

**REPORT OF THE SUBGROUP NOMINATED BY
THE EAC (COAL MINING) ON VISIT TO THE
TWO OPERATING AND TWO PROPOSED
COAL MINES OF NORTH EASTERN COAL
FIELDS (NEC) OF M/S COAL INDIA LIMITED
LOCATED IN DIGBOI FOREST DIVISION OF
TINSUKIA DISTRICT OF ASSAM**

Ministry of Environment and Forests

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Report on the visit to the two operating and two proposed Coal mines of North Eastern Coal Fields (NEC) of M/s Coal India Limited located in Digboi Forest Division of Tinsukia District of Assam

1.0 Background

The North Eastern Coal Field (NEC) has a lease hold area of 26.88 sq. km in the luxuriant tropical rainforests of Digboi Forest Division, a bulk of the Division has already been converted into Tea Gardens. Most of the forests are confined to hilly terrain. The Makum Coalfields are confined to these hilly landscapes which harbour at present secondary forests. The primary climax forests dominated by giant *Dipterocarpus macrocarpus* were already logged for plywood and for other woods (*Shorea assamica*, *Terminalia myriocarpa* and *Mesua ferra*) of industrial value. These were 4-5 storeyed forests with abundant orchids, ferns, lianas and climbers. The NEC with its headquarters at Margherita is at present extracting coal from the following 6 mines:

(i) Baragolai underground mine, (ii) Tipong underground mine, (iii) Ledo underground mine, (iv) Tirap open cast mine, (v) Tikak open cast mine, and (vi) Ledo open cast mine. These coal mines cover 2688.16 hectares.

The North Eastern Coalfield has applied for EC for Tikak extension OCP (0.2 MTPA from 192 ha of ML area) Lekhapani OCP (0.25 MTPA from ML area of 235 ha). The EIAs based on TORs of both the projects were considered by EAC (T&C) in meetings held on 22-23, March 2010 and again on 17-18, October 2011 (Lekhapani case) and on 26-27 October 2010 and 17-18 October 2011 (Tikak Extension OCP). Since both the projects are located in biodiversity rich tropical rainforests of upper Assam and since the area is known to be corridor for elephants (in fact Lekhapani Reserve forest including the proposed site of forest diversion also falls in Dehing - Patkai Elephant Reserve). Further, the mine water is acidic due to pyrite, and the run off from OBDs which contain shales is also acidic; this acid mine drainage contaminates ground water, surface water including rivers, and soils. An NGO (Purbanchal Welfare Organization, dated 10th October 2009) also represented the Ministry on the adverse impacts of mining in the Makum Coalfields on the ground water, rainfall, forests etc.

It was decided by the Committee that a subgroup consisting of Professor C.R. Babu, Shri T.K. Dhar, Dr. R.K.Garg, Advisor, CIL and Director, MoEF may visit the sites of both the projects and submit the site specific environmental measures to mitigate the likely adverse impacts of mining.

2.0 Site Visit

Shri T.K. Dhar, Dr T. Chandini, Dr R.K. Garg (Adviser in CIL) and Professor C.R. Babu visited the sites from 4-6th April 2012. The subgroup accompanied by the Chief General Manager (Shri A. K. Bora), General Manager (Dr D. Sarkar) and other senior officials visited: (a) Nursery, (b) Butterfly Park, (c) Orchidarium, (d) reclaimed OBDs, (e) backfilled voids, (f) voids of existing Tikak OCP and (g) proposed Tikak extension OCP, (h) Tipong OCP, and (i) Museum (j) Ledo valley recreation centre (reclaimed abandoned mine), (k)

Ledo OCP and lime dosing plant for treatment of acid mine water, (l) proposed Lekhapani OPC, (m) Tipong underground mine where heritage steam loco engine is still in use for coal transportation, (n) Arboretum of Digboi Forest Division at Digboi Town and also (o) Dibru-Saikhowa National Park. A presentation was also made by the officials to the subgroup. At Arboretum the subgroup interacted with DFO of Digboi Division and discussed about the feasibility of providing saplings of native forest species for restoration of OBDs of NEC.

