

Information
technology for the
mining industry
environmental
sciences essay



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\n[/toc]\n \nIndia's numerous technology research institutes are working on energy related R&D. However, there is a possibility that they are operating in a fragmented fashion. The Government may get improved recoveries on its investment by concentrating on few important technology areas. To start with focus may be applied for tighter emission standards and development of technologies for extraction of methane from coal deposits. All mining operations today involve continuous use of explosives, thereby generating high noise level, vibrations and shocks and very high level of dust pollution. This also takes away very large area as explosive safety zone and environment safety zone. Alternative technologies for using high power laser system for safe, pollution free and precision mining need to be evolved. 8. Information Technology for the Mining Industry India has a unique blend of small and large scale mining operations. There is a need for assimilating the advances in Information & Communication technologies into mining operations for technological upgradation. Experiences from the oil & gas exploration where most advanced ICT have been successfully used will be useful in the mining industry as well. Many times the oil & gas industry has given the thrust to ICT out of necessity– 3D imaging & visualization and networking of large scale super computers. Indian mining industry could

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further modernize by using softwares for an integrated data management, analysis & 3D geological modelling, 3D plant design and advanced real time control & monitoring systems. Application of Information Technology should lead to robotic mining for improving the precision, safety and overall yield from mining. In addition to the above, the following measures, which have been accepted in principle, are awaiting implementation:

- Freeing the sector from controls on distribution
- Establishment of a regulatory authority to resolve price disputes between producer and consumers of coal
- Granting of infrastructure status to coal sector
- Allowing public sector enterprises for joint venture projects with private sector.

From 2007 to August 2011, 113 coal mining projects have been granted forest clearance.[2] This includes 67 projects which received final forest clearance and 46 projects which received in-principle forest clearance. About 26, 000 ha of forestland has been diverted for coal mining since 2007. During the 10th FYP the total forestland diverted for all mining projects was about 29, 000 ha. So, the forestland diverted for coal mining alone during 11th FYP is equivalent to forestland diverted for all mining projects in 10th FYP. In the last five years, during the 11th five year plan (FYP) period (till August 2011), 181 coal mines (including projects that applied for capacity expansion) were given environment clearance (EC) by Ministry of Environment and Forests (MoEF). The combined production capacity of these 181 coal mines is at least 583 million tonnes per annum (MTPA). In 2010, India produced 537 million tonnes of coal. So, during the last five years, MoEF has granted EC to double the coal production capacity in the country.[3] The Offshore Areas Mineral (Development and Regulation) Act, 2002 providing for development and regulation of mineral resources in the territorial waters, continental shelf, and the exclusive

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economic zone was notified on 31. 1. 2003. The legislation would enable streamlining of mineral exploration and development in the offshore areas and ensure systematic and scientific exploitation of mineral reserves (except petroleum, natural gas and hydrocarbon resources) for attracting private investment in the mineral sector. Offshore Areas Mineral Concession Rules are being finalized in consultation with Legislative Department.

Private Sector Participation

Need for captive mining The need for captive mining in India can be better comprehended by having a glance at development of coal mining industry. Pre-Nationalization - most of the mines were privately owned. There were concerns on safety and occupational health in the light of which Government of India decided for nationalisation of coal mines. Post-Nationalization - Under the Coal Mines (Nationalization) Act, 1973 coal mining was mostly reserved for the public sector. National Coal Development Corporation /Coal India Limited (CIL) became the central agency for mining coal. In 1976 captive mining was opened up for private companies engaged in production of iron and steel. Sub-lease of coal mines in isolated small pockets not requiring rail transport was allowed. In 1993 captive coal mining was opened for power generation companies and for washing of coal obtained from a mine. The idea was to expedite coal production from sources other than CIL to feed coal to the power plants as coal fired power contributed majorly to the power generation in the country as it was difficult for CIL to match the increasing demand of coal. It was felt that private participation in coal mining may ease the increasing pressure of the widening gap between demand and supply of coal in the country. Private sector would also bring in

