SUSTAINABLE DEVELOPMENT
Emerging Issues in India's Mineral Sector

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SUSTAINABLE DEVELOPMENT: Emerging Issues in India's Mineral Sector

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ABBREVIATIONS

ABG	African Barrick Gold
ABR	Aboriginal Benefit Reserve
ANZMEC	Australian and New Zealand Minerals Energy Council
API	Assessment on Proponent Information
BALCO	Bharat Aluminum Company Limited
BAP	Biodiversity Action Plan
BEE	Black Economic Empowerment
BHJ	Banded Hematite Jasper
BPD	Business Partnership for Development
CBO	Corporate Business Obligation
CCL	Central Coal Fields Ltd.
CEAA	Canadian Environment Assessment Act
CEC	Central Empowered Committee
CEPA	Canadian Environment Protection Act
CIL	Coal India Ltd.
CMPDI	Central Mine Planning and Design Institute Ltd.
CMR	Coal Mines Regulations
CPCB	Central Pollution Control Board
CRMS	Community Relations Management System
CSE	Centre for Science and Environment
CSR	Corporate Social Responsibility
CTE	Consent to Establish
CTO	Consent to Operate
DGMS	Director General of Mines Safety
DMF	District Mineral Fund
DSM	Dutch State Mines
e3	Environmental Excellence in Exploration
EAC	Environment Assessment Committee
EIA	Environmental Impact Assessment
EIR	Extractive Industries Review
EITI	Extractive Industries Transparency Initiative
EMP	Environment Management Plan
EPA	Environment Protection Act

EPBC	Environment Protection and Biodiversity Conservation
EPR	Environment Protection Rules
ESP	Electrostatic Precipitator
FCA	Forest Conservation Act
FDI	Foreign Direct Investment
Fe	Iron
FIMI	Federation of Indian Mineral Industries
FIPB	Foreign Investment Promotion Board
FRA	Forest Rights Act
GDP	Gross Domestic Product
GMI	Global Mining Initiative
GOI	Government of India
GPS	Global Positioning System
GRI	Global Reporting Initiative
GSI	Geological Survey of India
GVA	Gross Value Added
Ha	Hectares
HCL	Hindustan Copper Ltd.
HDSA	Historically Disadvantaged South Africans
HEMM	Heavy Earth Moving Machinery
HINDALCO	Hindustan Aluminum Company
HTREL	High-Technology Reconnaissance-cum-Exploration License
IBA	Impact Benefits Agreement
IBM	Indian Bureau of Mines
ICME	International Council on Mining and the Environment
ICMM	International Council of Mining and Metals
IDP	Integrated Development Plan
IIED	International Institute for Environment and Development
IPR	Industrial Policy Resolution
IRR	Implementing Rules and Regulations
ISO	International Organization for Standardization
IT	Information Technology
JPOI	Johannesburg Plan of Implementation
Km	Kilometer

LAPL	Large Area Prospecting License
Mg	Milligrams
M^3	Cubic meter
MALCO	Madras Aluminum Company Ltd
MBR	Maternity Benefits (Mines) Rules
MCA	Minerals Council of Australia
MCCM	Mines Control and Conservation of Minerals
MCDR	Mineral Conservation and Development Rules
MCR	Mineral Concession Rules
MDC	Mining Development Contract
MDF	Mine Development Fund
MFG	Mineral Foundation of Goa
Mm	Millimeters
MMDR	Mines and Minerals Development and Regulation
MMR	Metalliferous Mines Regulations
MMSD	Minerals, Mining and Sustainable Development
MNC	Multi-National Corporation
MOA	Memorandum of Agreement
MoEF	Ministry of Environment and Forests
MOIL	Manganese Ores India Ltd.
MOU	Memorandum of Understanding
MPRDA	Mineral and Petroleum Resources Development Act
MR	Mines Rules
NALCO	National Aluminum Company Ltd.
NCAER	National Council of Applied Economic Research
NEERI	National Environment and Engineering Research Institute
NEMA	National Environmental Management Act
NGO	Non-Governmental Organization
NMDC	National Mineral Development Corporation Ltd.
NMP	National Mineral Policy
NMRA	National Mining Regulatory Authority
NMT	National Mining Tribunal
NOAMI	National Orphaned and Abandoned Mines Initiative

NPI	Net Positive Impact
NPV	Net Present Value
NSDP	Net State Domestic Product
OCSL	Ore crushing, screening and loading
OEPA	Ontario Environmental Protection Act
OMC	Orissa Mining Corporation
OPEC	Organization of the Petroleum Oil Exporting Countries
OTML	OK Tedi Mining Ltd.
OWRA	Ontario Water Resources Act
PER	Public Environment Review
PL	Prospecting License
PNG	Papua New Guinea
POSCO	Pohang Iron and Steel Company
RBI	Reserve Bank of India
ROM	Run of Mine
RP	Reconnaissance Permit
RPDAC	Rehabilitation & Periphery Development Advisory Committee
RSPM	Respirable Suspended Particulate Matter
RTI	Right to Information
SAIL	Steel Authority of India
SDF	Sustainable Development Framework
SEAC	State-level Expert Appraisal Committee
SEAT	Socio-Economic Assessment Toolbox
SEIA	Socio-Economic Impact Assessment
SEIAA	State-level Environment Impact Assessment Authority
SHG	Self-Help Group
SMT	State Mining Tribunal
SPCB	State Pollution Control Boards
SPM	Suspended Particulate Matter
TERI	The Energy and Resource Institute
TOR	Terms of Reference
TSM	Towards Sustainable Mining
UNCTAD	United Nations Commission on Trade and Development
UNEP	United Nations Environment Programme

