

2. Environment and Sustainable Development

Considering that minerals are finite, exhaustible and site specific, their resource development has to be compatible with environmental policy to strike a balance between environmental protection and sustainable development of mineral resources. Mostly, in India, small and medium entrepreneurs manage the mines with financial constraints. It is advisable to view the environmental impacts in a regional way to achieve the sustainable development of the area through collective and realistic efforts by the group\cluster. For this, based on the process involved and geographic location of mining units, separate realistic norms and measures are drawn. The procedural involvement in the implementation of environmental management system is :

Defining Environmental Policy → Planning → Implementation and operation → Checking and corrective action → Management review → continuing improvement.

In order to achieve environmental objectives, the environmental management system should encourage organisations to consider implementation of the best available technology, which is appropriate and economically viable. In addition, the cost effectiveness of such technology should be fully taken into account. Therefore, the environmental consideration should be implemented in such a manner so as not to become an impediment to mineral development.

The United Nations Conference on Environment and Development (UNCED), held in Rio de Janeiro in June 1992, adopted Agenda 21 as the programme for sustainable development for the 21st century. Agenda 21 emphasised the need for guidelines for natural resources development. Five years later, at the special session of the United Nations General Assembly to review and appraise the implementation of Agenda 21 held in New York (United Nations Earth Summit + 5), member states reaffirmed their belief for the comprehensive implementation of Agenda 21.

2.1 United Nations Environment Programme (UNEP) - Environmental Guidelines for Mining Operations

In recent years, the Department of Economic and Social Development and its Division for Sustainable Development and the UNEP have received requests from number of countries to provide guidance for mining and sustainable development. The first edition of *Environmental Guidelines for Mining Operations* was published in 1994, as a useful outcome to the 1991 Berlin Round Table Conference on Mining and the Environment organised by the United Nations and the German Foundation for International Development.

Since the publication of the first edition of the *Guidelines*, continuing changes have occurred within the mining sector, particularly in the evolution of legal, fiscal and regulatory policies, accompanying the trend of liberalisation and privatisation of the industry. Among other things, environmental conditions attached to credit and insurance have raised the profile of environmental planning and management for sustainable development. There have also been

2.4 National Environmental Agencies

Now most of the countries have established National Environmental Agencies or Councils, which may exist under different names in different countries to lay down environmental protection policy of the country. In India, there is a Ministry of Environment and Forest under which Dept. of Environment and Dept. of Forest and Wildlife function for policy making and as a regulatory body. Likewise there is a central agency namely Central Pollution Control Board and State Pollution Control Boards, which are looking after the enforcement of the policy. Different statutes/legislations enacted in India, relating to environmental protection, are :

- 1) The Water (Prevention and Control of Pollution) Act, 1974
- 2) The Water (Prevention and Control of Pollution) Rules, 1975
- 3) The Water (Prevention and Control of Pollution) Cess Act, 1977
- 4) The Water (Prevention and Control of Pollution) Cess Rules, 1978
- 5) The Air (Prevention and Control of Pollution) Act, 1981
- 6) The Air (Prevention and Control of Pollution) Rules, 1982
- 7) The Environment Protection Act, 1986
- 8) The Environment (Protection) Rules, 1986
- 9) Hazardous Wastes (Management and Handling) Rules, 1989
- 10) Manufacture, Storage and Import of Hazardous Chemical Rules, 1989
- 11) The Forest Conservation Act, 1980
- 12) The Forest (Conservation) Rules, 1981
- 13) The Wildlife Protection Act, 1972
- 14) The Wild Life (Transactions and Taxidermy) Rules, 1973
- 15) The Wild Life (Stock Declaration) Central Rules, 1973
- 16) The Wild life (Protection) Licensing (Additional Matters for Consideration) Rules, 1983
- 17) The Wild Life (Protection) Rules, 1995
- 18) The Wild Life (Specified Plants - Conditions for Possession by Licensee) Rules, 1995
- 19) The Public Liability Insurance Act, 1991
- 20) The Public Liability Insurance Rules, 1981
- 21) The National Environmental Tribunal Act, 1995
- 22) The National Environmental Appellate Authority Act, 1997
- 23) The Noise Pollution (Regulation and Control) Rules, 2000

The penalties for violations under the Environment Protection Act (EPA) are that whoever fails to comply with or contravenes any of the provisions of this Act, or the rules made or orders or directions issued thereunder, shall, in respect of each such failure or contravention, be punishable with imprisonment for a term which may extend to five years or with fine which may extend to one lakh rupees, or with both, and in case the failure or contravention continues, with additional fine which may extend to five thousand rupees for every day during which such failure or contravention continues after the conviction for the first such failure or contravention. If the failure or contravention referred to in sub-section (1) continues beyond a period of one

year after the date of conviction, the offender shall be punishable with imprisonment for a term which may extend to seven years.

