staff member so as to reduce the pressure of fuel wood on the nearby forest land

• The afforestation of blank areas where forest density was less than 0.4 over the mining lease area was partially done in all the cases of underground mining.

• There were no major signs of surface subsidence except a few cracks at places where depillaring was going on, however these cracks and depressions were checked and filled at regular intervals. The subsidence is monitored by using concrete pillars which are put half inside the land surface at equal intervals. The subsidence of these pillars is monitored in order to find out the subsidence pattern of the area however there is always high probability of error

Recommendations

• Monitoring the status of compliance of conditionalities to be fulfilled after final clearance

In all the projects the conditionalities such as NPV, money for the compensatory afforestation etc which are required to be fulfilled for the final clearance are complied strictly however once the user agency gets the final clearance the other conditionalities as per the FCA are neither fulfilled nor monitored.

• Use of non forest land for Compensatory Afforestation (CA)

The user agencies which are the subsidiaries of Coal India Ltd are exempted from the condition to provide revenue land for compensatory afforestation. This relaxation prevents the addition of area to the present forest land

• Demarcation of pillars around the mining lease area and CA sites – Use of Global Positioning System (GPS)

Demarcation of pillars will help in distinguishing the mining lease area from the non lease area; also it would help in preventing the encroachment. The demarcation should be done using GPS as it would help

in locating and monitoring the mine lease area

• Outsourcing afforestation and landscape maintenance activities

Monitoring the compliance of approval conditionalities can be outsourced to experts as it will help in speedy restoration of the degraded forest land. Afforestation activities including plantation in vacant areas, over burden dumps and compensatory afforestation could also be outsourced

• Laws governing reclamation plan should be stringent

*Mineral Conservation and Development Rules 1988, Rule – 33 which deals with the restoration and reclamation of mined out areas does not highlight the need of scientific methods for the whole process.

• Restoration of Landscape

This aspect deals with the restoration and reclamation process involved in case of open cast mining. There is a need to make the statues more stringent and also to monitor the user agencies to make sure that scientific methods are used for restoration and reclamation of mined out areas.

• Speedy restoration of worked out areas in open cast mines

There should be speedy restoration of worked out areas and backfilling of the quarry should be done as per the reclamation plan of the user agencies which is approved in their Environmental Management Plan.

• No clearance for mining deep inside the forest areas

Mining should be not allowed in the forest cover with density more than 0.5. For mining well below 80 meters opencast mining should not be allowed, if underground mining is possible. As per our observation underground mining causes very less impact on the forests and its surrounding areas compared to the opencast mining.

• Need for Innovation – Transplantation of trees

There is a need for a comprehensive study to protect semi mature trees and well established forest cover. If mine under consideration is given lease to go for the open cast mining, then well grown up trees should be transplanted to degraded forest sites. The compensatory afforestation done anywhere takes decades of

years to add to the environmental capital, however if the survival rate of transplantation is even around 40%, it will always be a better way of recovering the loss.

ACKNOWLEDGEMENT

We would like to express our deepest sense of gratitude to Mr. A.K.Rana(CCF,MoEF Regional office, Bhopal) and Mr. Sujoy Banerjee(DCF,MoEF Regional office,Bhopal) for providing us an opportunity to work on this project. Without their constant support and guidance, the successful completion of this work would not have been possible.

We would also like to thank the concerned CCFs, and DFOs of the six districts (Bilaspur,Korba,Shahdol,Singraulli,Betul,Chindwara) for their constant guidance during the field work period. Their vast knowledge pool was a great inspiration and helped in better understanding of the project work. Thanks are also due to Directors of SECL, WCL and NCL for their support as well as all the other members of the respective organisations for making our stay at the organization a pleasurable one.

Of course, all the learning would have been impossible without the support provided by Dr. R.B.Lal (Director, IIFM) and Dr. CVRS Vijaya Kumar (Summer Internship Coordinator, IIFM) in making the internship possible under the Course.

Lastly, a big thank you to our families for their encouragement, and our dear batch mates for their unrelenting spirit and confidence in our abilities.

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1.1 Background of the Project

In India the mining operations have degraded significant area of land and have replaced the ecosystem of the mined out areas with the undesirable waste materials in form of overburden dumps. The process of coal extraction drastically alters the physical and biological nature of the mined out areas, so the land protection becomes an inevitable aspect and should be given the prime importance right from the initial stage of mining operation. However in most of the mining areas in India, large scale exploitation of mineral resources has been carried out since early days of mining without taking due care of the land protection and also without any proper plan for the future use of degraded land. Due to these unscientific mining techniques used earlier large scale degradation of land, subsidence of strata, disturbance of water table, pressure on the nearby forest areas, threat to flora and fauna and many other hazards have taken place. Inspite of the above mentioned drawbacks of coal mining, coal is the main source of energy in most of the developing countries like India which is always short of energy for the purpose of development process and therefore coal mining becomes a necessary trade off to carry forward this development process so the authorities realized that the need of the hour would be to regulate the whole process of coal mining operations and ensure proper clearance and compliance of approval conditionalities of the forest land diversion due to mining. Therefore in order to make a formal process which would be followed by all, a law was made under the provisions of Forest Conservation Act 1980, under which prior approval of the Central Government is essential for the diversion of forest lands for any kind of non-forestry purposes.

Mining of sedimentary deposits i.e. coal, lignite, pyrite, rock phosphate, limestone etc. is being done by the following two methods depending upon the conditions of occurrence

1. Open cast Method – This method is used when the deposits are thick, nearly flat and close to the surface so that they can be extracted economically by removing the overburden. In this technique open cuts are made over the area where coal is found and this is done by removing the overburden by blasting

it and then by shovel. The overburden is initially dumped externally as there is no mining land to store it and subsequently the dump is backfilled in to the mining area. (Sengupta, 2000)

2. Underground Method – This method is used when the coal deposits are situated at a depth from where it's not possible to extract them economically by removing the overlying rock mass. In this method the mouth of the mine is cut which is called the incline and is reached upto the depth where the coal seam is feasible to extract. In India board and pillar method is used widely where the coal is extracted and then the roof is supported by pillars however in some places long wall technique which uses iron rotators to cut the coal wall and hydraulic supporters to support the roof. The air quality for the workers is maintained inside the mine by ventilators. The coal is transported by rail trolleys or conveyor belts. (Sengupta, 2000)

1.2 Impact of opencast mining on the forest area

1. The opencast mining involves the removal of all the vegetation from the areas where mining is to be done and also from those places where overburden mass will be dumped (Saxena & Singh, 2000)
2. The blasting of overburden which is a part of mining process causes noise, vibration and dust which disturbs the wildlife of the nearby forest areas. The dust gets settled on the skin of animals and also on the leaves of the trees which hampers their growth (Saxena & Singh, 2000)
3. The opencast mining causes alterations to the topography of the mining area as it involves the digging of the area. This ultimately leads to the change of landscape which is very displeasing to the eyes (Saxena & Singh, 2000)
4. The opencast mining damages the aquifers of whole area of mining due to which the surface and underground water bodies are drained out. This causes noticeable reduction in availability of water in nearby areas (Saxena & Singh, 2000)
5. Acidic water discharge is one more problem associated with the opencast mining which happens mainly at those places where pyrite content in the coal is high. This leads to the pollution of the nearby water bodies and also affects the growth of vegetation (Saxena & Singh, 2000)

1.3 Impact of Underground Mining on the Forest Area

1. The removal of vegetation is comparatively less in case of underground as the surface area required for carrying out the mining operation is very less. (Saxena & Singh, 2000)
2. Depressions which occurs mainly due to pit subsidence may cause the tilting of trees and a few trees may even fall (Saxena & Singh, 2000)
3. The surface drainage pattern may change due to water logging in the depressions caused by the subsidence (Saxena & Singh, 2000)
4. There can be leakage of air through cracks developed as a result of subsidence which may cause underground fires and in some cases leads to the surface fire (Saxena & Singh, 2000)
5. Damage caused to the aquifers may reduce the availability of water in the surrounding areas (Saxena & Singh, 2000)
6. The water pumped out of the underground mines has higher hardness and presence of coliform bacteria (Saxena & Singh, 2000)

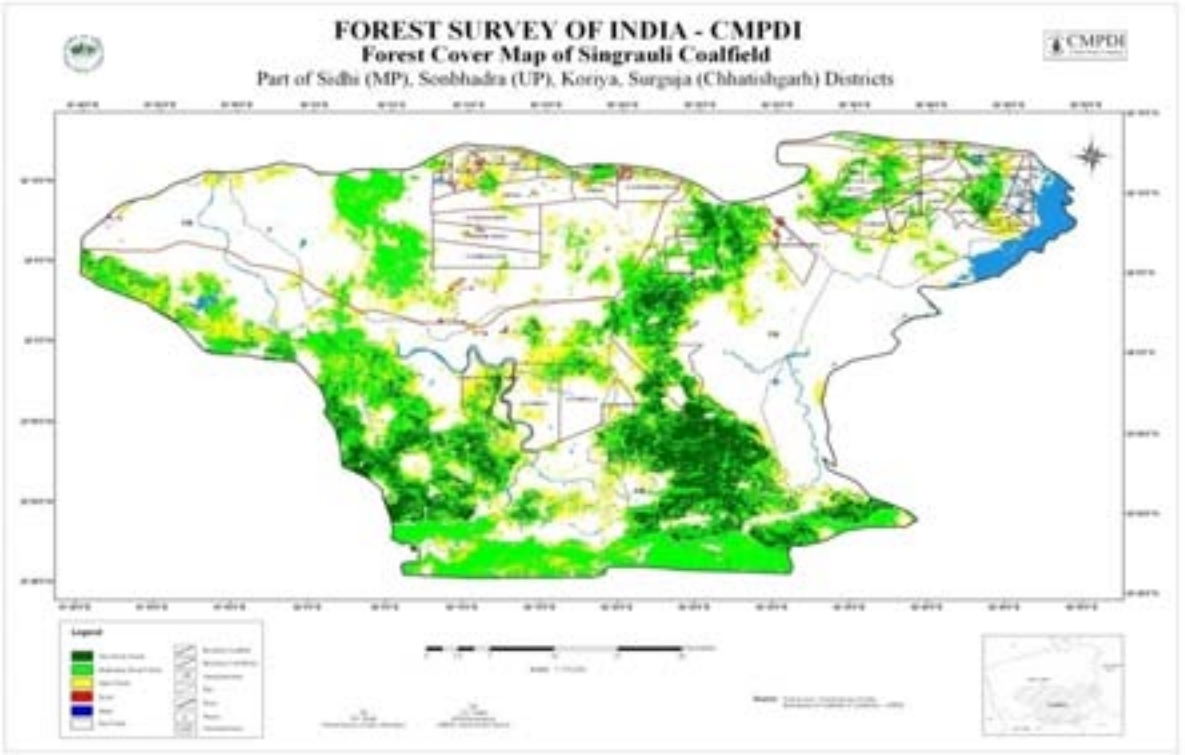

FIGURE 1 FOREST COVER MAP OF SINGRAULI COALFIELD (MINISTRY OF ENVIRONMENT AND FOREST)

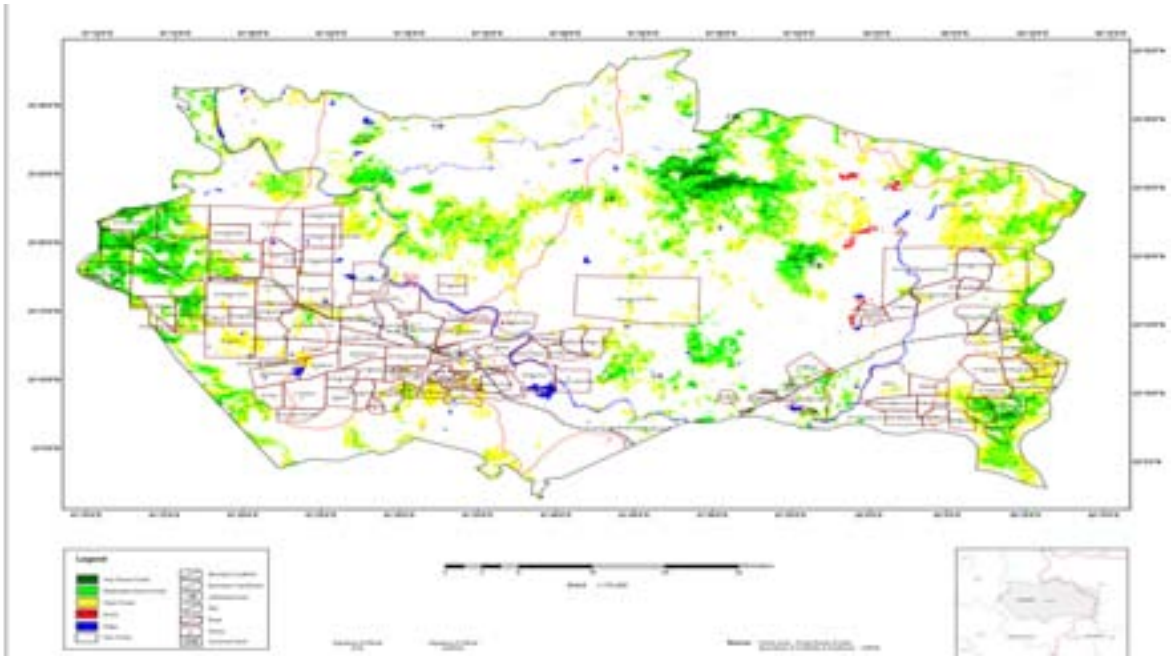

FIGURE 2 FOREST COVER MAP OF SOHAGPUR COALFIELD (MINISTRY OF ENVIRONMENT AND FOREST)

1.4 Objective

Study, analysis and evaluation of the status of compliance of major approval conditionalities of forest land diversion for coal mining projects

The regulation of forest land diversion for non-forestry purpose is done by the MoEF under the Forest Conservation Act 1980. The approval conditionalities of forest land diversion laid down under Forest Conservation Act 1980 depend on the type of project involved. The primary objective of the project was to study the status of compliance of approval conditionalities of forest land diversion for coal mining projects as in what is the present status of compliance of the conditionalities which are to be met before the final clearance and also those which are to be met after getting the final clearance for the forest land diversion. Although the upfront conditionalities which are to be met for getting the final clearance are

fulfilled by user agencies in all the projects however those conditionalities which are to be fulfilled after getting the final clearance are not properly adhered and also there is no monitoring done by the concerned authorities. The main focus of the project was to analyse and evaluate the status of compliance of those conditionalities which were to be met after getting the final clearance

1.5 Methodology

1.5.1 Field Study

The field study included the visit of twelve coal mining projects which includes five open cast and seven underground mining projects in different districts of Madhya Pradesh and Chattisgarh and a thorough study of different parameters on the basis of on sight observation, literature review and secondary information from the people associated with the projects.