UNICEF	United Nations Children's Fund
USGS	US Geological Survey
WAP	Water Action Plan
WBCSD	World Business Council for Sustainable Development
WBG	World Bank Group
WMI	Whitehorse Mining Initiative
WTO	World Trade Organization

PREFACE AND ACKNOWLEDGEMENTS

Sustainable development is a buzz word in natural resources development today. In view of the increased awareness of environmental problems, the accent on sustainable development has grown in recent times, particularly in respect of activities which degrade the environment and affect communities adversely. Mining is one such activity.

Mining also presents a contrast. It represents one of man's earliest activities and with time, the use of minerals has increased both in volume and variety in order to meet a wide range of demands of society. The result is that the present day society, especially in emerging economies like India and China is crucially dependent on the minerals industry for sustained economic progress that will alleviate poverty and improve the quality of life.

In these circumstances, sustainable mineral development boils down to bringing about a balance between economic, social and environmental well-being now and for the future. Achieving a dynamic balance between supply and demand for minerals, good governance and environmental management, economic and social stability and intra-generational and inter-generational equity is the challenge that India faces today for the development of its mineral sector.

Consequently, the primary objective of this study is to provide an overview of various aspects of the country's mining industry (mainly metalliferous minerals) as it impinges on the issues relating to sustainable development. It seeks to identify the operational principles of sustainable development that are relevant for mining and examines how governmental and industry practices and procedures can be aligned to these principles for a more satisfactory outcome than exists today. As such it is hoped that the report will be of value to those who are involved in the process of mineral development in the country.

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Nilmadhab Mohanty

EXECUTIVE SUMMARY

1. Introduction / Objectives:

The main objective of the study is to analyze the emerging issues of sustainable development in India's mineral sector. To that end it seeks to identify the operational principles of sustainable development in the context of the mining industry in India, examines the current regulatory mechanism for achieving sustainable mineral development and analyzes the prevalent national and international practices for achieving sustainability in mineral operations. On the basis of this analysis, the report identifies some areas of concern and makes recommendations for improvements and reforms including the measures needed to integrate mineral development with social concerns, environmental integrity and good governance.

The relevance of the study for development planning arises from the fact that mineral development has a close interface with the issues of environment, development, welfare of local (indigenous) communities and poverty alleviation and its sustainability is crucial for the promotion of inclusive growth.

2. Methodology:

The study is both reflective and empirical in nature and has been done through a combination of desk research and limited field study. The desk research covered both national and international publications, government reports and documents, reports of non-governmental organizations, company documents, court judgments, and studies by scholars and international organizations. The statistical data have been sourced from the Ministry of Mines (Government of India), the Indian Bureau of Mines, the Central Statistical Organization, selected state governments, and other relevant organizations. A number of documents and studies were also accessed through internet.

The purpose of the field study which covered the four mining states of Odisha, Goa, Karnataka and Jharkhand, was to gather data and textual information on the sustainable development practices being adopted by mining enterprises and also to understand the operation of the current legal and institutional arrangements for ensuring sustainable mineral operations in these states. Qualitative research methods such as semi-structured interviews

with open-ended questions and focus group discussions were used to collect the relevant information. Some relevant data on sustainability measures adopted by a few mining companies were also obtained through mailed questionnaires.

3. <u>Findings / Conclusions</u>:

- Mining, more than any other industrial activity, tends to leave a strong negative impact on environment and society. However, a complete ban on mineral extraction is not possible as modern society and civilization are heavily dependent on minerals and mineral production. 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. Sustainability principles have application for all stages of mine life cycle – exploration, mine planning, construction, mineral extraction, mine closure and post-closure reclamation and rehabilitation. These principles include elements such as intra and inter-generational equity, the precautionary principle, scientific mining, management of environmental and socio-economic impacts, creation of substitute capital in the form of social and physical infrastructure and stakeholder engagement.
- However, two main pre-conditions for achieving sustainability are the existence of good governance and self-regulating mining enterprises which are economically viable, financially profitable and technically efficient.
- Though the mineral sector's contribution to India's GDP in 2011 was around 2.6%, its importance arises from the fact that it supplies basic and strategic raw materials for the country's industrial and economic development. Due to the sharp rise in prices and demand of a number of mineral commodities, the production of many minerals has shown steady increase, both in quantity and value since 2004-05.
- The Indian mineral industry has a complex structure comprising large and small mines, public and private sector enterprises as well as an informal sector that covers most minor minerals being extracted in the states. Many mines (in case of bulk minerals like limestone, bauxite and iron ore) operate as captive to the relevant mineral-processing industries. The public sector continues to play a dominant role in various mineral sub-

sectors (such as coal, lignite, petroleum, iron and steel, bauxite and aluminum production). The private sector is dominated by a few large public limited companies.