much needed capital for investment in the sector. In 1993, limited private participation was permitted in the coal sector, essentially captive mining for self use. In 1996, the Chari Committee recommended a greater role for the private sector, along with its deregulation. These recommendations have been reflected in policy statements of the government. The Ninth Plan proposed reforms for deregulating the coal industry and increasing the role of the private sector. The main proposals were: restructuring the industry, greater autonomy to the subsidiaries of CIL, private sector participation in commercial coal mining through allocation of coal mining blocks and setting up coal washeries. The Approach Paper to the Tenth Five-Year Plan points out that a major policy constraint is the fact that the coal sector is the only one not open to private investment (except for captive mining).[4] Under the Coal Mines(Nationalisation) Act, 1973 coal mining is exclusively reserved for the public sector. By an amendment to the Act in 1976, two exceptions to this policy were introduced viz.(i) captive mining by private companies engaged in production of iron and steel and (ii) sub-lease for coal mining to private parties in isolated small pockets not amenable to economic development and not requiring rail transport, were allowed. Considering the need to augment power generation and to create additional capacity during the VIII Plan period, the Government decided to allow private participation in the Power Sector. The Coal Mines (Nationalisation) Act, 1973 was amended w. e. f. 9. 6. 1993 to allow private sector participation in coal mining for generation of power, for washing of coal obtained from a mine or for other end uses to be notified by Government from time to time in addition to the existing provision for the production of iron and steel. Mining of Coal for production of cement has also been permitted by the Government vide <https://assignbuster.com/information-technology-for-the-mining-industry-environmental-sciences-essay/>

notification dated 15. 3. 96.[5]The following are the guidelines adopted for allocation of blocks to the public / private sector for captive mining :-(i) An application for mining of a coal block for quantity less than 1 mtpa in opencast mining and less than 250, 000 tonnes per annum in underground mining would not be entertained so as to ensure economic / scientific mining of Indian coal.(ii) Preferably blocks in green field areas where basic infrastructure like road, rail links, etc. is yet to be developed should be given to the public/ private sector. The areas where CIL has already invested in creating such infrastructure for opening new mines should not be handed over to the private sector, except on reimbursement of costs.(iii) The blocks offered to private sector should be at reasonable distance from existing 'mines and projects of CIL in order to avoid operational problems.(iv) Blocks already identified for development by CIL where adequate funding is on hand or in sight should not be offered to the private sector.(v) Public/private sector should be asked to bear full cost of exploration in these blocks which may be offered.(vi) For identifying blocks, the requirements of coal for about 30 years would be considered.(vii) The other requirements are:(a) approval of mining plan as required under the Mines and Minerals (Regulation and Development) Act, 1957.(b) inspection for an appropriate enforcement of conservation measures by the Coal Controller under the Coal Mines (Conservation and Development)Act, 1974 with a view to ensuring scientific mining.(c) enforcement of safety regulations by the Directorate General of Mines Safety.[6]A Screening Committee under the Chairmanship of Additional Secretary(Coal) comprising of representatives from Ministry of Railways, Ministry of Power, Concerned State Governments, Ministry of Steel, Department of Industrial Policy & Promotion (Ministry of Industry), Coal

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Controller, Coal India Ltd., CMD's of concerned subsidiary companies of CIL, CMD, NLC as members has been set up in the Ministry for screening the proposals received for captive mining. Chapter 5

Problems Faced by the Coal Sector

- Lack of Investments in Mining[7]In spite of the economic liberalization of 1991 the mining sector has not seen major investments. This is possibly due to the problems such as government policy, land acquisition, development of infrastructure, transportation system, social engineering and community development involved in major green field site projects. There is a need to re-look at the total management solution for attracting investment in new mines. The solution has to lead to the creation of joint venture institutions with central government, state government and private sector as partners. The facilitation for the project through provision of land, infrastructural development, community development etc, can be done by the government agencies whereas the investment in the mine and the associated technological inputs can come from the private sector. In addition, the private sector must have the freedom to run the mine in a cost effective manner. This may be a long term solution for future mines in India and it will have unique opportunities for both the government and private sector to work together for India's development.
- Historically, opencast mining has been favored over underground mining. This has led to land degradation, environmental pollution and reduced quality of coal as it tends to get mixed with other matter.
- In addition, current economic mining practices are generally limited to depths of 300 meters and 25 percent of the reserves of the country are beyond this depth.
- Further, coal mining in India is

associated with poor employee productivity. The output per miner per annum in India varies from 150 to 2, 650 tonnes compared to an average of around 12, 000 tonnes in the USA and Australia. • India has still not been able to develop a comprehensive solution to deal with the fly ash generated at coal power stations through use of Indian coal. • Clean coal technologies, such as Integrated Gasification Combined Cycle, where the coal is converted to gas, are available, but these are expensive and need modification to suit Indian coal specifications. • Challenges in JhariaJharia Coal field in Jharkhand is the richest coal bearing area in India which contains large quantities of high grade coking coal. However, this area also contains a large number of mine fires which have been burning for several decades. A major challenge to the mining community is that of tackling fires which have engulfed large and densely populated coal bearing areas. A technological, cost effective, safe and minimum disturbance solution to this problem has to be found.