TABLE 1 LIST OF PROJECTS

State	District	Project Name
Chattisgarh	Korba	Manikpur OC
		Rajgamar UG
		Gevra OC
Madhya Pradesh	Shahdol	Navegaon Rajendra UG
		Dhanpuri OC
	Singraulli	Khadia OC
		Block B Gorbi OC
	Chindwara	Navegaon UG
		Rawanwarakhas UG
		Mahadeopuri UG
	Betul	Tawa I
		Tawa II

(Source- Self)

Domain of Field Visit

- Mining Lease Area
- Compensatory Afforestation Site
- Overburden Dumps and Reclaimed Areas

FIGURE 3 LIST OF VISITED MINING SITES IN MP & CHATTISGARH

(Source – Self)

1.5.2 Literature Review

The literature review included the study of the following documents –

- Forest Clearance – This is the clearance letter given by the MoEF for forest land diversion to the user agencies
- Conditionalities – The approval conditionalities are laid down by the MoEF under the Forest Conservation Act 1980 as per the project.
- Environmental Impact Assessment Report (EIA)/ Environment Management Plan (EMP) – The Environmental Impact Assesment and Environment Management Plan were also a part of study to analyze the impact of mining operations on the environment and also the mitigation measures carried out by the user agency

1.6 Major Approval Conditionalities

To regulate the process of forest land diversion for coal mining, the MoEF has laid down various approval conditionalities under the Forest Conservation Act 1980 for minimizing the impact of degradation caused due to mining. These conditionalities vary depending on the purpose of forest land diversion and also the project involved. However there are certain major approval conditionalities which are common for all the forest land diversion cases for the open cast coal mining projects and some for the underground mining projects

Major Approval Conditionalities of forest land diversion

- **Compensatory Afforestation** – Under this conditionality the user agency is subject to pay the cost of compensatory afforestation to be done over an equivalent non-forest area of land and if non-forest land is not available then the payment will be done for the afforestation over double the area on degraded forest land. The rationale behind this conditionality is to compensate the loss of forest degradation in case of open cast mining by having afforestation done over some other land. Also as per the FCA 1980, the land should be in the vicinity of the area diverted for mining and if not possible then it should be near a forest area. (FCA 1980)

- **NPV of the Environmental Loss** – The user agency is also required to pay for the loss of vegetation, wildlife and also the degradation caused to the environment. This conditionality is followed only after the Honbl'e Supreme Court had given orders by taking a review of recommendations made by Central Empowerment Committee regarding the payment of NPV as it was realized that payment of the cost of compensatory afforestation is not enough to recover the loss done to the forests and the environment and therefore NPV should also be realized. The NPV is calculated per hectare depending on the quality of the forest area diverted for mining. (FCA 1980)

- **Demarcation of the Mining Lease Area** – In order to distinguish between the lease area and the non-lease area the user agency is required to properly demarcate the mining lease area by erecting the stone wall fencing/trenching. (FCA 1980)

- **Restoration and Reclamation of Worked out Areas** – The mining operations especially the open cast, generates considerable quantities of overburden depending on the nature of occurrence of the deposit, method of mining adopted etc. The solid waste management is an essential component of any mining operation as it is one of the critical factors causing degradation of land. The active overburden dumps cause great damage to environment and terrestrial ecosystem and therefore there is a need for restoration and reclamation. The restoration implies the restoring the land to something like its original form and reclamation implies that the land will be returned to a form that is in conformity with the prior land use plan. The mining activities involve huge quantities of earth movement resulting in land degradation in form of huge dumps. With environmental awareness, people started realizing the impact of these mining activities and a common feeling developed that something is required to be done about the restoration and the reclamation of the sites. This particular aspect brought the very concept of adaptation of reclamation of along with the standard mining operations. (FCA 1980)

- **Maintenance of Safety Zone** – The user agency is required to maintain the safety zone around the mining lease area in form of plantation strip whose width varies. The user agency is also required to maintain the safety zone by fencing and protection from grazing animals. Apart from this regeneration of the safety zone is also to be done by the user agency. (FCA 1980)

- **Treatment of water to be discharged-** The water which is discharged from the mine is to be treated before it is discharged for any use. The water contains particles of coal dust which makes it necessary to treat it by sedimentation as well as by chemical treatment so that if the pH level of water has decreased then it would be treated before use. The water which is discharged from the mines is either used for dust suppression of the roads and by the local villagers or it joins a nearby water body therefore the treatment of water has to be done. (FCA 1980)

- **Free Supply of Coal to Labourers and Staff Members** – The user agencies are required to supply free coal to labourers and staff members for every month. This conditionality is based on the logic that it will reduce the pressure of fuelwood on the nearby forest areas and therefore help in protection of forests. (FCA 1980)

- **Afforestation in Blank Areas** - This conditionality states that wherever possible and technically feasible the user agency shall take up afforestation measures in the blanks within the underground mining lease area. This is mainly done in those patches where density is below 0.4 so that the forest cover is maintained. The user agency is required to protect the area till the life of the mining in consultation with forest department. (FCA 1980)

- **Managing Surface Subsidence** – In case of underground mining due to the surface movement and strata movement there is always a possibility of subsidence which can be either pit subsidence or trough subsidence. The user agency is required to manage this subsidence by taking precautions and also following the standard procedures. The user agency is also required to monitor the surface subsidence over a period of time in those areas where depillaring has been done. (FCA 1980)

Chapter 2 Open Cast Mining Projects

The project included the field visit of five open cast mines to study the status of compliance of their approval conditionalities. The mining sites were located in three different districts of Madhya Pradesh and Chattisgarh. The following table shows the details of the project sites.

TABLE 2 OPEN CAST MINES

S.No	Project Name	District	State
1	SECL Manikpur	Korba	Chattisgarh
2	SECL Gevera	Korba	Chattisgarh
3	SECL Dhanpuri	Shahdol	MadhyaPradesh
	NCL Khadia	Singraulli	Madhya Pradesh
	NCL Block B Gorbi	Singraulli	Madhya Pradesh

(Source – Self)

2.1 Manikpur Open Cast Mine in District Korba, Chattisgarh (User Agency – South Eastern Coal Fields Limited (SECL))

FIGURE 4 MANIKPUR OPEN CAST MINE (P.OB)

Area of forest land diversion for Manikpur open cast mine - 181.177 ha(forest clearance)

2.1.1 Approval Conditionalities for forest clearance

- The compensatory afforestation shall be raised over degraded forest land double in extent to the forest land utilized after 25-10-1980 i.e. over 282.714 ha (2X141.357). The user agency shall transfer the cost of compensatory afforestation to the state forest department. (Forest Clearance)
- The penal compensatory afforestation shall be raised and maintained over degraded forest land double in extent of forest (conservation) act, 1980 i.e.362.354 ha. (Forest Clearance)
- The user agency shall create fence and maintain a safety zone around the mining area. The user agency will deposit funds with forest department for creation, protection and regeneration of

safety zone area. The user agency will have to bear the cost the cost of afforestation over one and a half time of safety zone area in degraded forest elsewhere. (Forest Clearance)

- The reclamation of mines shall be carried out concurrently and should be regularly monitored by the state forest department. (Forest Clearance)
- RCC pillars of 4 feet height shall be erected by the user agency at the project cost to demarcate the area and the pillars will be marked forward and back bearings. (Forest Clearance)
- The state government shall charge net present value(NPV) from the user agency for the entire diverted forest land. (Forest Clearance)
- An undertaking from the user agency may also be obtained stating that in case rated NPV rate are revised then the user agency should pay revised/differential amount. (Forest Clearance)
- All the above mentioned funds shall be deposited in compensatory afforestation fund management and planning authority (CAMPA). (Forest Clearance)
- The permission granted under FC act shall be co terminus with the mining lease granted under MMRD act for 20 years or whichever is less. (Forest Clearance)
- Other standard conditions as applicable to proposals related to mining shall apply in the instant case only.

2.1.2 Observations

2.1.2.1 Status of compliance of approval conditionalities (As per personal observation)

- Money for the compensatory afforestation is deposited in the state forest department. Forest management plan has been made for the compensatory afforestation.

- Funds for the penal afforestation have been deposited in CAMPA.

- Funds for the creation, fencing & maintenance of safety zone around the mining area has been deposited CAMPA, New Delhi. Fencing around the mining area was done properly and in coordination with Forest Corporation (Van Vikas Nigam) plantation is carried out in the safety zone

- Demarcation of land was not done properly. Old demarcation pillars were hard to distinguished and also there no data available on the pillars

- Reclamation schedule is well prepared by the user agency before the mining process. The user agency hardly stick to their mining reclamation plan

- The top soil is partially preserved. There was no scientific methodology to preserve and the treat the top soil. Quality of top soil degrades over the period of time when kept in open for long

- Water discharged through the mines is chemically treated using the effluent treatment plant

2.1.3 Environment and Socio-economic conditions (as per Environmental Impact Assessment and Environment Management Plan)

2.1.3.1 Status of forest cover before the mining

Mixed forest of site quality IV and density of forest 0.5 i.e. in total forest cover, 50% is occupied by the trees.

Dump stabilisation – during mining over burden dump is allocated in the external dump and internal dump. Internal backfilling is maximised by the user agency to reduce the land requirements. To keep the dump stable, external as well as internal dump are kept flat and plantation is being done to keep the top soil intact and also to improve the aesthetic value of the site.

FIGURE 5 ADJACENT FOREST COVER AT MANIKPUR OPEN CAST MINE

(Source – Self)

2.1.3.2 Rehabilitation & resettlement

Mining operation will affect the families in the mine take area. One village named Bhilai consisting of 100 families was rehabilitated. Various development works like construction of primary school, community center, and primary health centre, construction of roads etc. have been done for catering the need of people and also for socio economic upliftment of society.

2.1.3.3 Plantation as mitigation measures against environmental pollution

Creation of green belt between coal stocks and the colony. Total no. of saplings planted in Manikpur open cast extension is 940665. Out of which 830500 numbers are planted in dumping areas, 19500 planted in colonies and 90665 in the vacant land areas. Plantation of these trees has taken off some pressure from nearby forest for the firewood.

Plantation is made on the slopes of overburden dump to avoid the sliding of the soil.

2.1.3.4 Water discharge

Manikpur is having the domestic effluent treatment plant of 0.5 mld. The mine effluent is first passed through settling tank. The treated mine water is then reused/recycled within the mine premises i.e. for watering of plants, washing of vehicles/HEMM, water spraying on roads etc. the extra treated water is then discharged into nallah/canal.

In Manikpur open cast, total 212 ha of external dump area has been already been covered under biological reclamation. In internal dumps, 15.5 ha area has been done so far.

2.1.3.5 Environment mitigation plan

- All permanent roads on surface for transportation of overburden/ coal are made black topped
- All temporary roads within the mine pit are provided with 25 mm thick layer or similar material having minimum content of 200 mesh size material
- Water spraying using mobile water sprinkler being done regularly on roads within the mining area to minimize the dust generation
- Automatic water spraying arrangement has been provided for 1.7 km length
- Plantation all along the haul roads is raised to minimize transport generated pollutants
- The de- coaled quarries is converted into the water body. This helps in recharging the ground water in future

- Maximum backfilling is practiced to minimise further degradation of land

Surface water sources in mining area:-

- Workshop effluent
- Mine water at discharge point
- Downstream of Hasedo river
- Upstream of Hasedo river
- Mine water from eastern quarry no.1

2.1.3.6 Impact on flora & fauna

- There is no endangered and endemic species in core and buffer zone
- Plantation of native species is done to improve the green cover in and around the immediate vicinity of the mine area
- Efforts are made to conserve the flora & fauna in the immediate surroundings of mining area

2.1.3.7 Land reclamation

The over burden dump will be terraced with bench heights of 30m. The top OB bench is graded and leveled to facilitate drainage of rain water away from the quarry. Simultaneously, the surface of the filled OB would be given a cover of top soil for plantation. Technical and biological reclamation of the backfilled area is done with adequate provisions. The process of land reclamation involves adequate level of tree plantation and restoration of the land to forest grade.

2.2 Gevera Open Cast Mine in District Korba, Chattisgarh (User Agency- SECL)

FIGURE 6 GEVERA OPEN CAST MINE

(Source – Self)

Area of forest land diversion for Gevera open cast mine- 100.898 ha

2.2.1 Approval Conditionalities for forest clearance

- Legal status of forest land shall remain unchanged (forest clearance)
- Compensatory afforestation shall be raised & maintained by state forest department (forest clearance)
- Fencing, protection & regeneration of the safety zone area (forest clearance)
- Wherever feasible user agency shall undertake afforestation in the blank areas (forest clearance)

- Planting of adequate drought hardy plant species and sowing of seeds to arrest soil erosion (forest clearance)
- Demarcation of mining lease area using 4 feet high reinforced cement concrete pillars with serial numbers, forward & back bearings and distance from pillar to pillar (forest clearance)
- The forest land shall not be used for any purpose other than that specified in the proposal (forest clearance)
- The state government shall charge NPV from the user agency for the entire diverted land as per the guidelines issued by MOEF (forest clearance)

2.2.2 Observations (as per personal observation)

2.2.2.1 Status of Compliance of Approval Conditionalities

- Legal status of forest remains unchanged

- Money for the compensatory afforestation is deposited in the state forest department. Forest management plan has been made for the compensatory afforestation.

- Funds for the penal afforestation have been deposited in CAMPA.

- Funds for the creation, fencing & maintenance of safety zone around the mining area has been deposited CAMPA, New Delhi. Fencing around the mining area was done properly and in coordination with Forest Corporation (Van Vikas Nigam) plantation is carried out in the safety zone

- Demarcation of land was not done properly. Old demarcation pillars were hard to distinguished and also there no data available on the pillars

- Reclamation schedule is well prepared by the user agency before the mining process. The user agency hardly sticks to their mining reclamation plan however no scientific methods are followed.