The Indian Bureau of Mines (IBM), a subordinate office under the Ministry of Coal and Mines, also executes environmental protection & pollution control rules and regulations insofar as they apply to metalliferous mines, through enforcement of the different provisions of Mines and Minerals (Development & Regulation) Act, 1957, Mineral Conservation and Development Rules (MCDR), 1988, while processing, approval and enforcement of statutory 'Mining Plans' required under Mineral Concession Rules, 1960, and MCDR, 1988.

2.5 Mining and Environmental Pollution

Mining operations in general have adverse environmental impact wherever mining is carried out. The magnitude and significance of the environmental pollution caused by mining depends on type of mineral mined, method of mining adopted and beneficiation carried out, emission of smoke and gases from beneficiation plants, processing plants, scale and area of mining activity, geological and geomorphological setting of the area, nature of mineral deposit, land-use pattern at the mining operations, etc.

2.6 Impact of Mining on Environment

Mining, along with the ore beneficiation processes, affects the environment considerably. These adverse effects may be briefly summarised as follows :

- (i) **Air Pollution** : The airborne particulate matter is the main air pollutant contributed by mining and mineral dressing processes. Apart from the fine-sized solid particles resulting during drilling, blasting and mining, particulate matter is spread in the atmosphere due to wind action. The transportation of ores by road adds to the problem. The mineral dressing processes, especially dry crushing and grinding, may also result in pollution. The particulates which are most hazardous from human health are having diameter less than 5 microns. Also, smaller the diameter of the particulate, longer time it takes to settle on the ground, thus it has potential for more widespread and long term effects. The most hazardous air polluting particulates are those which are toxic to plant and animal life, mainly those based on heavy metals such as lead, zinc, mercury, copper, nickel, cadmium and arsenic and fluorine. In plants, the toxic effects are caused mainly by the destruction of chlorophyll, thus disrupting the process of photosynthesis, and by interfering with respiration and transportation. In coal mining areas, spontaneous combustion of the carbonaceous matter contained in the waste rock dumps results in polluting the atmosphere with smoke and noxious and hazardous gases (sulphur dioxide, nitrous oxide, phenols and creosols).
- (ii) **Water Pollution** : The commonest water pollution problems caused by mining and ore beneficiation processes is the deposition of suspended solids in adjacent water courses, resulting from wash off from waste dumps and flotation and leach plant wastes in tailings disposal areas. The most common and direct form of such physical pollution of water is turbidity and silting of rivers, lakes and irrigation canals. Water turbidity results in decreased light penetration which affects the food chain in a marine eco-system. Directly, it has a serious effect on fish and particularly crustaceans. However, the most serious

water pollution problem associated with the mining industry is caused by toxic metals and by acid water drainage from both underground and opencast mines. This form of pollution results from the oxidation of the primary minerals being mined and/or of the other minerals in the ore, particularly of sulphide mineral. Oxidation causes acid formation and the release of metals and other complex compounds to the underground and surface water.

- (iii) **Land Degradation** : Land degradation is the most visible and serious environmental impact of mining. Surface mining, apart from causing air and water pollution, renders the land unsuitable for other uses unless it is restored or rehabilitated. It also reduces the land use potential. The degree of damage to the land varies with the topographic setting in which opencast mining is carried out, the type and quantity of overburden, the type and dimensions of the deposit mined and climatic conditions i.e. mainly rainfall. Also, these variables influence reclamation. In case of underground mining, subsidence of the surface is the most common environmental hazard.
- (iv) **Loss of Vegetation** : For the purpose of open-cast mining the land has to be cleared of any forest growth. Likewise, for the preparation of necessary approach roads, it involves a certain amount of damage to the vegetation. The loss of vegetation depends upon the location of the mining area, scale of operations, mining method and degree of mechanisation to be adopted, etc.
- (v) **Noise Pollution** : Mining activities, particularly drilling, blasting, loading and transportation result in increased noise levels. Human habitation located adjacent to surface mines, ore processing plants and major haulage roads may, however, be subjected to high noise levels.
- (vi) **Others** : Pits and waste dumps create scars on the original topography. The mining activities carried out in remote jungle areas on a large scale, result in the destruction and migration of wild life habitats.

2.7 Sustainability

Sustainable development aims at meeting the needs of the present human beings without adversely affecting the availability for future generations. Thus 'sustainable development' requires that the rate of depletion of non-renewable resources should be judicious as far as possible. 'Sustainable development' requires that the adverse impacts on the quality of air, water, and other natural resources are minimum and equilibrium is maintained in the ecosystem.

The government of India has adopted three key policies for the environmental protection in India. These policies are :

- The National Forest Policy, 1988
- Policy statement for Abatement of Pollution, 1992
- National Conservation Strategy and Policy Statement on Environment and Development, 1992.

In order to achieve a harmonious equilibrium between the sustainable mineral development and for the of preservation of the environment, the National Mineral Policy of 1993 has spelt out it's objectives that the mineral resources will be developed taking into account the national and strategic considerations so as to ensure their adequate supply and best use keeping in view the present needs and future requirements", and "every endeavour will be made to minimise adverse effects of mining on the forest, environment and ecology through appropriate protection measures".

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