The subgroup also interacted with members/representatives of village Committees/Gram Panchayats/Gram Sabhas of villages located in and around Tikak extension OCP and Lekhapani OCP (Annexure I).

The officials present during visits to different places and at the time of presentation and discussion with local representatives are annexed (Annexure I).

3.0 General Landscape features of the mine lease area of NEC

These coal mines are located on the south-eastern side of Burchi - Dihing River, northwest of which has dense forests of Margherita east range and further west was Digboi range; there is an elephant corridor between Digboi range and Margherita east range (Figure 1). The coal mines are located in Lekhapani range which is situated on the south east of Burhi - Dihing River (Figure 1). The Margherita east range is located on the south west of Burhi - Dihing River. All the mines listed fall under Tipong, Lekhapani and Tikak forest ranges (Figure 2). A network of streams, rivulets and rivers originate from the hilly terrains of these reserve forests. In other words these three reserve forests are watersheds and catchments. Some of the rivulets and rivers that pass through coal fields are: Namdang river (flowing besides Tikak OCP and Baragolai colliery), Ledo pani nallah flowing besides Ledo OCP, Tikak river flowing besides Lekhapani OCP and Tipong river flowing Tipong valley (Figure 2).

These hill ranges used to harbour luxuriant 4-5 storeyed tropical rainforest biome with top layer occupied by lofty *Diptocarpus macrocarpus*, *Shorea assamia*, *Altingia excelsa*. The second storey is dominated by *Mesua ferra*, *Dysoxylum*, *Terminalia*, *Litsea*, *Elaeocarpus* and *Vatica*. The third storey is represented by *Dillenia*, *Mesua indica*, *Ardisia*, tree ferns (Figure 3) and *Calamus* species. The fourth storey is represented by herbs such as *Musa* (Figure 4) and *Dryopteris/Glechinia*. Epiphytic orchids and ferns are abundant and climbers and lianas are plentiful.

4.0 Observations

4.1 Nursery: A central nursery, with a capacity to grow one lac saplings, spreading over an area of more than one hectare is established besides Dehing Training Institute (Figure 5). There are polyhouses and net houses with several thousands of saplings of mostly exotic species and a few species of fruit yielding plants such as mango, citrus, *Artocarpus*, *Psidium guajava* and *Eugenia*. The subgroup suggested to

the authorities that native forest tree species saplings like *Artocarpus* species, *Eugenia*, *Dubanga*, *Canarium*, *Dillenia*, *Sterculia*, *Macaranga*, Bamboos, *Morus*, *Terminalia myriocarpas*, *Alstonia*, *Aesculus*, *Dipterocarpus macrocarpus*, *Shorea assamia* should be raised.

- 4.2 Butterfly Park and Orchidarium:** The Butterfly Park located above the hills of Tikak Colliery besides the haul road leading to existing Tikak OCP has small Interpretation Centre (Figure 6). The restored OBD is mostly composed of *Acacia auriculiformis* and *Cassia siamea*. The ground is barren. A few ornamental plants were observed. A few common butterflies that visit ornamentals were also noted. The interpretation centre (Museum) has good and varied collection of butterflies. In the Orchidarium (Figure 7) some epiphytic orchids are grown on trunks and branches of *Acacia auriculiformis*; some are grown on hanging twigs covered with mosses. in pots filled with wood charcoal and gravel; a few terrestrial orchids are grown in soil and pots filled with soil. Some of the orchids are exotic. Native orchids are poorly represented. These newly created conservatories were located on a reclaimed OBD above the hills of Tikak colliery besides the haul road leading to existing Tikak OCP

A recreational children park was also developed in the township of Margherita on the way to mines. The subgroup visited Rajiv Gandhi Stadium at Baragolai beside NH 38 to the North where few coke own plants generating black fumes are perhaps responsible for acidification of soils and waters due to use of sulphur rich coal.