FIGURE 7 EXTERNAL DUMP OF GEVERA OPEN CAST MINE

(Source – Self)

- The top soil is partially preserved. There was no scientific methodology to preserve and the treat the top soil. Quality of top soil degrades over the period of time when kept in open for long.

- Water discharge through the mines does not undergo any chemical treatment. Water discharged undergoes only sedimentation process

2.2.2.2 Environmental management plan (as per EMP &EIA)

- Generation of environmental data bank
- Compensation to the land losers

- Land restoration
- Rehabilitation & resettlement plan

No. of project affected persons- 7058, out of which 6158 comes under the additional mine lease area.

- Pollution control measures

Water spraying by sprinkler (approach roads, coal transportation roads, within mining area)

7 nos. Of 28 kl, 14.5 kms of fixed water sprinklers, plantation of 36.98 lakhs saplings, conveyor belts(to be provided with cover) to be employed for the movement of coal mined from mine pit to surface, surface miner to be deployed for coal mining to reduce dust levels

- Water management

Management of surface water drainage: - garlands drains will be made around the periphery of the quarry. Mine water discharge & industrial effluent (settling tank + oil & grease trap for workshop effluent treatment)

- Control measures for noise

Lined chutes in silo to reduce noise, regular monitoring, and regular maintenance schedule for Heavy machineries and equipments

- Blasting vibration control plan

Vibration standard depends on the type of structure. There is permissible peak particle velocity at foundation level of structures in mining areas (mm/s)

- Green belt development/ plantation

Shock absorbers against dust and sight curtain in the periphery of mining areas. Haul roads, all other roads and vacant spaces

Infrastructural facilities (Nursery)

2.2.2.3 Land reclamation

Backfilling of overburden into the excavated voids and bringing back the land to some productive use i.e. agriculture, forestry / recreational purposes. Systematic handling of top soil, top soil storage, top soil and other materials removed shall be stock – piled only when it is impractical to promptly redistribute such materials on re graded areas.

Stock piled materials shall be selectively placed on stable area, not disturbed, and protected from wind and water erosion, unnecessary compaction, and contaminants which lessen the capability of the materials support vegetation when redistributed.

Top soil redistribution, technical reclamation, biological reclamation,

Plantation technique on overburden dumps

- The top surface of OB dumps selected for afforestation will be roughly levelled by dozer keeping a mild slope of about 1 in 200 for surface water drainage
- Seeds of grass legumes will be sown on beds of 1.5m X 0.5m, alternating with slopes to be planted with tree species. Gully plugging and constructing check dams on water courses flowing through OB dumps with boulders, will also be made to arrest soil erosion.
- The pit sizes 45X45X45 cm will be dug at spacing of 2.0X2.0 m on the top surface as well on the gentle slopes of the dumps.

Funds allocated under Environmental Management Plan for conservation efforts

- Heavy machineries and equipments for reclamation (Dozers, water sprinklers)
- Afforestation/Habitat restoration (nursery raising, mixed plantation on dumps etc.)
- Compensatory afforestation
- Conservation of fauna
- Fencing of quarry area
- Distribution of saplings of fuel supply in neighboring villages
- Enrichment of forest
- Arboriculture plantation

2.2.2.4 Socio economic impact

- Population growth & in migration
- Human settlement & resettlement/ rehabilitation
- Transport & communication
- Income & employment
- Civic amenities & community development
- Educational facilities & literacy drives
- Economic growth
- Growth of finance revenues- state & capital
- Social status growth
- Status of forest before mining:
- Mixed forest, site quality – III B, density – 0.1 to 0.2

2.2.2.5 Observations (as per personal observation)

- Fixed water sprinklers were not working properly as per mentioned in EMP. Dust suppression system mainly involved mobile sprinkler which leads to lot wastage of water.
- Conveyor belt was not commissioned for the movement of coal mined from mine pit to surface.
- Nursery for supply of seedlings with adequate infrastructural facilities. Plantation done in the vacant areas, on both sides of haul roads
- Plantation of 10 years was done on the internal dump. It was of mixed species with density of 0.8
- External dump was being prepared for the process of plantation.
- Money for the compensatory afforestation was deposited in the CAMPA fund by the user agency. But there is no plantation work that has been carried out by the forest department
- There is no provision to protect the top soil from wind, water erosion, unnecessary compaction, & other contaminants which lessen the capabilities of soil/any stock piled materials.
- There was no fencing around the plantation site as well as along the roads. The damage due to the plant due to cattle is negligible as it is well protected by the Rajya van vikas nigam for three years from the plantation. The main pressure on the growing trees is from the people who are residing near the mining area/nearby villages affected due to mining activities

- There is significant change in the social status of the area due to mining projects. It had accelerated in the urbanization process with creation of new employment opportunities. Under the community development work various educational institutes and programs have been launched. And also due to increase in industrial activities and population growth in the area, transport & communication system have improved over the period of time.
- Both external and internal dumps are leveled to avoid water accumulation

2.3 Dhanpuri Open Cast Mine in District Shahdol, MP (User Agency – SECL)

Renewal of 468.205 ha of forest land for Dhanpuri open cast mining(Forest Clearance)

Renewal lease of 351.205 ha of forest land and the project authorities will return back 117.00 ha of forest land to the forest department which has already been reclaimed

FIGURE 8 DHANPURI OPEN CAST MINE

(Source – Self)

2.3.1 Approval Conditionalities of Forest Clearance

- Legal status of forest land shall remain unchanged(forest clearance)

- Compensatory afforestation to be done as per the FCA 1980(forest clearance)
- Area shall be reclaimed keeping in view the international practice of stabilizing the dumps by grading or benching so that the angle of repose are maintained within permissible limits(forest clearance)
- Forest land not to be used for any purpose other than specified(forest clearance)
- Fencing, protection and regeneration of the safety zone area will be done at the project site and besides this afforestation over one and half times of safety zone area in degraded land elsewhere will be done at the project cost(forest clearance)
- Demarcation of mining lease area will ne done on the ground using reinforced concrete pillars with serial numbers(forest clearance)

2.3.2 Observations (as per personal observation)

2.3.2.1 Status of compliance of approval conditionalities

- The coal mining in Dhanpuri coal mines is done by open cast method so there is large scale degradation of land as the mining process itself involves the digging of the overburden to expose the coal seam and then start the extraction process. Since the coal is found at a depth of around 80mtrs there is no deep digging done for the extraction however the overall picture of the forest has completely changed during the process.

- As per the FCA 1980 the compensatory afforestation was supposed to be done however there was no compensatory afforestation done for the specific area of land diverted for the Dhanpuri open cast mines as we came to know from the first hand report provided by the forest department. Their version was that the compensatory afforestation is done as a whole for various projects including mining, rehabilitation, building of dams, roads etc. and there is no demarcation of the area of compensatory afforestation for a particular project and also no record of how much area has been planted under compensatory afforestation of a particular project. As per their records 1645.546 hectare of land has been planted under the compensatory afforestation scheme since 1988-89 to 2000.This is in direct contrast with the clause 3.2 of the FCA guidelines given by MoEF under which the concerned Deputy Conservator of Forests is supposed to make the Forest

management plan of the project for which forest clearance is needed by identifying the areas for compensatory afforestation.

- Reclamation as part of the approval conditionalities was done as per their own reclamation plan where in due care due care was taken to ensure that the top soil which is removed during digging is preserved by pilling it separately so that the same will be put back once the dumping is finished and plantation process is started. Since the mining was not done too deep there was not much of the overburden and due to this the height of ob was less however a point of concern was that the slope of dump was not maintained mainly due to less availability of land and this poses a threat as it can lead to soil erosion during rains and winds and also no benching was followed. Apart from this overburden was directly dumped at the site by making heaps of overburden at the edges which fill up the area however no care was taken for compaction layer by layer which could help in reclamation process. Plantation was done as part of their reclamation process where small grasses were planted on the slopes and various species of trees which can adapt to th conditions were planted on the leveled surface.

- The forest land was used for the purpose of opencast mining as was specified in the forest clearance

- There was no proper fencing and also the safety zone was not properly maintained mainly due to the close proximity of nearby villages which was a cause of threat for the people living nearby due to the blasting and other movements due to transportation of coal. There was no record found regarding the afforestation of one and half times of the safety zone over the degraded area.

- There was no visible demarcation of mining lease area however the user agency blames the local people for the breaking of the concrete pillars as it has got iron in it. There was no effort made by the user agency to replace the pillars with some other demarcation.

- Since the forest clearance is subject to the environmental clearance, one condition is that the there should be proper treatment of water before being used for any purpose. In case of Dhanpuri mines

the water was treated by sedimentation and there was no chemical treatment done to make it fit for the domestic use

2.3.2.2 Socio-economic impact (as per EIA)

- Around 1013 employees working presently
- Supply of free fuel in shape of coal for the workers
- Rehabilitation done at Silpari village

2.3.2.3 Reclamation Plan of the user agency (as per EMP)

The reclamation plan includes biological reclamation which lays emphasis on the importance of forest cover in ecology and environment. It includes sowing of grass and legumes to make the soil enriched with nutrients and tree plantation. The process of biological reclamation includes digging up of pit sizes of 45cm X 45cm X 45cm at a spacing of 2m X 2m where grasses and legumes will be planted to bind the loose soil material and avoid soil erosion. It is also recommended that the species selected for the afforestation on such backfilled areas will be of mixed type. The plant species which were thought of better suited for biological reclamation of backfilled areas are neem, akasmoni, sisham, bel, bamboo, khamher, mango, mahua, karanj etc.

Physical Reclamation

- Process of backfilling the excavated area with overburden in a systematic manner
- Volume of OB increases approx by 40% due to swelling of loose excavated material and this increases the height of backfilled area slightly higher than the surrounding ground
- The top portion of the dump would be made saucer shaped so as to temporarily store water and help it in percolating down the dumps for better biological reclamation by higher water retention capacity
- A toe wall of big boulders would be constructed all around the bottom of dumps to arrest the nutritious soil from the surface run-off. Cattle proof trenches would be provided around the

plantation area where animals like goats, cows, buffaloes etc are expected to enter and destroy the plantation.

As per the status of reclamation plan total of about 6.5 lakhs saplings have been planted on all external over burden dumps, backfilled area and on other vacant lands since 1982-83 to 1999-2000

2.3.2.4 Environmental impact (as per EIA)

Impact on land use

- Total forest land of 748.79 ha out of 1075.78 ha
- Probable cause of for land degradation may be quarry excavation, overburden dumping, construction, approach roads etc.

Impact on air quality

- Continuation of mining and other allied activities in Dhanpuri OC project and other oc and ug mines will have an impact on air quality maily due to dust generated due to blast holes, blasting, overburden removal, loading and unloading and wind erosion and also due to gaseous pollutants (SO2, NOx and CO)

Impact on water quality

- Mining and related activities can cause deterioration in underground and surface water quality

Impact of noise

- Possibility of noise pollution due to movements and operation of dumpers, tippers, shovels etc. and workshop equipment

Impact on soil

- The soil gets degraded due to to the surface mining and also due to the spilage of coal dust as it leads to soil erosion

Impact on Flora and Fauna

- As per the EIA report the 10km radius of the Dhanpuri opencast is covered mostly by dense forest and there are no endangered or rare species of flora and fauna in and around the project

area and the forest area in the buffer zone will not be disturbed by the minig activity and the species found are bear, wild pigs and domestic animals

Impact of Ground Vibration

- The main impacts expected due to the ground vibration were development of cracks in the houses located in the neighboring areas and also the rock fragments fly up to a distance of about 150m

2.3.2.5 Socio-economic impact

- Acceleration in employment opportunities
- Educational facilities
- Health care facilities
- Rehabilitation of 54 families at Silpari
- Heavy vehicular movement and blasting affects human health
- Benefit to the government in form of taxes

2.3.2.6 Mitigation measures as per the Environmental Management Plan

- Resettlement and rehabilitation of affected families at Silpari village and also the provision of secondary employment opportunities and also the educational facilities. As a part of health care facilities two hospitals and seven dispensaries are at service for the people. Various community development works have been done under different heads

- For proper reclamation the top soil of the overburden is preserved and stock piled which later helps in proper physical and biological reclamation. The maximum depth of the mine from the surface is around 83metres and average thickness of the coal is about 9mtrs so the quantity of overburden is sufficient to fill up the excavated void. The overburden dumps and backfilled areas are roughly leveled for the purpose of plantation

- To control the air pollution proper drilling operation, blasting operation, loading and transport would be ensured and coal handling plants would have provision of covers on conveyor belts,

unloading /transfer points to prevent access of wind, suppression of coal dust by water jets, minimization of height of coal fall and improved maintenance of plant and machinery.

- To ensure proper water management garland drains have been made around the periphery of the quarry. For water pollution control measure inflow and quality of the sewage will be checked before meeting to the water resources. For treatment of water oil and grease traps and sedimentation tanks have been installed.

- For ensuring noise control plantation of trees is to be done along the roads and proper maintenance of roads and vehicles used for transportation and also by ensuring controlled blasting.
- Proper slope of the OB dump in internal dumps as well as external dumps where the dump will be formed in tiers not exceeding 25m height and the slope will be equivalent to the angle of repose i.e. 37^{o} ..

2.3.3 Observations (P. Ob)

2.3.3.1 Socio-economic conditions

- The socio-economic conditions of the local people have no doubt improved to a great extent as it was evident from their occupation patterns. Most of the local people had given up farming and were now earning more by following other professions as there were many jobs created due to the presence of the Dhanpuri mines. The user agency has done many community development works which have helped the local people in a number of ways. The local people are also supplied water from the dhanpauri mine. The labourers and staff are also supplied with free gas cylinder every month as an alternative to coal

2.3.3.2 Environmental Conditions

- There was usual disturbance due to the process of coal extraction and it had an indirect impact on the nearby land and forest mainly in form of disturbance to the ecology .The air pollution was not high mainly because of not much high disturbance as the depth of the mine is around 80 mtrs however transportation of coal causes lot of dust which was suppressed by using sprinkling by the trucks, however the static sprinklers were absent. The noise and

blasting was causing a problem mainly at the time of blasting as the houses of the villagers were too close. The water from the mined out area was treated by sedimentation. Apart from this soil was affected mainly due to the coal dust. There was possible impact on the flora and fauna as we got to know from the local people and this was mainly due to dust, water loss, blasting and the large scale movement of dumpers. The wild species like bear, hyena, jackal which were seen earlier were not showing any sign of their presence.

