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MINING AND ENVIRONMENT

Dr.A.R.Kulkarni
Principal, College of Non-conventional Vocational Courses for Women (CNCVW),
Affiliated to Shivaji University, Kolhapur

"Sustainable development" is that pattern of development which "meets the needs of the present without compromising the ability of the future generations to meet their own needs [World Commission on Environment and Development, 1987"

1.0 INTRODUCTION

Minerals are valuable natural resources that are finite and non-renewable. The history of mineral extraction in India dates back to the days of the Harappan civilization. The wide availability of minerals in the form of abundant rich reserves and the eco-geological conditions make it very conducive for the growth and development of the mining sector in India. As a major resource for development the extraction and management of minerals has to be integrated into the overall strategy of the country's economic development. The exploitation of minerals has to be guided by long-term national goals and perspectives. Thus, minerals play a key role in the evolution of human society and its overall economic development. metals/stones, electrical & electronics equipment, glass and ceramics etc. There will be huge demand for minerals in view of the rapid urbanization and projected growth in the manufacturing sector in India. India occupies a dominant position in the production of many minerals across the globe.

Mining sector, being one of the core sector of economy, provides basic raw materials to many important industries like power generation (thermal), iron and steel, cement, petroleum and natural gas, petro-chemicals, fertilizers, precious & semi-precious.

On one hand mining is essential for the socio-economic development of our country and at the same time there are number of health and environmental impacts at various stages of mining. There are different phases of a mining project, beginning with mineral ore exploration and ending with the post-closure period. What follows are the typical phases of a proposed mining project. Each phase of mining is associated with different sets of environmental impacts. It is need of the time to understand and address the environmental issues at the beginning of the projects so that adverse impacts can be minimized. The development of mining industry should be sustainable in nature. This can be done by the implantation of Sustainable Development Framework (SDF) Developed by the Ministry of Mines, Government of India. The sustainability of the mining industry stands on three pillars: economic, environmental and social. Striving for sustainable development involves balancing the inevitable conflicts in these three areas.

2.0 MINING AND ECONOMIC DEVELOPMENT

India is home to 1,531 operating mines and produces 95 minerals – 4 fuel-related minerals, 10 metallic minerals, 23 non-metallic minerals, 3 atomic minerals and 55 minor minerals ((including building and other materials and the recently notified 31 additional minerals). Area occupied by mining in India just less than 2%. Area occupied. Area occupied major and minor minerals are approximately 60% and 40 % respectively.

India is the 3rd largest producer of coal. Coal production grew at CAGR 5.17% over FY14-FY19 (to 739.36 MT) and is expected grow 6-7% Y-o-Y over FY20 as miners focus on surface mining of coal. Coal's share in India's primary energy consumption is expected to be 48% in 2040. India is the 2nd largest crude steel producer in the world, generating an output of 106.5 MT in 2018, a growth of 3.7% Y-o-Y (https://www.investindia.gov.in › sector › metals-mining).

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Mining is one of the core sectors that drive growth in an economy. Not only does it contribute to GDP, it also acts as a catalyst for the growth of other core industries like power, steel, cement, etc., which, in turn, are critical for the overall development of the economy. Analysis has shown that every one percent increment in the growth rate of mining and quarrying results in 1.2 – 1.4% increment in the growth rate of industrial production and correspondingly, an approximate increment of 0.3 percent in the growth rate of India's GDP (FICCI, 2013).

There is significant mineral potential that still lay untapped in India for the growth of mining but historically, mining sector has struggled to exploit the potential due to three big factors i.e. regulatory and administrative procedures, inadequate infrastructure facilities and sustainability. These challenges have limited the overall investment in mining and exploration activities in India, as evident from very low inflow of FDI in the mining sector. India's spend on mineral exploration is less than 0.5% of the global spending on exploration in 2010, much below its fair share given the size of mineral resource potential.

Given the availability of mineral wealth in India, the Ministry of Mines, Government of India, has targeted significantly higher share of GDP from mining. It aims to increase share of mining and quarrying in GDP from current 2% of GDP to 5% of GDP over the next 20 years. This requires mining to grow at 10-12% per annum. On the other hand, within two decades of liberalized economy, much in contrast with the constitutional objectives, mining as a sector has come to be associated with scams, conflicts, violence and ecological degradation. The conflict it engenders is enormous and wide spread. The future should therefore usher in an era of mineral development with socio-economic development as the focus.