- There is a duality of control over mineral resources in India. This is the consequence of the constitutional arrangements which provide proprietary title of onshore minerals to constituent States while keeping the regulatory powers with the Central Government. Prior to 1991, there was strict government regulation of and large-scale public sector involvement in the exploitation and development of minerals which were considered 'basic' or 'strategic' materials. After that year, the mining sector has been gradually liberalized and opened up for private domestic and foreign investment, signaling a move towards "commoditization" of minerals. However, the pace of reforms has been slow. A National Mineral Policy was announced in 2008 and the proposal for a new mining legislation (Draft Mines and Minerals (Development and Regulation) Bill 2011) was put up for the Parliament's consideration only in December 2011. The Mines Act 1952 and the Mine and Minerals (Development and Regulation) Act 1957 and the Rules framed under these two laws are the basic legislations for the mining sector. The environmental and forest conservation laws also impinge on the sector. The most important environmental requirement for a mining project is a comprehensive environment assessment (EIA) programme which was started in 1994 and is being continued with refinements since that date. The laws and regulatory instruments work badly due to lax enforcement and inadequate coordination among a multiplicity of functionaries and central and state bureaucracies. This has resulted in illegal mining across a number of states.
- In the mineral-rich states of Odisha, Goa, Karnataka and Jharkand, mining has brought about economic development in the mining areas. At the same time, it has caused significant environmental damages and negative impact on communities in mining project areas. To that extent the mining and environmental laws and regulations have not been very effective. In some cases, mining operations have been carried out without concern for the 'carrying capacity' of the environment and other infrastructural limitations. This has put avoidable pressure on the environment and caused inconveniences to the people living in the mining areas. Illegal mining in many cases has similar effect while additionally causing loss of public revenues.
- Sustainable development is interpreted primarily in terms of environmental protection and management. Environmental behaviour of mining enterprises has shown considerable variation depending on their sizes and technological and technical capacities. Major

mining companies, with large mines and long-term interest in mineral development in their leased areas, use scientific mining methods including advanced technologies for efficient utilization of resources. They adopt comprehensive environment protection measures, sensitize their executives on sustainability issues and progressively try to improve their environmental performance. There are other large, medium and even small enterprises whose environment obligation consists in strictly conforming to the prescribed legal provisions. There are still others, mostly those using semi-mechanized or manual mining methods (mostly small mines) which tend to conform to the prescribed norms more in form than in substance. In case of illegal mining, these niceties are also not observed. Extraction of minor minerals in the states causes considerable environmental damage.

- Although mining enterprises tend to meet the legal requirement of preparing mine closure plans, their performance in this field falls short of the standards and policies followed in other leading mining nations. There is also no consultation with local communities in mining areas in the matter of preparation and implementation of mine closure plans.
- In fact, local stakeholder consultation is a highly neglected subject in the Indian mining industry. Except for one-time public hearing in the environmental impact assessment process (prior to start of mining operation), there is no meaningful consultation between mining enterprises and communities living in mining project areas. The mining law also does not require or encourage such consultation. Transparency in communication, sharing of information with local communities and accountability are also major problems in most mining areas.
- Mining enterprises undertake socio-economic local development works in their respective mining projects areas as part of their corporate social responsibility (CSR) activity. The level of commitment and the nature and extent of activities differ from one enterprise to another. Major mining companies have set up ‘trusts’, ‘foundations’ and ‘societies’ to take up socio-economic development projects in their mining areas. In Goa, a few major companies have formed a common ‘foundation’ to pool their resources for development projects. Most mining enterprises, however, have their individual initiatives under which each mine owner determines what local development works to take up as part of CSR activity.
- Illegal mining is prevalent in many mining areas. The Bellary district of Karnataka is the most glaring example in recent times. A combination of procedural delays, administrative inefficiency and political and administrative corruption against the background of rising

mineral prices (since 2004) has led to a sudden spurt in illegal mining in mineral-rich states.

- A large number of small mines (including quarries for extracting minor minerals) operate in most states. These present difficult challenges for sustainable development as their financial, technical and managerial limitations restrict their ability to take effective corrective measures against the negative consequences of mining.
- Sustainability issues have assumed considerable importance in major mining nations as the account in respect of Canada, Australia, South Africa and Papua New Guinea (PNG) shows. These countries take a comprehensive view of sustainable development in mining that includes apart from environment, other important dimensions such as local stakeholder engagement, socio-economic development in mining project areas and transparency in communication with stakeholders. The mechanisms of Social and Labour Plan in South Africa, Mineral Development Fund in Papua New Guinea and Impact Benefit Agreement in Canada are examples of legally-binding instruments that make it obligatory for mining companies to take up local development works in their respective mining project areas.
- In developed mining nations all regulatory mining and environmental laws meant to lessen the impact of mining are strictly implemented. These include provisions for mine closure and associated reclamation and rehabilitation of mined out land. The process of mine closure is initiated early in the mine life cycle and continues throughout the project life.
- Many international agencies have developed environmental guidelines for mining operations and major mining companies have adopted codes of conduct and are operating community development programmes that go beyond conformity to laws and regulations.
- Two main pre-conditions needed for achieving sustainable mineral development namely the existence of good governance and self-regulatory mining enterprises which are viable and engage in social, ethical and responsible business practices, are unfortunately not fully available in the Indian conditions.
- Governance failure in mineral administration is a major problem. Duality of state and federal control and multiplicity of state and central agencies with inadequate budget and staff appear to be the major reason for governance failure in India's mining sector. Political interference and institutional graft further complicate the problem.