2.4 Khadia Open Cast Mine in District Singraulli, MP (User Agency – Northern Coal Fields Limited (NCL))

The Khadia open cast mine is located in the Singraulli belt on the state border of Madhya Pradesh and Uttar Pradesh. At present mining is done in the territory of Uttar Pradesh however to increase the production the NCL has applied for the forest land of 180 ha which is in the MP territiory.As of today the project is awaiting the stage 1 clearance. The following are the general approval conditionalities which are expected to be met by the user agency NCL. (Forest Clearance)

Area of forest land diversion for Khadia open cast mine – 180 ha(Forest Clearance)

FIGURE 9 WATER TREATMENT PLANT AT KHADIA OPEN CAST MINE

(Source- Self)

2.4.1 Approval Conditionalities

- Legal status of forest shall remain unchanged(forest clearance)
- The user agency will transfer the cost of money of compensatory afforestation which shall be done over the degraded forest area which will be twice of the area applied for(forest clearance)

- The user agency shall pay the net present value as per the orders of Hon'ble Supreme Court dated 28/03/2008 and as per the guidelines issued by the MoEF of the environmental losses done by the mining(forest clearance)
- Reclamation of the mind out areas as per the international practice of stabilizing the dumps(forest clearance)
- Fencing, protection and regeneration of the safety zone to be done at the project site at the cost of the project(forest clearance)
- Demarcation of mining lease area using concrete pillars(forest clearance)
- Treatment of the water discharged from the mine(forest clearance)

2.4.2 Observation (as per personal observation)

2.4.2.1 Status of Compliance of Approval Conditionalities

- After the final approval the area will be under the lease hold of NCL, although the legal status of the area will remain unchanged however due to the practice of open cast mining the whole area will be excavated in a phased manner due to which there will be no vegetation of any form left. The present area of excavation of the Khadia open cast mining lies adjacent to the area for which proposal of diversion of made.

- The forest management plan for compensatory afforestation has been made by the state forest department to be done over 360 ha of degraded forest land at three locations.the break up will be as follows- (Forest Management Plan)
    - 200 ha in Amhara
    - 80 ha in Taal
    - 80 ha in Landhadol

- The user agency has given the undertaking that the 10% of the cost of compensatory afforestation for the purpose of monitoring and survey will be paid by them as well as all other payments which might be demanded by the Ministry of Environment and Forests

- The total amount of the net present value has been paid by the user agency

- The reclamation is done only after the mining has started , although in this case the mining over this area of 180 ha of forest land is yet to be started however the area over which the mining is being presently done in the Khadia project the reclamation is done by the way of external as well as the internal dumping however the rate of backfilling could have been as it gave a view of large empty land which could have been back filled and the rate of reclaiming the land could have been better. There was plantation done on the external dumps and also over a few backfilled areas however there were no measures taken to save the plantations.

FIGURE 10 EXTERNAL DUMP AT KHADIA OPEN CAST MINE

(Source – Self)

- The green belt is not properly maintained for the area which is being presently worked and also because the various open cast mines of Singraulli coal belt are along one stretch so that necessitates the need of proper green belt

- Demarcation of the mining lease area will be done after the mining rights are being given to the user agency

- The water discharged from the khadia mine is being treated in the Effluent Treatment Plant and the water is used for the supply to the local village as well as for the sprinkling of roads for the suppression of the dust.

2.4.2.2 Environmental Impact and Mitigation measures

- This data could not be collected because of the non cooperative nature of the concerned officer

2.4.2.3 Observation (as per personal observation)

- The forest land of 180 ha consists of average density of forest with total number of 1,76,520 trees. From the site visit of the area, the forests present a good aesthetic view and have mature trees and as per the survey of the forest department done during the period of 23/12/2003 to 29/12/2003 the various species of animals and birds include Leopard, Cheetal, Wild Boar, Bear, Peacock, Fox, Hyena, Sambhar and the species of plants and trees like Sal, Tendu, jamun, Dhawda, Awla, Kusum, Palas, Bel, Saj, Kari, Behda, etc. The surrounding environment of the area is disturbed due to the large scale open cast mining of Singraulli coal belts. The flora and fauna of the nearby forests is bound to get disturbed by the large scale movement of dumpers and the coal dust. The possible impact on wildlife is mainly due to the blasting vibrations and transportation. The air quality is affected due to coal dust. The terrain of the area is mostly of small hillocks and because of mining lot of disturbance has been caused to the landscape.

2.5 Gorbi Block B Open Cast Mine in District Singraulli, MP (User Agency-NCL)

The area is undulating and hilly terrain. The elevation varies from 375m to 512m above mean sea level. The drainage of the area occurs through Karahia nallah in the west which joins the Kachi River, a tributary of Rihand River. (Forest Clearance)

Area of forest land diversion for Gorbi Block B open cast mine – 447 ha(Forest Clearance)

FIGURE 11 GORBI BLOCK B OPEN CAST MINE

(Source – Self)

2.5.1 Approval Conditionalities of Forest Clearance

- Legal status of forest land proposed for diversion should remain unchanged(forest clearance)
- Compensatory Afforestation shall be raised and maintained over degraded forest land twice in extent to the diverted forest land by the State Forest Department at the project cost and the cost (revised as on date to incorporate existing wage structure) will be transferred to the State Forest Department by the user agency(forest clearance)

- The State Government shall charge the Net Present Value of the forest area diverted under the proposal from the user agency(forest clearance)
- An undertaking from user agency shall be obtained stating in case the rates of Net Present Value are revised upwards, the additional/differential amount shall be paid by the user agency(forest clearance)
- The user agency shall create, fence and maintain a proper safety zone around the mining area. The user agency will deposit funds with the Forest Department for creation, protection and regeneration of safety zone area and also will have to bear the cost of afforestation over one and half time the safety zone area in degraded forest elsewhere(forest clearance)
- All the funds received from the user agency under the project should be transferred to the Compensatory Afforestation Fund Management and Planning Authority (CAMPA). The State Government should utilise the funds other than the Net Present Value till a direction is given by the Central Government in respect of utilisation of Net Present Value of the diverted Forest land(forest clearance)
- The user agency shall demarcate the area by erecting 4 feet high RCC pillars at the project cost indicating forward and back bearings and distance between adjacent pillars on them(forest clearance)
- The user agency should protect the top soil at the project cost(forest clearance)
- The detailed reclamation plan showing year wise physical and financial targets, and to be implemented at the project cost should be submitted by the user agency(forest clearance)
- The rehabilitation of displaced persons should not be done on the forest land(forest clearance)

2.5.2 Observation (as per personal observation)

2.5.2.1 Status of Compliance of Approval Conditionalities

- The proposed area for diversion contains protected forest area as well as revenue forest area

- NPV value as well as the money for the compensatory afforestation has been deposited by the user agency. Compensatory afforestation is proposed in 894 ha of degraded reserved forests. Compensatory afforestation is done in total of 7 compartments.

TABLE 3 STATUS OF COMPENSATORY AFFORESTATION OF GORBI BLOCK B MINE

S.N	Compartment No	Range	Area of Proposed compensatory afforestation	Total compartment area	Growing Stock
1	RF 301	Waiden range	200 ha	355.02	Under stock
2	RF 302, 307	Waiden range	200 ha	200.35 255.58	Under stock blank
3	RF 312	Waiden range	94 ha	947.29	Under stock
4	RF 314	Waiden range	200 ha	455.93	Blank
5	RF 420	Mada range	50 ha	508.14	Blank
6	RF 441	Mada range	50 ha	304.65	Under stock
7	RF 454	Mada range	100 ha	372.31	Blank

(Source- Forest management plan of ,Gorbi Block B)

- Demarcation work has been done partially. It becomes difficult to distinguish between the lease and non lease area.

- Safety zone is prepared by the user agency, fencing and maintenance of safety zone is done partially by the user agency

- No rehabilitation of people is required as there was no population in the mine lease area

- Reclamation plan is designed by the user agency; proper schedule is prepared for the backfilling of Overburden dump. The rate of reclamation process is slower than the usual one prescribed in their plan

2.5.2.2 Facilities for treatment or disposal of solid waste/liquid effluents (as per EMP)

Solid wastes is mostly overburden lying above the coal seam is stacked at earmarked sites as external OB dumps (429.10 ha) and backfilling the excavated area of the mine as internal OB dump (113.30 ha). The OB dumps are technically & biologically reclaimed

Liquid effluents

The effluents from workshop & CHP and mine discharge into nallah as there is no effluent treatment plant in the area. At present no treatment water is done for industrial purposes within the premises of mine.

Total land involved is 1339.00 Ha & its breakup is as follows –

Pre mining land use

- Forest land 447.00 Ha
- Agricultural land 163.00 Ha
- Govt. Land 429.00 Ha
- Tenancy land 300.00 Ha

Flora & fauna

There is no endangered or endemic floral species found in the core & buffer zone of mine area. Also there is no endangered faunal species or migratory birds in the core as well as in buffer zone.

There is provision of 4 nos. Of 8-12 KL capacity of water sprinklers and sprinkling of water 3 or 4 trips per shift on haul roads and other dust generation sources during the OB removal. The estimated area for the external dump is 429.10 Ha. The estimated backfilled area is 113.30 Ha. The technically and biologically reclamation will be concurrent with the mining operations.

Socio economic

Total resettlement of about 569 project affected peoples (PAPs) is involved due to acquisition of tenancy land. The total no. of land oustees are 2314, the house oustees are 283 and land & house both outsees are 286 only.

Total no. of PAPs rehabilitated and resettled – 2013

2.5.2.3 Reclamation plan of Block-B mine (as per EMP/EIA)

The main objective is to restore the mined out areas to an environmentally acceptable state. Land reclamation is done in two stages, technical and biological respectively. Both the process is applicable for external as well as internal mining.

The technical reclamation is process of back filling of excavated area with over burden in systematic manner. It depends on the depth and volume of over burden. Technical reclamation also involves breaking and levelling the top of OB dumps. The internal dumping is done in the de- coaled area and for the stability of internal dumps; mine floors are ripped in strips before back filling.

Biological reclamation includes preparation of ground, selection of plant species, nursery plant maintenance and after care etc. Biological reclamation is same for both external as well as internal dumping. Selection of plant species depends on the stage of plantation. For freshly dumped OB material which is deficient in nutrients & organic matter, the emphasis is on growing grasses & legumes to ameliorate the soil quality and prevent erosion at first instance. Other aspects considered while selecting species for plantation:-

- Providing quick binding of loose OB material
- Improving water retention capacity
- Providing quick green cover with species which can withstand the erosion, impact of rain and resist high dust particulate matter pollution.

After stabilization of Over Burden (OB) dump slope and top, second stage plantation is done. Following points should be considered for second stage plantation:

- Plants for timber, fuel wood, fodder, medicine, fruits etc
- Dump slopes facing south direction will receive more heat from sun & hence should be planted with the species having low water requirement
- The predominant wind direction in summer is from NW. To break the wind speed and to shelter the inner plant species against evaporation loss, the tall plant species should be grown on NW side of dump top.

Fast growing species having short rotation can be planted at closer distance. Plant population is reduced in areas where moisture availability is poor

Chapter 3 Underground Mining Projects

The Project involved the visit of seven underground mines to study the status of compliance of their approval conditionalities e.g. maintaining forest density over the blank patches in the forest area where underground mining is taking place and also maintaining surface subsidence, safety zone etc. These seven mines are spread over four districts of MP & Chattisgarh. The following table gives the detailed description.

TABLE 4 UNDERGROUND MINES VISITED IN THE FILED STUDY

S.No	Project Name	District	State
1	SECL Rajgamar	Korba	Chhattisgarh
2	SECL Navegaon Rajendra	Shahdol	Madhya Pradesh
3	WCL Navegaon	Chindwara	Madhya Pradesh
4	WCL Rawanwarakhas	Chindwara	Madhya Pradesh
5	WCL Mahadeopuri	Chindwara	Madhya Pradesh
6	WCL Tawa I	Betul	Madhya Pradesh
7	WCL Tawa II	Betul	Madhya Pradesh

(Source – Self)

3.1 Rajgamar Underground Mine in District Korba, Chattisgarh (User Agency – SECL)

Area of forest land diversion for Rajgamar underground mine – 461.80 ha(Forest Clearance)

The forest land of 461.80 ha was acquired by the SECL under Coal Bearing Areas (Regularization and Development) Act, 1957 on 07-10-1963 and the mining activities started accordingly in 1974 in which 280.66 ha of forest land has already been worked upon. This was a violation of the Forest Conservation Act according to which no mining shall take place without the forest clearance given by MoEF. As per the CBA act there was no provision of leas and right was acquired either till completion of mining operation or 99 years whichever is earlier however after the enactment of Forest Conservation Act 1980 and as per Coal Mines Nationalization Act 1973 the renewal of application was submitted in favour of DFO considering the fact that the 30 years of lease period expires on 30/04/2003.However due to the non-fulfillment of the approval conditionalities by the user agency and also due to the confusion of payments regarding the NPV of the loss of forest, there was much delay in the final clearance of this proposal. The SECL got the in principle clearance for the project in 2006 however again due to no non-fulfillment of certain conditions the final was not approved. The following are the approval conditionalities

FIGURE 12 RAJGAMAR UNDER GROUND MINE IN DISTRICT KORBA, CHATTISGARH

(Source – Self)

3.1.1 Approval Conditionalities

- The Penal Compensatory Afforestation shall be raised and maintained over degraded forest land double in extent to the forest area utilized in violation of FCA 1980, i.e. 561.32 ha (2 X 280.66 ha) at the cost of user agency(forest clearance)
- The user agency will protect and demarcate the diverted forests land in consultation with state forest department. Gap planting wherever required may carried out in consultation with Forest department(forest clearance)
- The state government shall charge the half of the Net Present Value from the use agency for the entire diverted forest land as per the orders of Hon'ble Supreme Court dated 28/03/2008 and as per guidelines issued by the Ministry of Environment and Forests(forest clearance)
- Undertakings from the user agency may be obtained stating that in case the NPV rates are revised upwards the additional or the differential amount shall be paid by the user agency(forest clearance)
- All the amounts shall be deposited with Compensatory Afforestaion Fund Management and Planning Authority (CAMPA) (forest clearance)
- The remaining forest land shall be surrendered to the state forest department(forest clearance)

3.1.2 Status of Compliance of Approval Conditionalities (as per personal observation)

- Although the user agency had started the mining in 1974 as per the CBA Act in which there was no provision for lease and right was acquired till mining was over or till the completion of 99 years and subsequently 280.66 ha of land was mined out till 2003, however the Forest Conservation Act came in to force in 1980 under which all the forest land used for non-forestry purpose would need to get clearance from the MoEF, which was not followed by user agency in this case and keeping this in consideration the condition of penal compensatory afforestation was set which was to be done over the 561.32 ha (2 X 280.66). The user agency has paid the amount

- In order to protect and demarcate the diverted forest land the user agency was directed to do the fencing in consultation with state forest department and maintain it during the entire period of the life of mine. In this regard the state forest department had calculated the amount as 52,00,925/- rupees and a letter was sent from the DFO's office dated 13/10/2009 requesting to send the demand draft of 52,00925/- rupees towards the DFO's office.