The Indian mining industry is passing through a critical phase, especially in the last two years witnessing even negative growth rate primarily due to closure of iron ore mines in the states of Karnataka, Goa and Odisha, high costs of borrowing and policy paralysis.

The mining and quarrying sector needs to grow at rate of 10 to 12% per annum in order to cater to the requirement of raw materials by the industries. As mining is interlinked with industrial development, the security of raw material is of prime importance and as such, the pro-active role of union and state governments is called for to ensure an era of mineral development. It is time we address the areas of concern coming in the way of mining or we will need to import both the raw materials and the finished products, which the country can ill afford. (FICCI, 2013).

Establishment of National Mineral Exploration Trust (NEMT), District Mineral Foundation (DMF) along with Corporate Social Responsibilities (CSR) activities will contribute to a great extent to the overall development of mining industries.

Mining industry has made significant impact on the economic development of our country. At the same time there are numerous adverse impacts of mining on Environment and Health.

3.0 IMPACT OF MINING

Three main types of changes are distinguished as a result of mining: change in the natural topography which results in restrictions in the possibilities of using the land for other purposes, changes in the hydro geological conditions with consequences for both groundwater and surface water and finally changes in the geotechnical conditions of the rock (Aswathanaryana 2003). The impact varies with local conditions of the specific site of mining. These changes caused by mining can give rise to various impacts on the geoenvironment, described below:

3.1 Impacts on the Lithosphere

Depending on the type of mining conducted and the site of mining there are several types of impacts on the lithosphere. The results range from formation of ridges, depressions, pits and subsidence on the surface as well as underground cavities affecting the stability of the ground. Furthermore, both the area for mining and the area used for waste dumps, occupy and degrade land that could be used for e.g. farming and agriculture (Aswathanaryana 2003).

3.2 Impacts on the Hydrosphere

Impacts on the hydrosphere resulting from mining include lowering of the groundwater table, mine water discharge into rivers, seas and lakes, leakage from settling tanks and evaporators that have a negative effect on the groundwater quality and pumping of water into the ground for the extraction of a mineral (Aswathanaryana 2003).

Significantly lowered groundwater levels can result in huge surface depressions and drained rivers and lakes with serious impacts on surrounding agriculture for example. Furthermore, depending on the chemical composition of the rock, the drained water usually becomes highly acidic with the resulting capability of taking into solution a variety of toxic and heavy metals (Aswathanaryana 2003).

3.3 Impacts on the Atmosphere :

Atmospheric emissions during mining occur not only from internal combustion engines in mining

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machinery but dust and gases are also released from blasts and rocks and mineral masses. One tonne of explosives produces about 40-50 m^3 nitrogen oxides and huge amounts of dust (Aswathanaryana 2003).

Smelters are commonly used for mineral purification and emissions from these processes include particulate matter and gases such as sulphur dioxide, carbon monoxide and carbon dioxide. Although some installations use different kinds of flue gas purifications, these are never completely effective (Carr &Herz eds. 1989).

3.4 Impacts on the Biosphere

The biosphere is adversely affected by mining mainly by pollution and by degradation of land and vegetation resulting in loss in biodiversity. Mining can also have impact on local microclimate (Aswathanaryana 2003).

3.5 Health Aspects :

Health impacts from mining can be divided into two categories: immediate impacts such as accidents; and accumulative and progressive impacts such as stress, radiation and pulmonary diseases (Aswathanaryana 2003).

In terms of health hazards, four different types can be distinguished: physical, chemical, biological and mental hazards:

3.6 Physical Hazards :

Physical hazards include noise, heat, vibrations, falls and explosions, flooding and various forms of dust, aerosols and fine particles with resulting fibrogenetic and carcinogenic effects (Aswathanaryana 2003). Ionizing radiation is included in the category of physical hazards.

3.7 Chemical Hazards

Chemical hazards arise from chemical pollutants in water, solid wastes and air with the most common substances being carbon monoxide and dioxide, oxides of sulphur, nitrogen oxides and fluorine compounds (Aswathanaryana 2003).

3.8 Biological Hazards

Biological hazards caused by living organisms such as fungus, bacteria and parasites are more common among mine workers in developing countries with poor standards of hygiene and sanitation.