4. <u>Recommendations</u>:

- The most urgent necessity is to ensure effective, efficient and purposive administration of the existing mining and environmental laws. Instead of creating more regulatory bodies and mechanisms of coordination among them, as the Draft MMDR Bill 2011proposes to do, efforts instead should be made to bring about administrative reforms that will end present duality and make state government agencies fully responsible and accountable for mineral administration. The field-level arrangements should receive special attention. IBM under the reformed arrangement should function as a technical and advisory body assisting the state governments and the mining industry in their technical tasks. The Central government, in public interest, should provide assistance to the states in preparing and implementing the reform proposals.
- The procedures for various approvals and monitoring including those for environmental and forest clearances should be streamlined in order to improve the efficiency and effectiveness of the system and to reduce the time taken to clear a proposal.
- Mineral development in a region should be carried out within its available social and environmental 'carrying capacity' and infrastructural infrastructure facilities at a given point of time. Appropriate administrative and procedural arrangements should be made in order to ensure this outcome.
- A separate legislation for mine closure should be formulated providing for, among other things, close and continuous community consultations, legal obligations of the mining lease holder for land reclamation and rehabilitation and strict implementation of the provisions.
- Both the government and industry need to take a comprehensive view of sustainable development in mining that beside environment should cover other dimensions such as stakeholder engagement and consultations, local area socio-economic development and transparency in communication and accountability.
- The new mining law (now under consideration) should provide for mining enterprises to engage in consultations with local community stakeholders at all the stages of mine life cycle.
- The new law should also lay down a mandatory obligation on mining concessionaires to undertake socio-economic development projects in their mining project areas as a part of their corporate business obligation (CBO). This should replace CSR activity which is voluntary and optional in nature.

- Preparation of a socio-economic assessment report for a mining project to be followed by the formulation and implementation of long-term and short-term development projects should be made a part of the permitting process for the grant and administration of mineral concession to a mining enterprise.
- Local socio-economic development works should preferably be executed by mining enterprises rather than government and semi-government agencies (such as the District Mineral Fund proposed under the Draft MMDR Bill 2011) in order to avoid the problems of inadequate capacity, political manipulation and corruption. Also, simply doling out cash to affected persons is not a sustainable solution.
- In order to alleviate the limitations of small mines in carrying out sustainable development activities, consortia of small mining enterprises in a region should be promoted. Technical advisory services should be made available to them in the relevant areas.
- It is prudent to establish firmly the concept of "social license to operate" and expose mining enterprises to this principle through community pressure and discipline. The legal arrangements for sustainable mineral development should encourage this process.
- A sustainable development framework (SDF) along with a set of sustainable indicators is required to enhance public accountability of mining enterprises in India. Its key elements could be: scientific mining, environment protection and mitigation, community stakeholder engagement, local socio-economic development in mining project areas and transparency and accountability. Designing and implementing the SDF should be an industry responsibility. 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.

INTRODUCTION

Mining as an activity has been there since the beginning of human society and minerals have contributed to the development of human civilization since the Stone Age. For most of its history, however, mining was dominated by mining benefits staying in the hands of too few people with little regard for environment, local community or development. Generally speaking, society, often mainly comprising indigenous, relatively backward communities in mining areas, has been silently tolerating the damaging impacts of mining. The situation has changed somewhat since the 1980s due to increasing concern worldwide regarding intensified environmental damage and failure to address the problems of poverty and marginalization of indigenous backward communities that have accompanied universal economic development in the post-World War II years. In India, economic reforms and liberalization introduced since 1991 along with the forces of globalization to which the Indian economy is now exposed to, have no doubt increased the pace of economic growth, but these have also raised concerns about inequality, poverty, unsustainable use of natural resources and environmental damage. The rise of terrorist activities in the country's mineral-rich areas across a number of states has further highlighted the gravity of these problems.

There are some groups, mainly environmental activists and non-government organizations who feel that mineral endowments are a "curse" and mining is an inherently unsustainable activity counterproductive to long-term growth and poverty reduction. There are many others who are of the view that mineral wealth of a country or region must be developed as minerals in the ground are a dormant asset. What is, however, needed is to transform mineral-generated wealth to more lasting areas of economic endeavor in order to generate sustainable development in the regions and communities where mining enterprises operate.

The main objective of the study is to ascertain if and how mining can catalyze sustainable development in India's mineral-rich areas. In that context, this report seeks to identify the operational principles of sustainable development that can have

application for the country's mineral sector, examines its current regulatory mechanism for sustainable mineral development and analyzes international experience in the adoption of sustainable development principles to mining operations. On the basis of this analysis, the report then identifies some areas of concern and makes recommendations for improvements and reforms. Finally, it outlines a set of elements for an appropriate sustainable development framework for the mineral industry in India.

The study has been done mainly through desk research supplemented by limited field study in four mineral-rich states of the country. The desk research covered both national and international publications, government reports and documents, reports of non-government organizations, company documents, court judgments and findings and studies done by scholars and international organizations. A number of documents and studies were also accessed through internet.