- As per the order given by the Honb'le Supreme Court dated 28/03/2008 regarding the payment of Net Present Value after accepting the recommendations of Central Empowered Committee, for all the forest land used or diverted for non-forestry purpose, the NPV of the loss to the environment has to be compensated by the user agency however as per the orders of the hon'ble supreme court only 50% of the NPV shall be paid for the land diverted for underground mining. This amount has also been paid by the user agency

- No such undertaking has been obtained in which the user agency has accepted to adhere to the revised rates of NPV

- All the amounts which have been paid till now by the user agency has been deposited with CAMPA

- The user agency has not yet got the final clearance so the land is still under the forest department

3.1.3 Environmental Conditions (as per EIA/EMP)

Mining Methodology

- The mining is done by board and pillar system of mining and both manual and mechanized loading systems are being used

Socio-economic aspects

- The project will have on whole a positive impact on the overall socio-economic profile of the area mainly due to the increase in the employment opportunities, trade and business and community development

Land Use

- The land use is as follows – forest land 1994.121 ha, government land 6.305 ha, tenancy land 1486.151 ha

Air quality

- Air is mainly polluted by mine fans and unmetalled colliery roads

Water Quality

- The main source of water pollution are mie discharge, domestic effluents from the colony and the industrial effluents from CHP, workshop

Noise

- The main source of noise pollution are CHP, mine fans and workshop

Flora and Fauna

- The flora mainly consists of Sal, Saja, Mahua, Lendia and Dhaora where as wildlife consists of Jackal, Bears, Langoors and Hares
- Biotic pressure and indirect impacts of development has some impact on the flora and fauna

3.1.4 Mitigation measure as per the Environmental management plan

Socio-economic impact

- Various facilities and development activities have taken place e.g. employment opportunities, in-migration, educational facilities, health care facilities, improvement in sanitation, literacy drives, vocational training etc.

Air and Water quality

- There is no considerable impact on water and air quality and there are various monitoring stations which keep a regular check. The physic-chemical –bacteriological parameters of the water which comes out from the mining is satisfactory.

Impact on ground water

- Due to the presence of impermeable beds in the roof of the mines, the impact of on mining on aquifer will be marginal however during the time of caving the top aquifers will be affected to some extent. The nearby perennial Phulakdi nala will help in the recharge of the aquifers so the impact on the groundwater is only a temporary phenomenon

Impact of subsidence movements

- The impact of subsidence is not much as it is proposed to leave solid barriers between the caved panels and according to the recent subsidence management practices the barriers would be 12

times the extraction thickness or 0.15 times the depth. So the only possibility would be the development of few cracks which would be filled using stone chips and matti

Impacts on Flora and Fauna

- There will be negligible effect of mining over the surface which means that the tree growth won't be affected and also from the experience of other mining areas which has similar geological settings and the study of State Forest Research Institute, Jabalpur, it can be inferred that the Rajgamar underground mining will have negligible impact on the flora and fauna

3.1.5 Observations (as per personal observation)

- The site visit of the Rajgamar mining area could not be done as per the plan, the reason being that there had an accident inside the mine just before a few minutes we reached there. The cause of accident as we came to know from the people and other labours was that the few people were asked to work in an unsafe zone where there the roof fall occurred and one labour died. Because of the accident we could not get in touch with the concerned personas all the survey officers were busy with reviewing the situation. However we saw the surroundings of the mining office area and proper greenery was maintained. We also saw the plantations along the road side and surrounding s of the mining office area. The forest covers over the mining area where at many places patches of land were seen where there was no vegetation. The demarcation pillars could be seen and there was a nearby village whose tenancy land was also used for underground mining. The impact on the air and water quality could not be observed however the road sprinkling was done regularly. We could not get any information regarding the subsidence however the forest cover consisted of mature sal and other variety of trees. The wildlife as we came to know from the nearby villagers was disturbed mainly due to disturbances caused by transportation of coal and also due to blasting vibrations.

3.2 Rajendra Navegaon Underground Mine in District Shahdol, MP (User Agency- SECL)

Renewal of mining lease for <u>diversion of 113.110 ha</u> of forest land for Navegaon Rajendra Underground Mine(Forest Clearance)

FIGURE 13 NAVEGAON RAJENDRA UNDERGROUND MINE, PLANTATION DONE OVER BLANK AREAS

(Source – Self)

3.2.1 Approval Conditionalities for Forest Clearance

- Compensatory afforestation shall be raised and maintained over 29.35 ha of non forest land(forest clearance)

- Charging the net present value of forest area diverted under this proposal as per the orders of Hon'ble Supreme court of India dated 30.10.2002 and 01.08.2003(forest clearance)
- User agency should undertake plantation over the forest area diverted due to underground mining(forest clearance)
- User agency should deposit the funds in the CAMPA(forest clearance)
- Period of diversion shall be 20 years or co- terminus with the mining lease whichever is earlier. (forest clearance)
- Legal status of forest land shall remain unchanged(forest clearance)
- No tree felling will be done in the forest area(forest clearance)
- There should be proper demarcation of mining lease through RCC pillars of 4 feet. User agency can get the help of forest department for the proper demarcation of the forest area. (forest clearance)
- In case of forest land with density less than 0.4, afforestation has to be done in the vacant/blank areas of degraded forest land(forest clearance)
- Subsidence should be continuously monitored and recorded by the user agency and also there should be proper schedule for subsidence management(forest clearance)

3.2.2 Observations (as per personal observation)

3.2.2.1 Status of Compliance of Approval Conditionalities

- Legal status of forest area remains the same as it was before the mining

- The money for the NPV of forest area diverted and also for the compensatory afforestation have been deposited by the user agency in CAMPA

- Since the mine under consideration is underground one, therefore there has not been any activity of felling the trees above the surface of the mines by the user agency or forest department

- Proper demarcation of the mining lease area has been done through 4 feet RCC pillars.

- Afforestation has been done in the vacant/blank areas where the forest density is less than 0.4.

- Cracks are being monitored and regularly filled with stone chips, clays etc

- Subsidence is measured by the levelling technique. Although it's a mechanical process for the anticipation of continuous and discontinuous subsidence due to depillaring but it is quite helpful in measuring it with little error

- Water discharged through the mine is treated through the process of sedimentation. Sedimentary tanks are built in for that purposes.

3.2.3 General observations (as per personal observation)

Methodology used for the mining – longwall method.

This method of mining enables high productivity with comparatively little development work. Subsidence is even over the working area and rate and amount of subsidence can be regulated easily within the limits. Also it provides maximum degree of extraction from the seam.

- Water discharged from the mines is stored at various intermediary points in the mine and then it is final discharged to main storage point. At the storage points water is being purified through sedimentation, there is no chemical pollutants in the water. The water is supplied to Shahdol city for the domestic purposes. The mine water is collected in settling tanks and after sedimentation clear water is discharged in natural stream.
- 8 months old plantation with cattle protecting walls/trenches (CPT/CPW) to protect the plant from cattle grazing
- For the compensatory afforestation of 29.35 ha, the sum of money required has been deposited by the user agency as per the forest management plan prepared by the forest department. But no plantation has been done
- After the development work, subsidence is caused which not visible through the naked eyes. During the development the maximum subsidence is caused at the centre point and in many cases it leads to the formation of cracks on the surface. Subsidence does not have any major impact on the trees standing on the surface above the mining area
- The condition of trees over the underground area is unchanged. There is loss of fauna due to vibration and interference of human beings.

3.2.4 Socio economic impact (as per EIA)

Since in the case of underground mining no resettlement of families are required. In case of acquisition of tenancy land compensation and jobs are provided to the land losers under rehabilitation norms of CG government & CIL norms. It does provide employment opportunities where many persons are benefited from the transportation, trading of coals & other allied operations. In nearby villages the facilities of electricity were provided by the user agency. Educational institutes, healthcare facilities centre are being provided to the local population. Plantation to be done in the vacant areas under social forestry with the involvement of local people. Trees of timber value yielding poles combined with plants yielding tannins and bamboos are to be planted.

3.3 Navegaon Area For Rawanwarakhas Underground Mining Project in District Chindwara, MP (User Agency – Western Coal Fields Limited WCL)

Area of forest land diversion for renewal of Rawanwarakhas underground mining lease – 63.282 ha

The diversion of 63.282 ha of forest land is applied for the renewal of Rawanwara Khas underground mining. The present status of the proposal is that the final clearance has been approved however when the in principle clearance was approved, there were certain conditions which were to be fulfilled. (forest clearance)

3.3.1 Approval Conditionalities

- Legal status of forest shall remain unchanged(forest clearance)
- Fencing, Protection and regeneration of the safety zone area(100 meter strip along the boundary of the mining area).Apart from this afforestation on degraded forest land measuring one and a half times of the land used for safety zone will be done at the project cost(forest clearance)
- Whenever possible and wherever the user agency will take the afforestation measures in the blanks within the lease area in consultation with the state forest department at the project cost(forest clearance)
- Following shall be taken by the user agency
    - Proper mitigation measures to minimize soil erosion and choking of streams will be prepared by the user agency
    - Planting of adequate drought hardy plant species and sowing of seeds to arrest soil erosion
    - Construction of check dams, retention/ toe walls to arrest sliding down of the excavated material along the contour
    - Top soil management plan should be strictly adhered
- The forest should not be used for ay other than specified(forest clearance)
- The approval under FCA 1980 is subject to the clearance under the Environment Protection Act 1986(forest clearance)
- Free supply of coal to labourers and the staff so as to avoid any pressure on the adjacent forest land(forest clearance)
- Period of permission uder the lease is for 20 years(forest clearance)

- Demarcation of mining lease area by erecting stone wall fencing/trenching around it(forest clearance)
- The user agency will implement the recommendations of the subsidence analysis report at the project(forest clearance)
- User agency will discharge the water for processing only after proper treatment(forest clearance)
- Other standard conditions as applicable to underground mining projects(forest clearance)
- User agency shall take up the plantation over the surface area wherever the density is less than 0.4. Gap plantation shll be taken up in the area where density is between 0.4 and 0.7. The user agency will protect the area till the life of the underground mining in consultation if state forest department(forest clearance)
- Any other condition that the state government or MOEF may impose from time to time. (forest clearance)

3.3.2 Observation (as per personal observation)

3.3.2.1 Status of the Compliance of Approval Conditionalities

- The legal status of the forest shall remain unchanged however the land will be under the lease hold of the user agency till the lease period is over. The underground mining will be done which will not cause any surface damage.

- The payment of the cost of fencing/trenches around the 63.282 ha of forest land amounts to 1,90,00/ and has been paid by the user agency and the NPV of the Navegaon area forest land diversion amounts to Rp 37336380/- and was paid by the user agency

- The user agency has not done any fencing and has taken no efforts for protection and regeneration of the safety zone .Apart from this no afforestation has been done over the degraded land as compensation of the land used as safety zone

- The user agency has agreed to take over afforestation over the blank areas of the forest land however at present there has been no afforestation done by the user agency in this area

    - The mitigation measures to minimize soil erosion are not applicable to the underground mining as there is negligible impact on the top soil
    - The condition of planting of drought hardy plants was not met by the user agency
    - The condition of constructing the check dams, retention/toe walls is not applicable in underground mining

- The forest land has not been used for any other purpose that specified and the user agency has agreed to follow this condition

- The user agency has obtained the environmental clearance on 08/11/2007
- To fulfill the condition of supplying the free coal to labourers and the staff, the user agency is instead supplying one LPG cylinder per month to every family of the labourer. This is a better option than supplying coal which would degrade the air quality

- The period of the lease will be 20 years

- The user agency has agreed to do the demarcation as was required in the condition to be done by erecting stone wall fencing /trenching around the mine lease area however at present this condition is not followed

- There has been no subsidence analysis report for this mine

- The water which is discharged from the mine is used by the nearby villagers and is treated by natural sedimentation and finally flows to the nearby Pench river

- The user agency has not taken up any plantation in the forest area as per the conditions that depending on the density, the user agency will make sure that plantation is done

3.4 Rawanwarakhas Underground Mine in District Chindwara, MP (User Agency – WCL)

Area of Renewal of forest land for Rawanwarakhas underground mine – 657.367 ha (forest clearance)

The Rawanwara khas UG mine is situated in Pench Valley coalfileds in Chindwara district of Madhya Pradesh.The Pench River is located just 1 km from the mine site

The WCL had applied for the renewal of forest land of 657.367 ha on 27/07/2006 and the lease period of the land expired on 31/10/2005, however as per the CEC the proposal for renewal was given on 07/09/2006 and it was also known that the actual area required for the mining is 247.176 ha. Also the user agency carried on the underground mining over 6 ha of land for which the forest clearance was not obtained. So according to the CEC there was violation of FCA 1980 and two offences were booked against the user agency. The user agency was asked to do the penal compensatory afforestation over 12 ha of degraded forest land also apply for the renewal of 247.176 ha of forest land for the Rawanawarakhas underground mining which is presently operational. (forest clearance)