3.9 Mental Hazards

Mental hazards involved with mining include claustrophobia, anxiety, tension or irritability involved with the awareness of the dangerous working site. Fatigue and other disorders linked to shift work are other potential problems among mine workers (Aswathanaryana 2003).

4.0 MINING AND SUSTAINABLE DEVELOPMENT

Mining, more than any other industrial activity tends to leave strong negative impacts on environment and society. However, a complete ban on mineral extraction is from the earth's crust. The efforts instead should be to limit the negative consequences of mining through the application of the concept and principles of sustainable development to mining operations.

"Sustainable development" an all-inclusive, somewhat ambiguous concept basically means economic and social development that endures over the long-term and its core ethic is intergenerational equity.

The government should primarily be concerned with the „legal framework for sustainable mineral development and ensure that the relevant laws are implemented fairly and effectively in order to ensure good governance in the mineral sector.

In the Indian mining sector, the more urgent necessity is to ensure effective, efficient and purposive administration of the existing mining and environmental laws that are designed to ensure scientific mining, optimum utilization of mineral resources and environmental integrity. Duality of central and state control of mineral administration and multiplicity of regulatory bureaucracies with inadequate staff and budget seem to be the major deterrent for sustainable development of mining industry (D.P.Tripathy, 2008).

As per the recommendations of a High Level Committee headed by Shri Anwarul Hoda, a Sustainable Development Framework specially tailored to the Indian context was developed taking into consideration the work being done in International Council of Mining and Metals (ICMM) and International Union for the Conservation of Nature and Natural Resources (IUCN). The SDF was based on the following eight principles. (E-Book on Mineral Sector, 2016).

4.1 The following eight principles form the core of the Sustainable Development Framework for India :

Principle1: Incorporating Environmental and Social Sensitivities in decisions on leases: This principle integrates sustainable development concepts at the earliest phase of the mining life cycle. The underlying philosophy of the principle is to categorize mineral bearing areas based on an environmental and social analysis taking a risk based approach. At the bidding stage the categorization of lease areas into High and Low risk will allow the investors to take business decision with the knowledge that the cost and uncertainties of getting approvals as well as operations

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in high risk areas will be significantly higher than the low risk areas. It will also allow regulators to put additional commitments at an early stage for environmental and social performance. This principle allows for the government to balance environmental and social interests of the nation, with mining priorities in the longer term;

Principle 2 :Strategic Assessment in Key Mining regions: Understanding that mining activities occurs inclusters which have impacts at a regional level, undertake a strategic assessment of regional and cumulative impacts and develop a Regional Mineral Development Plan based on as assessment of the regional "capacity" at periodic intervals. Creating an institutional structure to own and implement such plans in key mining regions and taking critical decisions on mining, new leases, allocation of resources, and even possible moratorium on mining to ensure more sustainable planning and development in such regions;

Principle 3: Managing impacts at the Mine level impact through sound management systems. The key elements of this principle are impact assessment of key environmental, social, health and safety issues, and development of management framework and systems at the mine level and continual improvement of the same on the basis of international standards on a self driven basis. A key element is disclosing performance on environmental and social parameters to external stakeholder at every stage of the project lifecycle;

Principle 4: Addressing Land, Resettlement and Other Social Impacts. This principle demands a comprehensive assessment of social impacts and displacement of mining projects at the household, community and mining region level, and management commitment to address those impacts through mitigation measures and management plans;

Principle 5: Community engagement, benefit sharing and contribution to socio-economic development. This principle seeks commitment to regular engagement with the local community as well as sharing of project benefits with the affected families. It is rooted in the principle of sharing profits with the affected communities already provisioned for the in draft MMDR Act awaiting approval. It dovetails the social impact management of project operations with the CSR initiatives being undertaken and looks at an integrated approach to mitigate impacts and improve local livelihoods and living conditions in the neighborhood areas/communities.