Through field study, qualitative and quantitative data and information were collected by visiting selected mines in the four mining states of Odisha, Goa, Karnataka and Jharkhand. During the visits to the states there were extensive discussions with company and mining executives, state and central government officials, representatives of industry associations and non-government organizations. There were also focus group discussions with community leaders and local community stakeholders in some of the mining villages in these states. Relevant data on sustainability measures adopted by some leading mining companies were also collected through mailed questionnaire. While the findings may not be generalized for the entire mining sector or present a complete assessment of sustainability practices in all its sub-sectors, the case studies (on aspects of mining industry in the four states) provide a fair idea of the sustainability practices being adopted by many mining companies in India. These also throw light on the role and effectiveness of various government agencies in implementing the current laws for ensuring sustainable development in the mineral sector.

The first three chapters of the study (Chapters 1-3) discuss the concept and principles of sustainable development and identify the principles that have relevance for the mineral sector. Chapters 4-6 give a brief profile of the mining industry in India and describe the regulatory system for mineral concessions and environmental protection. The next four chapters (Chapters 7-10) give an analysis of the sustainability practices

being adopted in selected mining enterprises in the four states mentioned earlier. Chapters 11 and 12 present international experience in sustainability practices in mining. The final four chapters (Chapters 13-16) delineate the concerns and conclusions of the study.

Section I
SUSTAINABLE DEVELOPMENT AND MINERAL PRODUCTION

Chapter 1

WHY SUSTAINABLE DEVELOPMENT TODAY?

Minerals and metals have played a crucial role in the development and continuation of human civilization. Mining or mineral development comprising exploration of the nature's mineral reserves, their extraction from below the earth's crust in solid, gaseous and liquid forms and subsequent processing and recovery of derivative-products for industrial and commercial purposes have been an important human and business activity over the ages.

The (Western) view that nature exists for human use, primarily as a resource rather than as something only to be admired or contemplated for enjoyment, has underlined most of development thinking. In fact, modernisation and belief in progress are defined in terms of human capacities to harness and use nature for mankind's benefit. At the same time there has been a nagging guilt about the consequences of this use. Even thinking in ancient India represented this approach (and the guilt) as may be seen from the following quotation from the Atharva Veda:

> *"Oh Earth, whatever we dig out from you must have to be filled up again, and restored as fast as possible. Oh Pure one we do not intend to hit you at your heart of hearts"*

The tension, however, increased after intensified environmental damage that has accompanied universal development in the post-World War II years. It has been felt that the development strategies, often actively supported by international and national development institutions, with their focus on industrialisation, urbanisation and income growth, failed to screen out policies and programmes that harmed the environment, failed to address the problems of poverty and empowerment and failed to sustain local communities and indigenous people. There is increasing concern that by not acting sustainably, economic progress is being achieved at the expense of such significant damage to natural resources, environment and social justice that future generation will be worse off than the present one.

These failings of traditional economic development served as the impetus for the sustainable development movement world-wide. At the international level, the growing concern about the undesirable effects of the traditional economic development policies started in the early 1970s and was reflected in the deliberations and outcomes of a series of international conferences starting with the United Nations Conference on the Human Settlement held in Stockholm in 1972. This was followed by the World Commission on Environment and Development (the Brundtland Commission) in 1982-1987, the United Nations Conference on Environment and Development (the Earth Summit) in Rio de Janeiro, Brazil in 1992 and the World Summit on Sustainable Development in Johannesburg, South Africa in 2002. These conferences and their reports, in particular the Brundtland Commission

Report, the Earth Charter and Agenda 21 of the Rio Conference, defined and framed the imperatives of sustainable development and enunciated various principles and processes to be followed in operationalizing its objectives and principles including changes to be brought about in existing attitudes and values.

In India, the movement in support of environmental concerns and sustainable development really started in the early 1980s, partly influenced by international developments but mainly due to the devastating effects of the Bhopal gas tragedy in 1984. The Bhopal tragedy was followed by a number of policy statements and legislations in order to meet environmental challenges. Economic reforms and liberalisation introduced in 1991 along with the forces of globalization to which the country was now exposed, no doubt accelerated the pace of Gross Domestic Product (GDP) growth but also raised concerns about inequality, poverty, damage to the environment and natural resources.

These issues and the rise of terrorist activities in the country's mineral-rich forest areas across a number of states have been ascribed to the resource-intensive, urban-industrial growth model that has resulted in large-scale exploitation of the natural resources (land, forests and minerals) and to the consequent deprivation and marginalization of the indigenous people (scheduled tribes and scheduled castes) residing in these areas.

In this scenario, mining has attracted a special attention, especially from environmental activists and civil society groups. As it is mining is perceived as a "dirty" and polluting industry, amenable to corruption and illegal operations. It is also inherently an unsustainable activity being concerned with the exploitation of non-renewable resources, causing damage to the natural environment. While minerals are (no doubt) needed for economic development, mineral extraction tends to have considerable negative environmental and social effects. Mining, strip mining in particular, destroys large areas of habitat, damages soil, destroys vegetation and can even change eco system or wipe out local population.

Mineral development involves use of large tracts of land and there are often problems and disagreements around issues such as resettlement, compensation and land rights of the indigenous people. Mining activities can bring benefits to the local communities through creation of jobs, encouragement to business and infrastructure development. Conversely, they may also generate social tensions and economic problems through loss of traditional livelihoods and culture, involuntary resettlement and inequitable distribution of benefits and costs within the communities, inadequate infrastructure development and health concerns due to exposure of populations to chemicals and particles and workers' safety.