Effect on environment due to coal mining[8]

The mining operations like drilling, blasting, extraction, transportation, crushing and other associated activities are carried out in underground and opencast mines. Mining operations damage the environment and ecology to an unacceptable degree, unless carefully planned and controlled. There is a need for balance between mining and environmental requirements. The various impacts of mining on environment and their mitigation measures are as follows:(I) Impact of Mining on Air QualityAir pollution in mines is mainly due to the fugitive emissions of particulate matter and gases including methane, sulphur dioxide, oxides of nitrogen and carbon monoxide. Most of the mining operations produce dust.[9]The major operations producing dust

are drilling, blasting, hauling, loading, transporting and crushing. Basically, dust sources in mines can be categorized as primary sources that generate the dust and secondary sources, which disperse the dust and carry it from place to place called as fugitive dust. Opencast mining is more severe an air pollution problem in comparison to underground mining. High levels of suspended particulate matter increase respiratory diseases such as chronic bronchitis and asthma cases while gaseous emissions contribute towards global warming besides causing health hazards to the exposed population. The uncontrolled dust not only creates serious health hazard but also affects the productivity through poor visibility, breakdown of equipment, increased maintenance cost and ultimately deteriorates the ambient air quality in and around the mining site. The dust can also pollute nearby surface waters and stunt crop growth by shading and clogging the pores of the plants. Besides polluting the environment, the generation of dust means the loss of fines, which act as road surface binders.

(II) Impact of Coal Mine on Fires

A number of coal mines in the country are affected by fires leading to steady destruction of precious energy resource. The reason for mine fires presumably involves the phenomenon of spontaneous heating through two interrelated processes viz., the oxygen coal interaction or oxidative process and the thermal process. If remains uncontrolled, the fire could spread further through interconnected pathways and fissures in the strata. It is estimated that about 10% of total national coal resources are in the fire-affected areas. Mine fires give rise to several environmental problems besides safety hazards and economic losses. Apart from direct losses due to burning of coal, the other associated hazards encountered are: i) gas poisoning, ii) difficult geo-mining conditions, iii) sterilization of coal, iv)

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hindrance to production v) explosions, vi) damage to structure and adjacent properties, etc. (III) Impact of Mining on Water regime(IV) Impact of Mining on Land[10]Irrespective of the type of mining used for extracting coal, mining invariably results in enormous land disturbance- e. g. large scale excavation, removal of top soil, dumping of solid wastes, cutting of roads, creation of derelict land etc. The mining industry, in general, is reluctant to rehandle overburden material for economic reasons but in a few cases it has been planned to rehandle the material to fill the voids created at the end of mining, and it is expected that the practice will become more widespread in future. Opencast mining has more potential impact on land than underground mining. With improved technology, opencast coal mining is being used extensively because of its cost effectiveness and productivity though it results in large-scale land disturbance. Although underground mining has considerably less impact than opencast mining on land, it causes enough damage through subsidence as observed in Jharia and Raniganj Coalfields. The surface subsidence inflicts severe damages to engineering structures such as highways, buildings, bridges and drainage besides interfering with ground water regime.(V) Impact of Noise and Vibrations from MiningA cumulative effect of all mining activities produces enormous noise and vibrations in the mining area, which constitutes a source of disturbance. The availability of large diameter, high capacity pneumatic drills, blasting of hundreds of tonnes of explosive etc. are identified as noise prone activities. The obvious implication of noise is, of course, the potential for noise-induced hearing loss. In addition, noise produces other health effects, influences work performance and makes communications more difficult. Besides, the fauna in the forests and other areas surrounding the mines/industrial complexes is

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also effected by noise and it has generally been believed that wildlife is more sensitive to noise and vibrations than the human beings. Environmental Measures Adopted[11]Air Pollution Control Measures

- Water spraying on haul roads by mobile and fixed sprinklers: The coal transport road was covered under water spraying scheme either with the help of road side static water sprinklers or mobile sprinklers.
- Dust extractors in the Coal Handling Plants and drilling equipment: All the excavation drills have been equipped with dust extractors.
- Black topping of service roads: The coal transportation roads have been black topped with arrangement of collection of the coal dusts and removing the same periodically. Besides, the coal transportation contractor have been cautioned not to overload the truck which may cause spillage generating dusts due to crushing by running trucks.
- Avenue plantation: Forest Department has been engaged for plantation on roadsides besides plantation on the OB dumps and other empty lands.
- Dust masks: The excavation equipment operators have been issued with dust masks.