4.3 Abandoned/Closed Mine at Ledo

Ledo Valley Recreation Centre (Figure 8) is located close to NH-38 and is on the western side of Ledo OCP. A stadium called Pataki Stadium, a park and a lake (Figure 8) have been created on an abandoned mine. A part of the void is backfilled and developed into a flat cricket ground and a part is left as a shallow water body. External OBDs without reclamation were also observed. The flat cricket ground of the backfilled void was covered with grasses such *Paspalum* (turf grass) and *Cyanodon*. The reclaimed OBDs mostly harbour stands of *Acacia auriculiformis* and *Cassia siamea* (Figure 8). The flat area near the void, where VIPs planted trees, harbour fruit yielding species such as *Citrus*, and *Eugenia* and mango. The void is shallow and the water is clean and supports aquatic vegetation suggesting its nonacidic nature. Fish is also found in the void.

The non coal bearing areas harbour degraded communities consisting of weeds such as *Chromolaena*, *Mikania* and also a few pioneer species such as *Eugenia*, *Macaranga*, *Osbeckia/Melastoma* and *Sterculia*.

4.4 Tikak OCP (existing):

The OCP is still active and represents mining of a hill of about 300 to 400 m high above the ground level (Figure 9). It was dug upto 30m - 40m depth below the flat ground. Massive cut slopes of the hill with the strata exposed were noted; OBDs were scattered on non coal bearing deforested areas. One reclaimed OBD harbouring *Acacia auriculiformis* and *Cassia siamea* was located on the eastern side of existing OCP. The entire OBD is composed of clayey soil mixed with shales. The void did not have mine water but it receives rain water drained from the slopes. There are streams originating from the hills. The Coal Authorities confirmed that the entire OBD will be used for backfilling after 3 to 4 years. Some external OBDs would still exist.

The hill ranges have specific topography and support a luxuriant 4 to 5 storeyed tropical rainforest, but the topography of back filled areas is mostly flat. These flat back filled areas may not support the dense luxuriant forests which used to exist on the gentle slopes and valleys. The backfilling of voids should be carried out in such a manner that the original topography is restored so that the native forest communities can once again be easily established. The surface drainage from OBDs and mine void is acidic and the surface run off enters in streams/rivulets/rivers.

During our inspection, we found that most of the reclaimed OBD has only weeds such as *Mikania* and native weedy fern *Dryopteris/Glechinia*. Plantation of *Acacia auriculiformis* and *Cassia siamea* are common on OBDs.

4.5 Acid Drainage from mines and its management

The issues relating to acid drainage from mines are: (i) acid drainage from cut surfaces, (ii) acid mine void water, and (iii) the acid surface run off from OBDs. These issues can be addressed in the following way:

- (i) Treatment of acid drain in mine pit: It should be pumped into Lime treatment plant and allow the treated water to settle before discharging into streams. Acid mine void water should also be treated in the same way as that of acid mine drain in the pit. The pH and chemical composition should be regularly monitored at the point of discharge. The stream water should also be monitored. Records pertaining to the above should be made and put up to inspecting Authorities.
- (ii) There should be a garland drain with sides well pitched with stones around OBDs which should necessarily be channelized into a tailing pond and then pumped into Lime treatment plant.

The treatment plant installed at present has a small capacity (Figure 10) and the capacity of the plant should be enhanced. The residue of tailing pond and lime after treatment should be disposed off safely.

The OBDs and cut surfaces should be sufficiently grassed to prevent leaching and sliding. This would prevent acid drainage to a large extent, but we wish to mention that the lime treatment is not a solution to handle large volumes of acid drain in the long run.

The OBDs, as far as possible, should be restored to original rainforest communities.