More than most other industrial activities, mineral extraction tends to leave a strong environmental footprint. The environmental problems associated with mining relate to destruction of land and forests, soil erosion, mine tailings as well as contamination of surface, ground water and air from toxic wastes and ore particles. Although these effects vary between the different types of minerals and the stages of their production, these can have

profound impact near the project site, in the neighbouring areas as also at the global level (e.g. through global warming).

The environmental impact caused by mining takes three main forms (Richards, 2002):

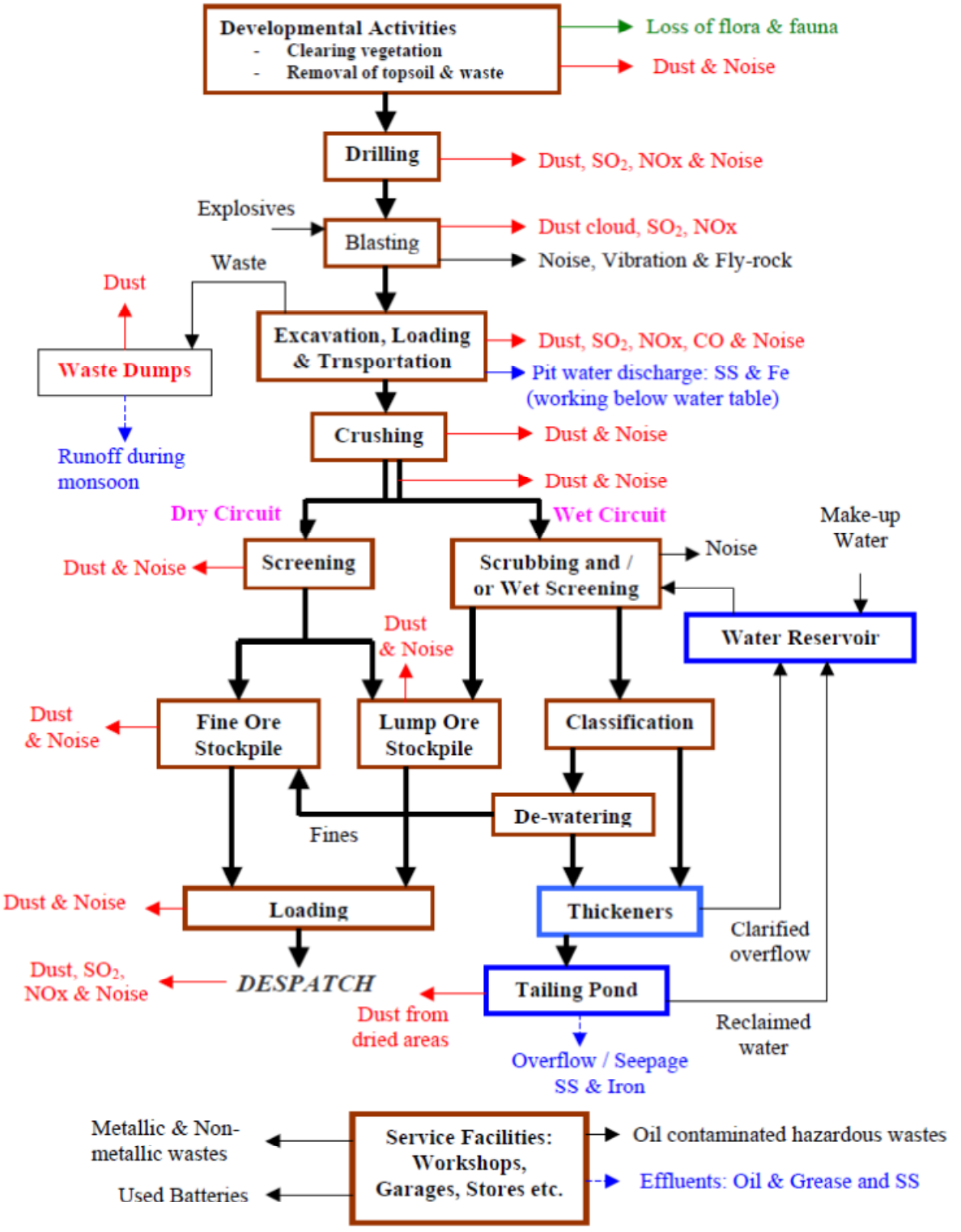
- Land disturbance that covers change of land use and land forms, visual impact of an open pit or waste dump and subsistence of the ground surface due to mining;
- Destruction of habitat including flora, fauna, natural watersheds and drainage pattern and of aquifer causing lowering of water table;
- Adverse chemical impacts of improperly treated wastes which cover air pollution due to dust and noxious fumes, water pollution due to surface run off from different areas of mines, waste dumps, seepage from tailings dam etc., effluents including acid mine drainage, associated with many past and present coal and metalliferous mines as also noise and ground vibration due to blasting.

As an illustration, figure 1.1 shows environmental consequences of different unit operations of an iron ore mine.