Water Pollution Control Measures

- Industrial effluent treatment plants: Effluent Treatment Plants (ETPs) have been constructed in the downflow line of the workshop as well as mine discharges so that pollution parameters in the effluents are well within acceptable norm. Many of the mines could reach the ' zero discharge' arrangement targeted for.
- Silt arrestors/ Siltation ponds/ Sedimentation ponds: Catch drains termiating at sedimentation ponds have been constructed garlanding the OB dumps to arrest flow of silts to the rivers/ nalas.
- Sewage Treatment Plants (STPs): STPs have been constructed to take care of the domestic effluents in all the mine colonies of the project replacing the conventionnal safety tanks.

The treated effluents are being utilized for dust suppression and being
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supplied to the agreeable villagers for irrigation. Noise & Ground Vibration Control Measures Following actions are adopted to keep the noise level within the statutory limit in day as well as night time. 🏭 Use of Controlled blasting techniques. 🏭 Green belts around colonies and mine areas. 🏭 Proper maintenance of heavy Earth Moving Machinery. 🏭 Issue of earmuffs to the excavation workmen.

Conclusion

Coal mining sector needs structural overhaul to attract investments that can help the sector meet growing needs for raw material for power, steel, cement and other usages. The sector has been traditionally dominated by the government-owned companies and with limited participation from the private sector. Government should provide roadmap for amendment to MMDR Act to ascribe marketability to prospecting and mining licenses will help the sector reap risk capital and will make exploration a sustainable business for private investment. Government may also facilitate creation of alternate investment market that will provide much needed funds to support prospecting and exploration activities. The economic liberalization policies and programs, which commenced in 1991 in India, had no impact on the Coal Industry. Coal Industry continued substantially unchanged in spite of the captive mining being permitted for specified industries. It is suggested that the environmental issues in respect of projects which are important to reach the Tenth and Eleventh Plan targets should be taken up on priority consideration. The most urgent measure to augment coal supplies and increase the number of players in coal mining would be to ensure the full and fair use of the provisions for captive coal-mining under the current legal

framework, especially by those public and private power generating companies with the necessary financial and management capabilities to quickly realize the full potential of captive blocks. It is further concluded that the current provisions for increasing the level of competition in coal mining through captive mining were adequate and reasonable. However, procedures and processes need to be improved to expedite the allotment of the captive coal blocks in a transparent and effective manner. These procedures/processes should address the legitimate concerns of various stakeholders involved and incorporate necessary flexibility to achieve the end objective of raising the number of players engaged in coal mining with a view to increasing supply and competitive efficiency in the coal mining sector. Further, the established procedures/processes should be able to select serious allottees committed to developing and mining blocks allocated within a prescribed timeframe. Finally, the procedures/processes must include a set of punitive penalties for failure to do so. This will help address some of the lacunae in the manner in which the policy is currently being implemented. Ledo Opencast Project is one of the recent projects. The project is located in 101 ha. For which mining lease has been granted. Environment and forest clearance has been approved. Permission under Mines act has been approved by DGMS. Outsourcing of Coal & OB production has been achieved. The mine operation has been started and is now in construction period. The project located in Ledo block of Makum coalfield, has mineable reserve of 1.68 Mt. and has a rated capacity of 0.15 MTY at an average stripping ratio of 1:5.24, for the project life of 14 years. Mine operation was started in April 2009. Our Missions in the area of coal mining should be :- (i)

To augment production through Government companies as well as captive
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mining route by adopting state-of-the-art and clean coal technologies with a view to improve productivity, safety, quality and ecology.(ii) To augment the resource base by enhancing exploration efforts with thrust on increasing proved resources.(iii)To facilitate development of necessary infrastructure for prompt evacuation of coal. With the objectives to ensure achievement of targets for coal production and off-take, lignite production and power generation (NLC). To facilitate development and production from captive blocks. Introduction of Competitive Bidding as selection procedure for allocation of Captive Coal blocks. Identification of new coal blocks. To ensure coal supply to regulated power utilities. To ensure that the coal companies bring all linked consumers under FSA regime. To consider rationalization of existing sources of coal supply with a view to reducing transportation cost for the existing consumers. Implementation of Rail & Road Infrastructure Development in Coalfield areas. Publishing guidelines for preparation of mining plan of Coal and Lignite Blocks. Thrust on detailed drilling to augment proved reserves.