3.4.1 Environmental Impact (as per EIA)

Air quality

- The air quality is monitored so as to make sure that the impact, mainly due to the mining and allied activities like transportation is within the limits. As per the ananlysis of the results all the values are found to be well within the standards for the coalmines stipulated by the Ministry of Environment and Forests

Impact of noise level

- To monitor the noise level various monitoring stations have been installed in the nearby villages however since the basic coal mining operations are done below the ground the effect of noise on the surface is negligible

Impact on the land

- The coal mining in Rawanwada Khas is carried out at a depth of 200mtr so if there is any impact that is localized however for the subsidence to take place there are many factors which are responsible e.g.
    - Thickness of the seam
    - Percentage of extraction
    - Depth of panel
    - Width of panel
    - Dip of the seam
    - Method of working
    - Nature of goaf support, caving or stowing
    - Nature of overlying strata
    - Geological disturbances
    - Topography of the surface

3.4.2 Mitigation measures as per the Environment management plan

Plantation/Green cover

- Plantation of various tree species like Eucalyptus, mango tree, guava, jamun and medicinal plants has been planned and this will be done with the help of state forest department with three years of maintenance contact. The plantation would be done along the roads and around the colony and also in the vacant land

Subsidence Management

- The underground mining causes least damage to the surface in any form however the impact of mining in form of subsidence can be prevented by following the certain guidelines e.g. the barrier width should be 12 times the extraction thickness or 0.15 times the depth
- Protective bunds and garland dams shall be laid so that no water from surface enters the subsidence area or through the cracks to the working area
- Surface cracks shall be sealed up by using shale, clay or other suitable matter
- Depressed portion shall be leveled up using soil or clay or other suitable material
- To monitor the subsidence, grid pillars shall be located 30m apart at the surface over the working panels and at intervals of 50m beyond

Precautions against fire and explosion

- Proper ventilation of the mine and regular inspection of places where firedamp may accumulate is essential
- Explosion due to coal dust – the coal dust can cause explosion if it is suspended in the air as cloud as it becomes capable of bursting even in the absence of firedamp. It can be prevented by -
    - Reducing the formation of coal dust and suppressing it by infusion, water spraying and proper control shot firing
    - Preventing its spread during transport of coal
    - Provision of stone dust barriers or water barriers
    - Avoid accumulation of methane in underground by proper ventilation

Inundation - Precaution Measures

- Any place in a seam approaching a fault passing through the seam my contain accumulation of water so adequate precautions should be taken against such eruption of water
- All the boreholes drilled from the surface should be plugged with cement to prevent inflow of water through such boreholes
- Careful assessment of the danger of inundation from surface should be made before the onset of every rainy season and adequate precautions should be against such dangers should be taken
- During rainy season, It is necessary to keep a constant watch on the upstream of river or nallah and take suitable precautions

3.4.3 Observations (as per personal observation)

- The Rawanwara khas underground mining area is not covered with dense forest, although the user agency has taken up plantation drive near the mining sites and along the roads and also near the Pench river which is adjacent to the mining area. There is no proper demarcation of the mining area and also no effort has been taken by the user agency to fill up the empty spaces in the forest area over the mining by plantation. The air quality was not much affected however the water from the mine discharge goes in to the Pench River without being treated. Also there was no proper fencing done of the mine lease area. There were no visible effects of subsidence however a few cracks were developed and were filled up with soil and clay. Since the mining is going on since past many years however the user agency has put many efforts so as to improve the forest density.

3.5 Mahadeopuri Underground Mine in District Chindwara, MP (User Agency- WCL)

Diversion of 865.83 ha of forest land for underground mining on lease and also surface right over 1.832 ha of forest out of the total area of land proposed for diversion(forest clearance)

The Mahadeopuri underground mine is located in the Pench area of district Chindwara. The mine lease was granted in 1988 for a period of 30 years. The approval was granted by the MoEF based on the fulfillment of certain approval conditonalities

FIGURE 14 MAHADEOPURI UNDERGROUND MINE IN CHINDWARA

(Source- Self)

3.5.1 Approval conditionalities

- The legal status of forest shall remain unchanged(forest clearance)
- The period of the lease shall be 30 years(forest clearance)

- The compensatory afforestation should be done and the area shall be declared as Reserved Forest/ Protected Forest. For this necessary funds shall be put at the disposal of state forest department before the transfer of the forest land for mining(forest clearance)
- No work will be done over the are asked for the underground mining(forest clearance)
- If at a later stage it was found that there has been some damage to the forest area due to mining, then the user agency will pay for the cost of equivalent land and also for the afforestation of the same(forest clearance)
- The area which is mined shall be reclaimed by the user agency after the mining is over(forest clearance)
- The fuel wood needs of the staff and the project labour will be fulfilled by the user agency in order to make sure that no damage is caused to the forests by them(forest clearance)
- The explosives would not be allowed to be stored in the forest area(forest clearance)

3.5.2 Observation (as per personal observation)

3.5.2.1 Status of Compliance of Approval Conditionalities

- The legal status of the forest is unchanged, although the user agency holds the lease rights for underground mining however it won't cause any damage to the surface of the mining lease area.

- The period of the lease is for 30 years and the lease will be expired in the year 2018

- The user agency has provided the land for the compensatory afforestation of 1.832 ha of forest land for which surface right is acquired in the village Gop of Damua region of South Forest division and has also deposited the amount of 18,320/ towards the forest department for the purpose of afforestation
- No work has been done over the mine surface area as it is covered with forests and the mining is done under ground.

- Since the mining is done underground, so there is negligible impact on the surface however to monitor the subsidence the concrete pillars are put inside the land over the workable area to monitor the subsidence. There is no reclamation required in the underground mining

- The user agency is providing coal or LPG cylinders for the use of labourers and staff members so as to fulfill their fuel needs. This helps in reducing the impact on the forest land of mining area.

- The magazine(room where the explosives are stored) is in the premises of the mine office which is located just next to the forest area and can be a possible threat as it can cause fire

3.5.3 Environmental Impact (as per EIA)

Air pollution

- The air pollution is mainly caused due to drilling, blasting, loading and transportation of coal and also as the underground mining is practiced so there is not much affect on the air

Water Pollution

- The water pollution is mainly caused due to mining operation present and pollutants are mainly the coal particles in the mine water. This water is treated in a settling tank before being used for any purpose

Noise pollution

- The noise pollution is mainly caused due to drilling operation, ventilation fans and also due to movement of trucks for the transportation of coal

Flora and Fauna

- Trees like Dakra, Bell, Khoer, Salar, Mahau, Palas, Amal tas, Ashoka, Chilla, Bal, Nimbu, Aam etc
- The Fauna of the forests include Maina, Ghar, Sasna, Kokila, Bagla, Sutar, Garden Lizard, Dhaman, Nag, Ghonas etc.

3.5.4 Mitigation measures as per the environment management plan

- The air pollution is checked by water sprinkling before drilling holes and on coal faces, sprinkling of water on coal before transportation, spraying of water coal stocks and tree plantation around service building and open land
- The water is mainly polluted by the suspended particles and for its treatment sedimentation pond should be provided

- The noise pollution can be checked by proper selection of mining equipments so as to keep the noise level below 85dB and also by maintaining green belt around the workshop and other sensitive areas

3.5.5 Observation (as per personal observation)

- The forest land of Mahadeopuri underground mine is of good density and is also properly maintained. The new plantation is also done on the empty areas in the forest and proper demarcation of the mining lease is also done by white stone pillars. The air is somewhat affected by the loading and unloading of coal and the transportation. The sprinkling is not properly done so as to minimize the effect on air due to coal dust. The water which comes out from the mine is treated in a sedimentation tank before being used. The sedimentation is made of iron and is very old. Proper treatment of water should be done. To reduce the impact of noise pollution green belt is well maintained and plantation of eucalyptus has been done few years back. There is no impact on the flora as the mining is done underground however the fauna of the forests have been affected mainly because of the blasting vibrations and movements in the forest area.

3.5.6 Community development works (as per corporate social responsibility)

- The user agency has carried out many community development works under this project. Some of them are as follows –
    - Providing of hand pumps at six places
    - Bus shed at Rawanwara
    - Construction of bus stand at Bamori
    - Construction of one room at Thovari School
    - Construction of bus stop near Gagando
    - Construction of road at Bajipane village

3.6 Tawa –I Underground Mine in District Betul, MP (User Agency- WCL)

Underground mine is in Pathekhaeda area in Betul district. The forest land required for the mining process is 637.55 ha but the mining lease/ rights for Tawa was taken along with other underground mines of the same region such as PK mines, Satpuda mines.(forest clearance)

Underground mining rights in Pathakhera area are over an extent of 1349.248 ha of forest land. Beside that Tawa mines got the surface right of 10.190 ha in the forest land dated on 1997.(forest clearance)

FIGURE 15 SURFACE AREA OF TAWA I UNDERGROUND MINE

(Source – Self)

3.6.1 Approval Conditionalities for Forest Clearance

- The legal status of forest land will remain unchanged(forest clearance)
- Penal afforestation will be taken by the user agency over equivalent degraded forest land at the cost of user agency(forest clearance)
- Time targeted programme for subsidence management (based on predicted subsidence) in the underground mining area may be given and implemented. (forest clearance)

- The environmental quality parameters may be monitored in the mine lease and adequate control measures taken up so that quality parameters are within standards stipulated. Six monthly reports on the above may be submitted to the ministry's regional office. (forest clearance)
- In the event of any subsidence, the user agency will pay the compensation as per norms of the state governments and also transfer equivalent non forest land and funds for compensatory afforestation over the same to the state forest department(forest clearance)
- The forest land shall not be used for any purposes other than that the specified proposal(forest clearance)
- Any other condition that the state government may impose from time to time in the interest of afforestation and protection of forests. (forest clearance)
- In case of forest land with density less than 0.4, afforestation has to be done in the vacant/blank areas of degraded forest land(forest clearance)
- Demarcation of mining lease area using 4 feet high reinforced cement concrete pillars with serial numbers, forward & back bearings and distance from pillar to pillar(forest clearance)
- Lease period shall be co terminus with lease under the MMRD act subject to a maximum of three years(forest clearance)

3.6.2 Status of Compliance of Approval Conditionalities (as per personal observation)

- Legal status of the forest remains as it was before the lease. Legal status of forest is protected forest with density around 0.6

- Subsidence is measured using levelling technique; pillars are made with spacing between the pillars 10 meters. Maximum subsidence during the depillaring is 0.8 metres. There is need for better technology for anticipating continuous and discontinuous subsidence and also it will minimise the error

- The forest land is not being used for any other purpose except the mining associated activities.

- Afforestation has not been done in the vacant areas as the forest density is more than 0.6. Therefore afforestation in blank areas is not required. Beside that the plantation has been done in the campus premises

- Proper demarcation of mining lease area has been done. The height of the pillar is not uniform and information on the pillar is not carried

3.6.3 Ecological impact assessment (as per EIA)

Pre mining land use

The entire area is located in the forest. Tawa River is located to the southern side of the project. There is no human settlement in the area and since the entire area is located in forest, it not possible to avoid the usage of forest land for the infrastructure

Pre mining Environmental scenario

Rapur and Asir reserve forests are in this region, there are no sanctuaries, national parks, and tourists spot in this zone.

Ambient air quality, water quality is good from the point of view of physic- chemical parameters, noise level in the range of 32 to 65 dB; 'mahua', 'amla', 'pakkad' etc. are found in these forests. There are no large wild fauna except for bear, monkeys, rabbits, jackal etc.

Socio economic scenario

There is no village in the core zone. And there are few villages in the buffer zone. The main employment of the villagers residing in the buffer zone is agriculture and coal mines in the nearby areas.

Socio economic impact

There is no rehabilitation involved in the project. Additional direct employment opportunity and indirectly opportunity to many persons is created due to mining. Certain facilities like Dispensary, Hospital, Post office, and training centre etc. total of 603 houses were constructed for tawa underground project.

Environmental impact assessment

Land degradation

Subsidence is the main factor causing land degradation apart from minor degradation of land caused due to incline drivage, construction of infrastructure etc.

The magnitude of subsidence depends on various factors such as thickness& depth of seam, soil geology etc. maximum subsidence of 0.8 meters is observed in the mines and it is uniform and gradual. In general it causes no effect on the vegetation. Cracks occur on the surface of the mine.

Impact of forest

As the mining activity in case of underground mining is carried well below 60 meters of soil surface, so there is no direct impact to the trees and vegetation above the surface. There is no direct impact of mining on the wildlife. But due to vibration and human interference the wildlife is disturbed. Also development of the area affects the wildlife population. Subsidence have not resulted adverse impact on soil characteristics.

3.6.4 Environmental control measures (as per EMP)

The air quality and dust control measures are taken care by user agency

- Development of green barriers around the colony, industrial area and other dust generating places. Use of water tankers for the dust suppression
- Black topping of roads. Proper maintenance of the machineries, tools & equipment used for the mining activities.
- To retain the quality of water before being letting it out into natural drainage, sedimentation of water is being done. Settling tanks for industrial effluents from the workshop.
- Noise level is within tolerance limit. Improved design and maintenance of machines to minimise the noise level.
- The surface cracks are filled up with clay, shale, or any other suitable material also if needed, subsided area is leveled up using soil or clay
- Development of green barrier and social afforestation- for reducing air and noise pollution and also to improve the ecological aspect of the mining area, plantation is done around mine inclines, township and industrial areas etc

Environmental conditionalities

- The air quality within the leasehold area should be monitored for conforming of standards prescribed by the competent authority. The control measures suggested in the EMP should be strictly implemented

- The quality of effluent discharged into the nallah/ main water course should be maintained below the standards as provided under GSR 422 (E) dated 19.5.93. Adequate treatment facilities as detailed in EMP and supplementary information should be installed before mining commences
- The CHP, conveyors and fan house etc should be designed to minimise the noise level and fugitive emissions. The control measures including development of green belt should be implemented
- No change in method and scope of working should be made without prior approval of the ministry
- The project authorities should carry out hydro geological study of the whole area which includes seepage and leakage aspects of Tawa
- The afforestation and green belt development across mine lease hold should lay special emphasis on mixed rather than mono- culture
- Mitigation measure envisaged in the SERI Jabalpur should be implemented to control adverse impacts of pressure due to mining

Mitigation measures for taking care of impact of subsidence movements on the forest

- No mitigation measure is required for the trees above the surface as the maximum tilt of 2.74^0 is observed on the trees on the forest land due to subsidence movement
- To minimise the impacts on soils the cracks developed on the surface due to subsidence movements is filled during and after the extraction of the panels in each seam
- The cracks are filled with clay and soil chips. Proper maintenance development and filling of cracks are recorded.