Mineral wastes (i.e. overburden and waste rock as well as solid tailings) and contaminated process water and run off are the two major releases from mining; and their management presents a great challenge to the mineral industry. Mine wastes result from the extraction of mineral ores as metals and mineral resources are found in nature mixed with a large proportion of impurities. In case of metalliferous mining, for example, high volumes of wastes are produced because of low or very low concentration of metal in the ore. Also, spills from tailings and release of toxic waters are responsible for serious negative environmental impact of mining although adequate technology is available to reduce or even eliminate these risks.

A mineral project also has impacts—some beneficial and others harmful—on the society, in particular on the local community inhabiting the mining project area. In many developing countries, where mining projects are located in remote regions (forest areas), these communities mostly belong to indigenous people (scheduled tribes in India). While mining projects are seen as triggering development in relatively backward regions, providing opportunities for employment and infrastructure facilities like roads, schools, hospitals etc., these also result in displacement of people, loss of traditional livelihood, disruption to the age-old socio-cultural life, change in population dynamics through immigration of outsiders, increase in the cost of living and of land value, water scarcity, environmental pollution and health hazards. Therefore, the prospect of a new mine can promise economic benefits, but it also raises many fears and people are genuinely concerned that it will damage the environment and interfere with their traditional and stable life style. In many regions of the world, there is a trend of increasing assertiveness (sometimes bordering on violence) on the part of local communities who want to exercise considerable influence over decision-making processes in mining.

Figure 1.1: Environmental Consequences of an iron ore mine



Source: Comprehensive Industry Document on Iron Ore Mining, Central Pollution Control Board, Ministry of Environment and Forests, May 2008.

For years, many mining enterprises have been stripping away land to get the minerals they are after, caring very little for what damages they are causing to the environment and local people. Boom in the mineral prices in the early 2000s has further accelerated this process, with indiscriminate and illegal mining taking place in many mining regions of the

country. The emphasis in most of these cases has been on short-term gains cashing on the sudden rise in minerals prices, ignoring the long term consequences of their action. Also, mining companies' relationship with local communities has never been smooth; some companies have even been accused of human rights' violations and there is a legacy of abuse and mistrust. These practices and social and environmental legacies combined with inadequate transparency and accountability (on the part of mining companies) have undermined the trust among these companies and the civil society. Although mining activities have expanded in recent years, there is yet no evidence that the industry has earned the "social license to operate" in many regions of the country. At the same time, in today's globalised world, issues of poverty, social and economic development, and climate change are reshaping the context in which the mineral cycle operates and mining operations are now increasingly under close scrutiny from local communities, indigenous people, non-governmental organisations (NGO), environmental groups and other interests.

In our society, every material is either derived from a mineral product or made using intermediate goods produced out of minerals (such as steel, aluminium, fertilizer and energy). It is, therefore, not possible to survive and develop without drawing mineral resource from our environment. What, however, needs to be done is to limit the negative impact on the environment and local population and undo the damage to the maximum extent possible through appropriate technological and management practices and procedures. This is what the concept, principles and practices of "sustainable development" are designed to achieve.

Conclusion

Sustainable development has emerged as an important concern for mankind, following intensified damage to environment and socio-cultural integrity that has accompanied accelerated economic development in many regions of the world in post-World War II years. Mining in this scenario has attracted special attention as more than any other industrial activity, it tends to leave a strong negative impact on environment and society. However, a complete ban on mineral extraction is not a feasible option as modern society and civilization are heavily dependent on minerals and mineral production. 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.

Chapter 2

SUSTAINABLE DEVELMENT:
Concepts, Principles and Applications

There are many definitions of 'sustainable development', but what is most frequently quoted is that formulated by the Brundtland Commission in 1987. According to this definition, "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." In addition to emphasizing the intergenerational (and intragenerational) equity, this broad definition also covered two other key concepts. The first is the concept of "needs", especially the needs of the world's poor which are seen to have overriding priority. The second concept is the idea of "limits" on the ability of the environment to meet the present and future needs. The Brundtland Commission also saw sustainable development as a process of change rather than a fixed state of harmony.

Subsequent global conferences on the themes of development and environment, in particular the 1992 United Nations Conference on Environment and Development (the Earth Summit) in Rio de Janeiro, Brazil through its outcome (Agenda 21 and the associated Earth Charter) and the 1995 World Summit on Social development through its declaration and programme of action elaborated the principles of sustainable development. Agenda 21 in particular emphasized that broad public participation in decision-making was a fundamental prerequisite for achieving sustainable development which involves integration of environmental and social concerns into all development processes.

The 2002 World Summit on Sustainable Development held in Johannesburg, South Africa further elaborated the definition through its inclusion of "economic development, social development and environmental protection — at the local, regional and global levels" as the "interdependent and mutually reinforcing pillars of sustainable development". The 2005 World Summit (14-16 September 2005) confirmed the formulation while reaffirming its commitment to achieve the goal of sustainable development as enshrined in various declarations including Agenda 21, the Rio principles and the 2000 Millennium Declaration goals which in one sense contributed to definitional elaboration by laying down short-term (by 2015) development targets in areas such as eradication of extreme poverty, hunger and malnutrition, primary education and environmental sustainability.