The species that can thrive on OBDs are: (i) *Duabanga*, (ii) *Macaranga*, (iii) *Dillenia*, (iv) *Melastomia*, (v) *Eugenia*, (vi) *Litsea*, and (vii) *Kydia*, (viii) *Gmelina*, (ix) *Terminalia myriocarpa* and others.

Saplings of about 140-170 native tree species are available in the nurseries of Digboi Forest Division located at Digboi town. As a part of CSR activities, local ladies and men could be deployed for planting these native species with the assistance of DFO, Digboi Forest Division.

5.0 Tikak Extension OCP

The proposed Tikak Extension OCP is located on the north east of existing OCP. These hill ranges have the secondary tropical rain forests having the same floristic composition as mentioned above and described in the Wildlife Conservation Plan in and around coalfields of North East Coalfield by Aaranyak. These forests support rich wildlife, including primates such as Gibbon and many Schedule I and II mammals, butterflies and threatened orchids.

6.0 Lekhapani OCP

This is a catchment area for Tipong and Lekhapani rivers originating from in and around mine lease area of the proposed Lekhapani OCP. The area harbours secondary tropical rainforest (Figure 11) with the same composition as that of Tikak OCPs. The proposed Tipong West and East OCPs are located on the north eastwards of Lekhapani OCP. The OBDs of the proposed Lekhapani OCP and future expansion of Tipong occupy significant proportion of forest area. It is likely that these OCPs may also have acidic mine water. It is felt that the quantum of acidic water in all these OCPs will be enormous and accordingly the amount of lime required for dosing will also be enormous. We would strongly advise that the management of OBDs should be such that void after decoaling should immediately be backfilled so that the acid water, by and large, is contained and there will practically be no acid surface runoff from OBDs. The mining of the blocks should be sequential in a way that OBDs of one OCP is completely used for filling the decoaled void of another mine.

The OBD should be temporarily covered with grasses and bamboos, and after back filling, the entire area should be restored to original tropical rainforest ecosystem using sapling of same 140-170 species available in the nursery of DFO, Digboi Forest Division.

7.0 Recreational Parks and Museum

The NEC established a Recreational Park and a Museum at Margherita. The Recreational Park has a manicured lawn, a fountain and beds of seasonal ornamental plants and few ornamental shrubs. Although the park is well maintained, it does not have native fruit yielding plants and endemic plants of the area.

The Museum depicts the Colonial Heritage of the area and developmental activities in the area, including history of coal mining in the area and World War II activities in the area (Figure 12). The methods of mining are depicted very well by models. All the exhibits are self explanatory and are well maintained. In short the Museum has an immense educative value and preserves heritage of the past. It has, indeed, been a laudable effort on the part of Sh A.K.Bora and his team to have thought of this nice initiative.

8.0 Issues discussed during presentation by officials of NEC

During presentation by the officials of NEC, the following suggestions have been made by the members of subgroup on the proposed Tikak extension OCP and Lekhapani OCP.

Parallel action should be taken up for FC and EC of the projects. Differential GPS should be used for plotting boundary coordinates of the proposed projects. Recommendations of the State and National Wildlife Boards are required for FC. Spatial data at intervals of every 3 years on the reclamation of mined out areas in NEC should be generated by remote sensing. The water quality of streams in the area should be properly assessed. The environmental quality in NEC should be monitored regularly and at times authenticated by a third party. Yearly Social audit of CSR activities undertaken by NEC should be got carried out through a nearby reputed Institute or University. Monitoring of status in aquatic biodiversity of streams should be carried out regularly and records maintained and furnished to Authorities of Pollution Control / MoEF.