Principle 6: Mine Closure and Post Closure Mining operations must prepare, manage and progressively work on a process for eventual mine closure. This process must cover all relevant aspects and impacts of closure in an integrated and multi-disciplinary way. This must be an auditable document and include a fully scoped and accurate estimate of planned cost of closure to the company. The cost estimates must be adequately provisioned to cover national, regional and local legal and regulatory requirements for closure; and must also include the cost of servicing all agreements/commitments made with stakeholders towards post-closure use;

Principle 7: Ethical functioning and responsible business practices. This principle underlines the need for ethical business practices and a strong sense of corporate responsibility among mining companies. It recommends companies to go beyond legal compliance

Principle 8: Assurance and Reporting. This principle seeks mining sector stakeholders to assess their performance against this SDF and demonstrate continual improvement on this performance over the life of the project. It requires this performance to be reported in a structured manner in a Sustainable Development Report to be disclosed in the public domain as well as to regulatory agencies to consider during approval processes (Ministry of Mines, November 2011).

5.0 National Mineral Policy 2019 : The new Mineral Policy 2019, Ministry of Mines, Government of India will be mile stone for systematic and sustainable development for mines. The National Mineral Policy 2019 includes provisions which will give boost to mining sector. Some of the provisions are:

The Policy also introduces the concept of Inter-Generational Equity that deals with the well-being not only of the present generation but also of the generations to come and also proposes to constitute an inter-ministerial body to institutionalize the mechanism for ensuring sustainable development in mining (https://www.insightsonindia.com › 2019/03/01) .

Key proposals of the National Mineral Policy 2019

- Proposes to increase the production of major minerals by 200 per cent in seven years, and reduce trade deficit in mineral sector by 50 per cent in seven years.
- Aims to attract private investment through incentives like financial package, right of first refusal at the time of auction etc. or any other appropriate incentive according to international practices.
- Introduces the concept of Exclusive Mining Zones which will come with in-principle statutory clearances for grant of mining lease.

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- Emphasizes on simplifying the clearance process and making it time-bound for mineral development and commencement of mining operations.
- Proposes to identify critically fragile ecosystems and declare such areas as "no-go areas"/ "inviolate areas".
- Encourages merger and acquisition of mining entities, and transfer of mining leases that have been granted in a transparent manner to ensure seamless supply of ores and scaling up of business.
- Focuses on a long term export-import policy for the mineral sector to provide stability for investing in large scale commercial mining activity.
- Proposes harmonizing royalty and all other levies and taxes with mining jurisdiction across the world.
- Emphasizes on ensuring welfare of mining-affected people / communities and ensuring rehabilitation and resettlement, by suitable implementation of all relevant Acts / Rules.
- Introduces the concept of Inter-Generational Equity in mineral resource exploitation.
- Proposes development of an over-arching inter-ministerial body, under the aegis of the Ministry of Mines, to institutionalize mechanisms of sustainable mining. The body will also advise the Government on rates of royalty, dead rent etc.

Mr A. K. Nayak, Joint Secretary, Ministry of Mines, Government of India said that National Mineral Policy (NMP) 2019, which aims to hike mineral production by 200 per cent in seven years, is a fine document but would need support from all stakeholders to make it a success. Speaking at 'National Mineral Policy 2019 - A Landscape of New Opportunities' conference, organized by FICCI, jointly with the Ministry of Mines, Govt. of India, Mr Nayak said, "The new policy is a very fine document, but it is up to all of us to make it a blueprint for action **(https://www.business-standard.com › News-CM › Economy › News)**

Niti Aayog, government's premier think-tank, has floated the idea for the mining sector with an aim to double the area explored in the country to 20% from 10%, which in turn is expected to create employment for 15 million people by 2022-23 against 10 million currently employed, both directly and indirectly (*Yogima Seth Sharma* ,2019).

5.1 Exclusive Mining Zones

A key proposal that has been introduced in the NMP is the creation of 'Exclusive Mining Zones'. These 'zones' will come with approved, in-principle clearances to *"curtail delay in commencement of mining operations"*.

All mining shall be undertaken within the parameters of a comprehensive Sustainable Development Framework which will ensure that environmental, economic and social considerations are integrated effectively in all decisions on mines and minerals issues. The guiding principle shall be that a miner shall leave the mining area in an ecological shape which is as good as it was before the commencement of mining or better with least impact on flora and fauna of the area.

Establishment of National Mineral Exploration Trust (NEMT), District Mineral Foundation (DMF) along with Corporate Social Responsibilities (CSR) activities will contribute to a great extent to the overall development of mining industries. The mining legislation has been amended to provide for the establishment of District Mineral Foundation (**"DMF"**) with the objective of working for the interest and benefit of persons, and areas, affected by mining related operations. The objectives for devolution of mining benefits under DMF for inclusive and equitable development of project affected persons and areas are to be guided by the provisions of the Pradhan Mantri Khanij Kshetra Kalyan Yojana ("PMKKKY").