3.7 Tawa II Underground Mine in District Betul, MP (User Agency – WCL)

Diversion of 195.20 ha of forest land for underground mining rights and 12.708 ha of forest land for surface rights for Tawa – II underground mine

FIGURE 16 TAWA II UNDERGROUND MINES

(Source – Self)

3.7.1 Approval Conditionalities for forest clearance

- Legal status of shall remain unchanged(forest clearance)
- In the event of subsidence the user agency will pay for the damage and also for the equivalent non-forest land(forest clearance)
- Transfer of the cost of compensatory afforestation to be done over 25.416 ha of degraded forest land(which is the double the area of land for which surface right is proposed) in favour of the forest department(forest clearance)
- Obtaining of environmental clearance of the project under environment protection act from the ministry of Environment and Forests(forest clearance)

- User agency shall take up enrichment planting over the the surface diverted for underground mining by planting indigenous species(forest clearance)
- Demarcation of the mining lease area and the surface right area(forest clearance)

3.7.2 Observation (as per personal observation)

3.7.2.1 Status of Compliance of Approval Conditionalities

- The forest land diversion of 195.2 ha which is deep inside core forest area is used for underground mining and there is no impact on the surface as the mining of the coal is done between 56-150 meters depth from the surface and also the topography of the area is somewhat suitable where there can be minimal effects on the surface due to mining. The area has a rocky terrain and the top soil thickness is around 1mtr.The density of the forests is extremely in good condition with different varieties of mature trees. There is no activity done by the user agency over the surface of the mining lease area and therefore the forests which are naturally very dense and also because the mining has started very recently, there is no change in the legal status and the appearance of the forest. The major activity is done only in the area for which the surface rights have been acquired.

- The underground mining is done at a depth between 56-150 mtrs and also the terrain of the area is very rocky which means that there is very less probability of subsidence and apart from that the Tawa – II mine has started the production recently and in its mining process there has not been much depillaring due to which it is not possible to check the subsidence. However as suggested by SFRI Jabalpur the hilly nature of the area suggests that horizontal stresses may be present in this block and if the magnitude of the stress is high then it can pose a serious problem. So there is a need to carry out a comprehensive study to map the direction and magnitude of stresses which will eventually help in the designing of roof support system.

- The cost of compensatory afforestation which was to be done over 25.416 ha for the compensation of 12.708 ha of forest land was estimated as 3,81,240/= rupees by the forest department and was transferred to the forest department (CAMPA) however there was no record found regarding the status of the compensatory afforestaion as in whether the afforestation was done or not

- The environmental clearance of the project was obtained from the Ministry of Environment and Forests and the conditionalities were met as per the rules
- The plantation was done in most of the area whose surface right had been transferred and also along the road. The mine is located at a little elevated position due to which the greenery on the surface right area bears an aesthetic look. The surface of the mine lease area is covered with dense forest cover so there is no need for plantation.

- The mining lease area is marked with white concrete pillars at equal distance however there was no boundary of surface right area

- One of the observations which was in direct contrast with the MoEF guidelines was the distance of the mining area from a water body. Since the Tawa II mine is in very close proximity to the Satpura reservoir there was no proper distance maintained (120 mtrs) between the mining area and the reservoir which is a matter of concern

- There was not much water discharged from the mine mainly because of the topography however whatever water was discharged was used for the sprinkling on the coal which was transported using conveyor belts. The water from nearby Satpura reservoir was also used for dust suppression and other construction purposes

3.7.3 Environmental Impact as per Environmental impact assessment Report

Impact on land use

- The mine is located in the core forest are and the underground mining is practiced so there is no impact on land use except the area for which surface right has been taken

Impact on air quality

- Air quality is affected by coal dust mainly at the time of loading the coal.

Impact on water quality

- Since the Satpura water reservoir is located just adjacent to the mining area there is greater possibility that the mining water discharge gets mixed with the water in the reservoir

Impact of noise and blasting

- The area is a very dense forest and home to a large number of different species of flora and fauna
- The noise and the vibration due to blasting can pose a serious threat to the wildlife as they are very sensitive

3.7.4 Mitigation measures as per the Environmental management plan

- In order to study the impact of mining on the land mainly due to subsidence a study was carried out by Centre of Mining Environment, ISM Dhanbad for shobhapur UG mine which is located in the same coalfield as Tawa II. From this study it was observed that in case of Tawa II maximum likely subsidence would be around 1980mm.In order to control the subsidence protective bunds and garland drains shall be laid around the depillaring area so that no water from the surface enters the subsidence area. The surface would be packed using non-carbonaceous debris. The cracks shall be filled with matti and stone chips. For continuous monitoring grid pillars shall be located 30 m apart at the surface over the working panels at intervals of 50m.

- Mine water discharge will be allowed to settle in the underground sump and will be passed through a sedimentation pond to arrest the suspended solids and then the water will be used for dust suppression on coal transportation. Garland drain along the coal stockyard would be used to restrict the suspended solids entering into the natural water regime

- Noise pollution will be checked by proper periodic maintenance of plants and machinery and using noise absorbing pads at the foundation of the vibrating equipment. Development of green belts around the infrastructure and isolation of noise generating equipment will be ensured

- Green Belt will be maintained around the mining area so as to minimize the air and noise pollution. Species like black siras, neem, arjun, maharukh, ashoka etc. have been proposed for planting along the road.

Results of study carried out by SFRI, Jabalpur- A study was carried by SFRI Jabalpur to know the impact on forest due to Tawa II underground mining and the conclusion was –

- The mining has no direct impact on soil, water, flora, and fauna as there is no physical clearance of the forests for carrying out the mining process
- Subsidence will take place vertically up to a height of tunnel excavated in the operation of UG mining however no cracks have been found on the surface due to subsidence
- There has been little impact on the flora and fauna mainly due to human and bovine population and also air and water pollution due to extraction and transportation

Recommendations –

- Compensation of loss of vegetation by aforestation works and using multipurpose tree species for the general benefit of local population and labourers
- Alternative measures to meet fuel, fodder, small timber and other requirements of workers which will help in reducing the pressure on the natural forests
- Making workers aware about the deteriorating environmental conditions and taking protective measures to save the flora and the fauna
- Processing of water before releasing it into reservoir
- Make efforts to reduce impact on the flora and fauna by enhancement of forest area

3.7.5 Observations of environmental conditions

- The Tawa II mine is located in the Asir Reserved Forest located just adjacent to the Satpura range which has the forests of very high density. The mining is done by underground mining method using board and pillar method. The impact of mining over the land is mainly due to the building of infrastructure for mining process and transportation. The effect of subsidence could not be assessed as the mining had started just a few years back and the depillaring was not yet done in any of the mining compartments. The effect on air quality was not as such visible mainly because of low production and better techniques of transportation like conveyor belt where the sprinkling was done regularly. The water discharge from the mining is collected in settling tanks and used for sprinkling however most of the water which is used comes from the nearby Satpura reservoir

which is matter of concern also as there was no proper distance maintained from the reservoir which was a source of drinking water for the nearby villages. The close proximity of this reservoir is also posing a threat to the Tawa mine as there is a possibility of water seeping into the mine.

Chapter 4 Status of Approval Conditionalities

4.1 Compensatory Afforestation

The cost of compensatory afforestation has been realized in all the cases however due to non release of funds from CAMPA for past seven years, the compensatory afforestation was done for two mining projects only. The compensatory afforestation is done over small patches of degraded forest land which are scattered and therefore it becomes difficult to manage them. These sites are neither demarked nor properly marked therefore its difficult to identify them. The type of species which were planted in these afforestation sites were mainly teak, however it is a known fact that teak is not an indigenous species and does not attract wild life. One more anomaly associated with this conditionality was that those user agencies which are public sector subsidiaries are exempted from getting the non-forest land for doing compensatory afforestaion and in these cases compensatory afforestation is done over the double the area on degraded forest land however this does not serve the purpose of adding to the present area of forest land as we all know that mining activity completely degrades the land (P. Ob)

TABLE 5 STATUS OF COMPENSATORY AFFORESTATION

Project Name	Year of approval	Payment status	Implementation status
1. Manikpur OC	2006	Yes	No
2. Gevera OC	2006	Yes	No
3. Rajgamar UG (Penal CA)	2006	Yes	No
4. Dhanpuri OC	2001	Yes	Yes
5. Rajendra Navegaon UG Surface Right	2006	- Yes	- No
6. Khadia OC	2010	Yes	No
7. Gorbi Block B	2006	Yes	Yes

8. Mahadeopuri UG Surface Right	1998	- Yes	- No
9. Rawanwara Khas	2008	-	-
10. Navegaon UG	2008	-	
11. Tawa I	1997	-	-
12. Tawa II Surface Right	1997	- Yes	- No

(source – self)

FIGURE 17 COMPENSATORY AFFORESTATION SITE AT NIPUNIA VILLAGE,DISTRICT SHAHDOL

(Source – Self)

4.2 NPV of the Environmental Loss

Since the economic development shall not be at the cost of complete degradation of the forest or the environment and the ecosystem provided by the green area of the forest. Therefore it was considered that the user agency shall compensate for the diverdion of the forest land and subsequently as per the orders of the honb'le Supreme Court the NPV of the environmental losses is being realized from the user agencies of projects involving the forest land diversion since 2002.The NPV of the environmental losses has been realized in all the cases. The amount is deposited with Compensatory Afforestation Fund Management and Planning Authority. (P. Ob, Report of Central Empowered Committee)

4.3 Demarcation of Mining Lease Area

The demarcation of mining lease area is done in all the underground mining projects however this condition is not followed in open cast mining projects. This creates the problem of identifying the lease area from the non lease area and also there is always a possibility of over stepping the lease area. As per the conditionality the demarcation is to be done by erecting concrete wall/trenches or pillars however these pillars are not strong enough. There was no way to make out whether the pillars are at the right position or there has been overstepping of lease area.(P.Ob)

FIGURE 18 DEMARCATION OF MINE LEASE AREA, CHINDWARA

(Source – Self)

4.4 Restoration and Reclamation

The restoration and reclamation process of the mined out areas is governed by various statutes like Mineral Conservation and Development Rules 1988, Rule 33.However the national standards for restoration and reclamation are not followed in most of the cases of open cast mines. In some cases backfilling is done but no standard methods are followed for the treatment of toxic substances. Also there are no standards or studies carried out to reduce the hydrological impact over the reclaimed area as in what precautions should be taken to maintain the water content in the overburden dumps and also to improve the landscape of the degraded area. Apart the various technical mmodifications which can be helpful in better reclamation were not used. There was no benching done neither was the dump supported by stone wall so that soil erosion will be prevented. There were no precautions taken to preserve the top soil. No efforts have been take to maintain the reclaimed areas(P.Ob)

FIGURE 19 EXTERNAL DUMP AT GEVERA OPEN CAST MINE, DISTRICT KORBA

(Source- Self)

4.5 Safety Zone around the Lease Area

The safety zone around the mine lease area is not properly maintained in all the projects. The purpose of the safety zone is to act as a blanket against the dust and noise generating from the mining area however in most of the case the user agency takes some plantation in the office compound and the colony area to show as the safety zone area.(P.Ob)

FIGURE 20 KHADIA OPEN CAST MINE

(source- self)

4.6 Treatment of Water before Discharge

The water is treated by the process of sedimentation in most of the cases except in two cases where chemical treatment is also done. There are no guidelines for the proper treatment of water discharged from the mined out areas. This water is mainly used for dust suppression and also supplied to the local villagers who are unaware of the quality of the water. In a few cases like Gorbi open cast mine at Singraulli, the water left after the mining had turned acidic due to the pyrites in coal and there were no standards to anticipate or deal with this kind of situation.(P. Ob)

TABLE 6 WATER TREATMENT PLANT

Project Name	Sedimentation	Chemical Treatment
Manikpur OC	Yes	Yes
Gevera OC	Yes	No
Rajgamar UG	No	No
Dhanpuri OC	Yes	No
Rajendra navegaon UG	Yes	No
Khadia OC	Yes	Yes
Gorbi Block B OC	No	No
RawanwaraKhas UG	No	No
Navegoan UG	No	No
Mahadeopuri UG	Yes	No
Tawa – I UG	No	No
Tawa – II UG	No	No

(Source – self)

4.7 Free Supply of Coal to Labourers and Staff Menbers

The user agencies are supplying free LPG cylinders per month to every labourer and staff member so as to reduce the pressure of fuel wood on the nearby forest land(P.Ob)

4.8 Afforestation in Blank Areas

The afforestation of blank areas over underground mines where forest density was less than 0.4 over the mining lease area was partially done in all the cases. However these afforestation sites are always under the pressure of nearby villagers for fodder as well as for fuelwood.(P.Ob)

FIGURE 21 RAWANWARA KHAS UNDERGROUND MINES

(Source- self)

4.9 Managing Surface Subsidence

There were no major signs of surface subsidence except a few cracks at places where depillaring was going on, however these cracks and depressions were checked and filled at regular intervals, the reason being that there is a possibility of water seeping inside the mining area or air coming inside may cause explosion. The subsidence is monitored by using concrete pillars which are put half inside the land surface at equal intervals. The subsidence of these pillars is monitored in order to find out the subsidence

pattern of the area however these pillars are broken up by the local villagers as it has got iron rods for reinforcement. This technique has a high probability of errors.(P.Ob)

FIGURE 22 MEASURING SUBSIDENCE USING PILLARS, NAVEGAON RAJENDRA UNDERGROUND MINE

(Source- self)

Chapter 5 Environment - Background and Mitigation Measures

Environmental damage caused due to coal mining and any other metal mining process is evitable fall out of industrialization and modern civilization. Their operations drastically change the landscape and there is evident degradation of the visual environment. In case of underground mining land subsidence is major issue as it creates mine voids.