9.0 Discussion with representatives of Gram Panchayat/Gram Sabhas of Lekhapani, Tpong, Gaon Bura, Malu Goan, Phin Hiro, Nepaali Gaon, Mulang-3 no. villages

The representatives expressed an immense satisfaction with the social benefits provided by NEC under different programmes, including CSR, and welcomed both the projects. During their interaction they informed the subgroup that the broad requirements of villagers were: (i) employment in mining of the proposed projects, (ii) road connectivity, (iii) drinking water supply, (iv) electricity, etc.

The subgroup had a chance to witness a cultural programme wherein young school going girls and boys displayed their local artistic talents representing a wide range of rich traditional cultures prevalent in the area (Figure 13). The subgroup had a word of appreciation for the same and suggested that NEC

should establish a **Centre for promoting traditional cultures** of the region as a part of CSR activity.

10.0 Recommendations

The low lying hill ranges which bear coal reserves are mostly composed of clayey or clayey silt soils, and harbor biologically rich 4-5 storeyed evergreen tropical rainforests with *Dipterocarpus macrocarpus* in the top canopy and with abundant epiphytes and climbers. These hill ranges are water sheds for complex network of streams, rivulets and rivers that drain the entire area into larger river system of Bramhaputra. Removal of forest cover from these hills results in: (i) massive landslides and (ii) excess surface runoff resulting in floods in the downstream. As a matter of fact, the coal reserves in these mines should be extracted by underground mining- a method followed during British Rule and still followed by NEC.

Open cast mining, as is well known, results in deforestation of biologically richest tropical rainforest biome in one of the hotspots of the world leading to loss of biodiversity, including some rare, endangered and threatened and endemic biota, particularly orchids and butterflies.

Although the climax primary forests were logged, the secondary forests developed are also biologically rich.

Apart from the loss of biodiversity and adverse changes in hydrology, the other major issue of open cast mining is the acid drainage from OBDs and cut surfaces of hills, and mine void acid water leading to acid pollution of streams/rivers and also the soils. Keeping these vital aspects in view, after careful analysis of the work done by NEC and field observation made, the subgroup recommends the following:

- 10.1** At the outset, the subgroup strongly recommends underground mining in the areas that harbour luxuriant tropical rainforest ecosystems. If it is not possible, then open cast mining only in the presently proposed blocks (as the forest cover in the blocks has already been removed by shifting cultivation) can be permitted on the following specific conditions:

(a) that no external OBD is allowed to remain for longer period and is used to backfill the void in order to avoid acid drainage;

(b) the original topographic features such as slope, valley and peak is taken into account while rehandling OBD and back filling void or the mining plan is drawn in a way that critical biotopes if and where possible are excluded from mining;

(c) live collection of all the rare, endangered and threatened and endemic species are introduced into ex situ conservation areas such as Orchidarium, Butterfly Park and Arboretum before the mining operation;

(d) roads and a well pitched garland drain all around OBDs are provided in a manner that the contents are discharged into tailing ponds/lakes/lime dosing tanks before finally discharging the treated water into streams;

(e) acid mine water in mine voids are treated in a similar manner with lime before final discharge into streams/rivulets;

(f) till the OBDs are rehandled, the OBDs are planted with grasses, bamboos and such pioneer species as *Macaranga*, *Osbeckia/Melastoma* and such ferns as *Glechinia/Dryopteris* and others.

- 10.2** Immediately after back filling, the entire mined area should be restored to original forest ecosystem using some 140-170 native species, the saplings of which are available in the nurseries of Digboi Forest Division and maintained at Digboi town. Around 140 native tree species as seen by us during our visit are well established at the Arboretum of Digboi town.

The following pioneer species should be planted to begin with:

- (i) *Macaranga*, (ii) *Sterculia*, (iii) *Duabanga*, (iv) *Melastoma/Osbeckia*, (v) *Morus*, (vi) *Terminalia myriocarpas*, (vii) *Eugenia*, (viii) Bamboos and others.