Statutory Clearances for mining: In-principle clearance is tied to forest land diversion for non-forestry purposes. As most major mining activities involve such land diversion, this will help to open up huge tracks of forest land to multiple companies and investors for mining in one go.

The proposal will also create major loopholes in obtaining successive clearances and permits by mining companies who will be part of the exclusive mining zone, and also in compliance of clearance and permit conditions. All in all, serious concerns arise about the impact of this proposal on forest ecology, wildlife corridors and forest-dependent communities.

In fact, making the clearance process simpler and faster for the commencement of mining operations has been repeatedly emphasized in the Policy. So much so, that the Policy mentions that in case of delay, there shall be provisions for the project proponent to "*generate triggers at higher level*" in the online portal of clearances.

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6.0 CHALLENGES FOR SUSTAINABLE DEVELOPMENT

6.1 Exclusive Mining Zones (EMZ) are identified for investor on Auction basis for particular ore reserve base. Regional Mineral Development Plan based on as assessment of the regional "capacity" of the area be made available in public domain for the beginning of bidding process.

6.2 The environmental clearance (EC) and forest clearance (FC) process over the past five years has been streamlined and simplified (making it single-window) for the convenience of the project proponents.

Environmental Appraisal Committee of Ministry of Environment, Forests and Climate Change has pointed out that many of the Environmental Impact Assessment reports are of poor quality and the process of public hearings. Not only were EIAs seen at times to be fraudulent, but it is found that the minutes of public hearings are also manipulated. In some cases where the EIA consultant did not visit the village or did not conduct appropriate surveys and impact studies. Preparation of single EIA report for cluster of small mines / stone quarries is good step. However, compliance of the general and specific conditions imposed at the time of approval including post monitoring and assigning accountability is a difficult task.

6.3 Immediate reflection Community Development work against the contributions made by lessee under District Mineral Foundation (DMF). The Ministry of Mines in its SDF report 2011 acknowledge the basic fact that : in recent decades, “mining activities have resulted in little local benefit ” It is not just that mining activities have not translated into local benefits but that, ironically, the country’s most mineral – rich states and districts have poorest people.

Under DMF Lessee is required to pay 1/3 of Royalty amount paid to the State Government towards community development (Maharashtra District Mineral Foundation (Trust) Rules, 2016). The provision made under DMF is outlined below:

1. At least 2/3 amount shall be utilized in the directly affected areas and 1/3 shall be utilised indirectly affected areas (Directly affected mine area shall be an area within 20 km radius from mine / dump.
2. At least 60 % funds available with shall be utilized for high priority areas like :
   a) Drinking water Supply
   b) Environmental Preservation and pollution control measures
   c) Health Care
   d) Education
   e) Agriculture and allied activities
   f) Welfare of women and children
   g) Welfare of old and disabled People
   h) Skill development and Employment
   i) Sanitation

At present, nearly half of India’s total mineral production (including oil and gas) in value terms is contributed by seven key mining states, namely Odisha (9.6%), Andhra Pradesh (9.0%), Rajasthan (7.9%), Chhattisgarh (7.8%), Jharkhand (6.5%), Madhya Pradesh (4.8%) and Karnataka (3.6%). The seven big mining states also account for a third of India’s population but are relatively backward. Therefore, utilization of DMF fund for the purpose mentioned above and its implementation in a time bound manner is a big challenge.

6.4 Reporting of Sustainability for cluster of Mines: Demonstrate continual improvement on this performance over the life of the project.

6.5 Systematic Progressive Mine Closure and Final Mine Closure : It is big challenge for Enforcement Authorities to Monitor systematic Progressive Mine Closure and Final Mine Closure in case cluster of mines including land and resettlement of project affected people. The Financial assurance taken by the Government towards final closure is Rs. 3,00,000 / ha in case of large mines and Rs. 2,00,000 / ha in case of small mines. In case of failure of lessee to comply with the final closure of means of reclamation and rehabilitation of mines to bring to more or less to original landuse pattern before handing it over to surface right owner of land, the financial assurance given by the lessee may be adequate to meet the requirement.

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