Decades ago, mining industry, winning wealth from untapped nature was looked up as a symbol of man's ingenuity. In many cases it was the very reason for the existence of town. Now it is looked upon as a forerunner of the destruction of environment. In recent times, environmental controls and resource management procedures have resulted in the change of traditional approach towards the mining. Environmental impact assessment, environmental management plan, land reclamation schedule etc being the methodology by the user agency to check on the impact due to mining on the environment. In any cases, additional constraints are designed to reduce the environmental impacts. Environment is integrated and its components are linked by dynamic process. One component of environment to another component of environment therefore it is not possible to affect one part of the environment without affecting other part of it. (Sengupta, 2000)

Many adverse environmental impacts result from mining of coal if no mitigating measures are used. Important question is how to balance the need of society (continuous economic growth) with its desire to preserve the nature.

5.1 Environmental impacts of mining

- **Effect on the quality of air –** there are many factors which deteriorates the quality of air, some of the uncontrollable causal factors are due to lack of precipitation, wind (as it carries on the dust particle from mine site to other places) , and due to soil configuration (loose soil is easily blown up in the windy state of nature). Other than above mentioned factors there are factors such as vegetative density on the mined areas, also coal haul road surfaces where the transportation as well as loading and unloading of coal is done. (Sengupta, 2000)

- **Impact on noise level –** noise level in the mines is basically contributed due to blasting, use of heavy locomotives for transportation, use of heavy machineries, it also depends on the sequence of blasting and spacing between the blast holes. Soil geology also adds on in the factor causing noise e.g. in case soil having rocky strata heavy blasting material is required and it results in noise. Also noise level in case of open cast mines is slightly higher than in case of underground mines. (Sengupta, 2000)

- **Impact on surface water –** surface water involves two characteristics one is the physical aspect of the water and the other chemical one. Physical characteristics of the surface water depends on the natural vegetative density, natural drainage patterns, natural topography beside that it also depends on the factors interception caused on water due to open cut. Length and slope of overburden surfaces and soil quality in the mined areas. Factors causing the degradation in chemical characteristics of surface water are overburden geochemistry, overburden stratigraphy, inversion of overburden materials on spoil piles, change in the permeability of spoils. (Sengupta, 2000)

- **Impact on the ground water –** groundwater is affected by the pyrites content in the coal content. Higher content of pyrites in the coal acidifies the ground water and eventually the water left is of no use. Gorbi open cast mines is one of the examples where the ground water quality has degraded due to contact with pyrites in the coal. PH of the water in Gorbi mines is between 3 -4. Other than that ground water is affected by the natural height of water table, overburden characteristics and also due to altering flow rates of ground water. (Sengupta, 2000)

- **Impact on land use pattern –** it involves the use land for the mining in case of open cast mines. The factors that defaces the land involves placement of overburden dump. In most of the cases the overburden dumps are placed on the open land area for the longer period of time. Major changes in topography (rugged) leads to destruction of natural landscape. Removal of native vegetation affects the quality of the soil directly. High sulphur content with the coal mixes with the soil reduces the fertility of the soil and the nearby vegetation also the texture of the surface under consideration deteriorates (Sengupta, 2000)

- **Impact of subsidence -** land subsidence in case of underground mine depends on the topology of the area. The physical impacts of subsidence may vary from simple negligible lowering at ground surface to severe damage by wide and deep cracks. (Sengupta, 2000)

5.2 Mitigation measures for environmental effect due to mining

- To minimize the effect on the quality of air dust controlling measures are taken by the user agencies. Water sprinkling is done by the user agencies on coal haul roads. Water sprinkling is done by both static and dynamic procedures. In case of static water sprinkling, sprinklers are placed at the spacing of 10 metres and are able to rotate 360^0 for the full coverage of the area. In case dynamic water sprinkling water tank is used in 2-3 phases to sprinkle water on the haul roads. Water sprinkling through the water tank is the most common method in place. Also to suppress the dust plantation is done in staggered form. This method was quite evident in SECL opencast mines. Revegetation in mined areas is important measure that is taken by the user agencies.(P.Ob/EMP)

- To keep the noise under the prescribed decibel limit (< 90 dB) user agencies use silencer with the blasting equipments. Also in many places surface miner are deployed to eliminate noise. High quality machines like 42 Cum, Shovels & 240 tonne dumpers are deployed in the mine to reduce the number of vehicular trips, there by reducing the noise. There is blasting vibration control plan made by the user agencies to minimise the noise level in working zone. Regular monitoring of noise level and there is routine maintenance schedules of heavy machineries and equipments. Plantation is done in vacant areas / safety zone for the noise attenuation.(P.Ob/EMP)

- For the surface water drainage garland drains are made around the periphery of the quarry and these garlands are connected to nallahs. In many of the cases user agencies has deployed settling tanks to treat mine water. And the settled mine effluent is being used for domestic and industrial consumption. For the chemical treatment of water domestic effluent treatment plant is commissioned for three open cast mines. Storage of treated water in mine pits is given emphasis to provide water round the year. To keep the quality of surface water revegetation is done in mined areas. Also settlement of suspended solid prior to discharge to natural drainages ways.(P.Ob/EMP)

- For ground water recharge backfilling of dug out quarry is done approximately to original landscape. Also by spreading the top soil on the spoil surfaces. Plantation of indigenous species does help in the restoration of ground water. Selective placement of overburden materials is done and biological reclamation is preferred over the traditional methods of reclamation in few mines.(P.Ob)

- For the land reclamation of mined out areas primary objective of user agencies is to bring the land to some productive use, i.e. agriculture, forestry or recreational purposes. It involves systematic handling of the top soil, top soil are removed before any drilling, blasting, mining or any other surface disturbances.(P.Ob)

TABLE 7 STAGE WISE REMOVAL OF TOP SOIL,GEVERA

SL NO.	Stage of mining	Area (Ha), Quarry	Quantity (M.Cu.m.)
1	Up to 10th year	1386	4.16
2	Up to 20th year	1675	5.02
3	Up to final year	2037.25	6.11

(Source- land reclamation plan, Gevera OC)

Top soil is stockpiled when it is impractical to promptly redistribute such materials on re graded areas. Stock piled materials are selectively placed on stable area, protected from wind and water erosion and contaminants which lessen the capability of the materials to support vegetation when redistributed. Technical reclamation is followed up at many places with proper plantation technique on overburden dumps. Seeds and legumes are sown first according to follow the theory of succession. Plantation of indigenous and fruit bearing plant species is done at spacing of 2.0X2.0 metre on the top surface as well as on the gentle slopes of the dumps. (P.Ob/EMP)

Chapter 6 Conclusion

6.1 Monitoring the status of compliance of conditionalities to be fulfilled after final clearance

In all the projects the conditionalities such as NPV, money for the compensatory afforestation etc which are required to be fulfilled for the final clearance are complied strictly however once the user agency gets the final clearance the other conditionalities as per the FCA clearance are not fulfilled and monitored. So there is a need to have continuous monitoring of the status of these conditionalities.

6.2 Use of non forest land for Compensatory Afforestation (CA)

The user agencies such as South Eastern Coal Fields Limited, Northern Coalfields Limited and Western Coalfields Limited which are the subsidiaries of Coal India Ltd are exempted from the condition to provide revenue land for compensatory afforestation. As the open cast mining leads to devastation of landscape and biodiversity, doing compensatory afforestation on the degraded forest land does not add to the area under forest land. This exemption allows the user agency to get away with providing of the non-forest land for compensatory afforestation. (Saxena & Saxena, 2003)

6.3 Plantation of indigenous species and their protection at CA sites

The compensatory afforestation sites are mostly planted with trees that produce more of timber rather than adding to the natural capital and maintaining ecological balance therefore it would be prudent to encourage the plantation of indigenous species that will attract the wildlife and also add to the habitat which has been widely disturbed by the mining activities. (Saxena & Saxena, 2003)

6.4 Demarcation of pillars around the mining lease area and CA sites – Use of GPS

Demarcation of pillars will help in distinguishing the mining lease area from the non lease area; also it would help in preventing the encroachment. The demarcation should be done using GPS as it would help in locating and monitoring the mine lease area. Also the pillars should be properly marked so as to show the forest area in which the lease area is situated. The sites of compensatory afforestation should be properly demarcated with proper information regarding the area and plantation and also the mining project for which they are done. (Saxena & Saxena, 2003)

6.5 Outsourcing monitoring and landscape maintenance activities

Monitoring the compliance of approval conditionalities can be outsourced to experts as it will help in speedy restoration of the degraded forest land. Afforestation activities including plantation in vacant areas, over burden dumps and compensatory afforestation could also be outsourced. As the forest department is itself burdened with other activities of protecting the forest land, hiring private organizations could be helpful in improving the landscape of the degraded areas in a scientific manner and also maintaining the same over a span of time on contract basis. (Saxena & Saxena, 2003)

6.6 Laws governing reclamation plan should be stringent

*Mineral Conservation and Development Rules 1988, Rule – 33 which deals with the restoration and reclamation of mined out areas does not highlight the need of scientific methods for the whole process. The words 'as far as possible' reflect the degree of relaxation which makes it possible for the user agencies to find the loop holes in getting away with the responsibility of improving the landscape. The law does not mention the methods of preserving the top soil and also reducing the hydrological impact on the overburden dumps. (Saxena & Saxena, 2003)

6.7 Restoration of Landscape

This aspect deals with the restoration and reclamation process involved in case of open cast mining. There is a need to make the statues more stringent and also to monitor the user agencies to make sure that scientific methods are used for restoration and reclamation of mined out areas.

The management of external dump is an important aspect of reclamation and proper care should be taken so the height, area, angle of repose of overburden and the shape of the waste rock dump should be designed as per the area available. The vegetation of only those areas which are required to be worked in near future should be felled instead of felling the trees of whole area. The designed construction of waste dumps should be such that the outslopes do not exceed 20^0 from the horizontal plain and could be strengthened with contour bunds, contour trenches, vegetative hedges etc.

The design of overburden dumps should be such that there are no long unbroken slopes as they allow surface run-off to accelerate and therefore cause erosion. So the slopes should be of short length and also proper benching should be followed where the height of the slopes would be between 5-10 m and width of the bench would be 4-6 m. Addition of fertilizers and contour hedges can help in proper and speedy restoration of dumps.

To restore the landscape it is important to preserve the top soil. It can be preserved by temporary seeding, using bio chemical fertilizers. The overburden strata should be backfilled in such manner so that the water table is maintained. Under visual impact assessment the reclamation plan should provide certainty that the final site is compatible with the surrounding natural landscape. In case of mines of same geology, e.g. In Singraulli district of MP, Northern Coal fields Ltd is working on more than 12 opencast mining projects, therefore rather than preserving the top soil for a particular site it can be transferred to other mining site. (Saxena & Saxena, 2003)

6.8 Speedy restoration of worked out areas in open cast mines

There should be speedy restoration of worked out areas and backfilling of the quarry should be done as per the reclamation plan of the user agencies which is approved in their Environmental Management Plan. (Saxena & Saxena, 2003)

6.9 No clearance for mining deep inside the forest areas

Mining should not be allowed in the forest cover with density more than 0.5. For mining well below 80 meters opencast mining should not be allowed, if underground mining is possible. As per our observation underground mining causes very less impact on the forests and its surrounding areas compared to the opencast mining. (Saxena & Saxena, 2003)

6.10 Need for Innovation – Transplantation of trees

The value of a tree is well understood by the people living in the urbans and every measure is taken to protect even a single tree on the road side, however when the real environmental capital which is present in form of dense forest cover is degraded by large scale open cast mining then it becomes imperative to take action.

FIGURE 23 TRANSPLANTATION OF TREES

(Source- www.transplantation.in)

There is a need for a comprehensive study to protect semi mature trees and well established forest cover. If mine under consideration is given lease to go for the open cast mining, then well grown up trees should be transplanted to degraded forest sites. The compensatory afforestation done anywhere takes decades of years to add to the environmental capital, however if the survival rate of transplantation is even around 40%, it will always be a better way of recovering the loss.

Despite in mining significant area of land has been degraded, but it remains one of the important sources of energy. The process of coal extraction drastically alters the physical and biological structure of the mined out areas, so the land protection becomes inevitable aspect. From the initial phase of mining the

protection of land should be of prime importance. Coal is the main source of energy in most of developing countries like India which is always short of energy for the purpose of development process and therefore coal mining becomes a necessary trade off to carry forward this development process. There are few recommendations that have been put forward by us, and most important are the regular monitoring and evaluation of the mining area by nodal agencies. Post mining law should be strictly followed.

*** Mineral Conservation and Development Rules 1988, Rule – 33.** (Saxena & Saxena, 2003)

- Every holder of prospecting license or a mining lease shall take steps so that the overburden, waste rock, reject and fines generated during prospecting and mining operations or tailings, slimes and fines produced during sizing, sorting and beneficiation or metallurgical operations shall be stored in separate dumps.
- The dumps shall be properly secured to prevent escape of material there from in harmful quantities which may cause degradation of environment and to prevent causation of floods
- The site for dumps, tailings, slimes shall be selected as far as possible on impervious grounds to ensure minimum leaching effects due to precipitation
- Wherever possible the waste rock, overburden etc shall be backfilled into the mine excavations with a view to restoring the land to its original use as far as possible
- Wherever backfilling of the waste rock in the area excavated during mining operations is not feasible, the waste sumps shall be suitably terraced and established through vegetation or otherwise.
- Fines, Rejects or tailings from mine, beneficiation or metallurgical plants shall be deposited and disposed in especially prepared tailing disposable area as such they are not allowed to flow away and cause land degradation or damage to agricultural field, pollution of surface water bodies and ground water or causes flood

Chapter 7 Works Cited

Ministry of Environment and Forest. (n.d.). Retrieved from www.envfor.nic.in

Saxena, N. C., & Singh, G. (2000). Environment and Ecoplanning of Mining of Sedimentary Deposits in Forest Areas. *Indian Journal of Environmnet and Ecoplanning* , 439-446.

Saxena, R., & Saxena, S. (2003). *The handbook of Environment and Forest Legislations, Guidelines and Procedures in India.* Delhi: Green Publishing Corporation.

Sengupta, M. (2000). *Environmental Impacts of Mining - Monitoring Restoration and Control.* Florida: Lewis.

Environmental Impact Assessment Report

Environmental Management Plan

Forest Management Plan

Central Empowered Committee

Corporate Social Responsibility Report

Land Reclamation Plan

Forest Clearance