After the above species are planted in the first instance, the other native species should subsequently be introduced. Even the other native species could also be introduced simultaneously if the substratum has some top soil. The saplings of 140 – 170 native species, already established at Arboretum of Digboi town, should be procured forthwith from the nurseries of Digboi Forest Division and / or from the forest floor of reserve forests by deploying women folk as a part of CSR activity.

- 10.3** Exotics such as *Acacia auriculiformis*, *Cassia siamea*, Neem and other exotics should not be planted. It is absolutely meaningless to plant these desert plants in such high rainfall areas where the biologically productive rainforest communities thrive very well.
- 10.4** It is advisable that the exotics planted in Orchidarium and Butterfly Park are replaced by native species procured from nurseries of Digboi Forest Division and the butterflies and orchids of the area are conserved in the Orchidarium and Butterfly Park, before mining is initiated. It may perhaps be worthwhile to consider setting up of an alternative Orchidarium and Butterfly Park.
- 10.5** An Arboretum of native tree species should be established on the pattern of Arboretum developed by Digboi Forest Division. The NEC may wish to contact Mr P. Shiva Kumar, DFO – Digboi Forest Division for his advice and necessary help. During our interaction with him, we felt that he has a passion to undertake such challenges where many others fear to tread.
- 10.6** The nursery should maintain the saplings of native forest species and fruit yielding species. The saplings of native species can be obtained from the reserve/protected forest and or from nursery of Digboi Forest Division. The

saplings of fruit yielding species such as *Artocarpus*, *Citrus*, *Eugenia*, and local native species should be developed and should also be distributed among local communities.

The 1000s of saplings of exotic species present in the nursery as of now should be abandoned and saplings of native species should be raised. The seeds of exotic species already collected should be abandoned and seeds of native species should be collected and used for raising of saplings.

- 10.7** The existing lime treatment plant is not adequate enough to treat acid drain water and it is certainly not a viable option for the voluminous acid drain originating from all the OCPs keeping in view the enormous amount of lime required to treat acid drain water and the problem of disposal of waste residues from settling tanks.

The environmentally sound option is that the mining should be carried out in a manner that there is no external OBD except for the material taken out for mine opening and OBD is used for backfilling in parallel with mining. If this is not entirely possible or feasible, the external OBD in that case should be grassed and planted with bamboos and used for back filling as soon as the void is ready to receive it.

- 10.8** The subgroup appreciates Sh A.K.Bora, the Chief General Manager and his team for the efforts made to establish Recreation Park, Museum, Butterfly Park and Orchidarium.

The subgroup recommends that NECL to set up a **Centre for promoting and conservation of tribal art and culture** as a part of CSR activity.

- 10.9** NEC should also establish a conservation unit with an ecologist, wildlife biologist and hydrologist to manage Orchidarium, Butterfly Park and to restore mined out areas using native species and to monitor quality of underground water, water of streams/rivulets/rivers and also rain water and periodically through a third party for proper authentication.

- 10.10** NEC should go whole log to develop road connectivity in villages as also provide drinking water facilities as desired by local village communities besides providing them with employment opportunities and skill upgradation facilities by providing good training and retraining, if necessary, to earn their livelihoods.

- 10.11** The NEC should spend as a one time activity a sum of 0.4% of the Capital Cost of the Projects towards CSR activities and afterwards spend Rs. 5/- per metric ton of production when projects are in production stage towards CSR every year.

- 10.12** NEC should undertake quality of precipitation that falls near coke own plants and chemical properties of soils sampled from sites located close and also from coke oven plants in and around mines.

- 10.13** Since the Elephant Reserve includes a part of Lekhapani reserve forest, the Lekhapani OCP would require clearance from the National Wildlife Board.
- 10.14** The subgroup recommends that EC be given to Tikak Extension OCP and Lekhapani OCP with the stipulation of all conditions listed under recommendations.

Acknowledgement

The subgroup of EAC (T&C) extends thanks to the authorities of NEC for providing logistic support during their visit to the sites of NEC from 4th to 6th April' 2012.

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