Since the Brundtland report (World Commission on Environment and Development, 1987) first defined 'sustainable development', many other definitions have been formulated by various proponents taking advantage of the 'creative ambiguity' of the original formulation. These are based on multiple motivations, interests and goals. Also, much work has gone into the development of quantitative indicators of sustainable development which in turn have contributed to definitional profligacy! Parris and Kates (2003) have used taxonomy (2x3) to describe the goals in these formulations (Table 1.1)

Table 1.1: Taxonomy of sustainable development goals

What is to be sustained	What is to be developed
Nature • Earth • Biodiversity • Ecosystems	People • Child survival • Life expectancy • Education • Equity • Equal opportunity
Life Support • Ecosystem Services • Resources • Environment	Economy • Wealth • Productive Sectors • Consumption
Community • Culture • Groups • Places	Society • Institutions • Social Capital • States • Regions

Source: T.M. Parris and R.W. Kates, (2003) "Characterizing and Measuring Sustainable Development", Annual Review of Environment and Resources vol. 28

All these definitions have some combination of development and environment as well as equity; however, there are differences on the emphasis placed on what is to be developed, what is to be sustained and how to link environment with development. "In practice", to quote Parris and Kates (2003), "groups and institutions tend to acknowledge the many multiple and conflicting objectives to be both sustained and developed but then adopt implicit objective functions that take the forms such as: sustain only, develop mostly, develop only but sustain somewhat, sustain or develop — for favoured objectives." Similarly, the time period of concern, ambiguously described in the Brundtland definition as "now and in the future" has differed widely, from one generation (when almost everything is sustainable) to forever (when nothing may be sustainable).

The all-inclusiveness of the sustainability concept is both its strength and weakness. It is a strength because it is elegant and accommodates all viewpoints in discussion about achieving sustainability. The concept's ability to be so inclusive lies in its inherent ambiguity that seeks to harmonize the real conflict between economy and environment and between the present and the future. The weakness, on the other hand, arises from the fact that there are obvious contradictions which create difficulties in operationalizing the concept. For instance, when the present generation has difficulties in addressing effectively the more urgent problems of intragenerational equity and unfairness, how can it address the problem of intergenerational justice and equity through its actions? Again, there are obvious difficulties in reconciling economic growth and sustainability with environmental and social integrity. For, in practice, efforts to enhance socio-environmental quality have been viewed as imposing additional costs thereby impeding economic growth. Market discipline encourages

firms to ignore or avoid these costs. Also, under the dominant corporate philosophy, companies including mining companies are obliged to maximize shareholders' wealth consistent with limited social requirement that they abide by the law.

The all-inclusive character of the definition may also be partly responsible for the conflicting viewpoints adopted by environmentalists and economists/business people on environmental policy issues. Environmental activists view environmental degradation as a basic human rights issue and imposition of environmental damages as an act of exploitation and disrespect by powerful business interests who benefit at the expense of those who have little voice in decision-making. Economists, on the other hand, argue that environmental degradation is an economic problem involving growth and benefit-cost trade off rather than human rights. The correct answers are found in getting the prices right consistent with the notion of some socially optimal level of pollution. To achieve this, policy measures should be imposed that charge firms for socially unacceptable damages caused by them. These put a price tag on degradation and provide incentives to reduce damages to avoid fiscal penalties (such as pollution tax). As in the case of market failures, political decision and government intervention/regulation are needed to force producers and firms to recognize and account for the costs that environmental degradation or social disruption imposes on the affected population.

Though ambiguous, "sustainable development", however, is a positive concept that calls for changes in the attitudes and values that are responsible for making the current trends unsustainable. In that sense it represents an ethical position designed for political or public action. In spite of the term's somewhat oxymoron character (or perhaps because of it) there is a consensus or near-universal agreement that sustainability is a worthwhile goal to be pursued in this diverse and conflict-ridden social context. And it is also generally agreed that in broad terms, sustainable development means economic and social development that endures over the long run. Increasingly, there is a focus on the multi-dimensional nature of the concept comprising the three pillars: economic, environmental and social. Striving for sustainable development will inevitably involve conflict among economic, environmental and social goals which have to be managed and balanced.

The Brundtland definition of 'sustainable development' has some implicit and explicit values; based on these values, a set of guiding principles have evolved over the years in order to meet the needs now and in the future for human, economic and social development within the life support systems of the planet. Although the concept of "needs" or its implications have not been explained in the definition, most discussions "have retained the core ethic of intergenerational equity, emphasizing the current generation's moral obligation, to ensure that future generations enjoy at least as good a quality of life as the current generation has now" (World Development Report, 2003).

One possible approach to realize this outcome is to ensure that the flow of consumption or benefits does not decline over time. This depends on the stock of capital or assets per capita available to a society as it represents the capacity to provide flows of benefits to the current and future generations; and to ensure that the flow of benefits remain

constant over time, the current generation must take care to leave to the next generation a stock of capital (per capita) not less than what it has now. This can be done through the transfer of capital bequests to compensate the future for the damage done by the current generation by its activities.

There is a broad range of capital or assets available to a society: natural capital (both renewable and nonrenewable), man-made capita (buildings, machinery, roads etc.), human capital (skills, talent etc.), knowledge capital and social capital (e.g. networks). A distinction is made between "weak sustainability" which presumes that different forms of capital are fully substitutable and "strong sustainability" which holds that different types of capital are not fully substitutable because some natural capital or some functions performed by these assets — such as global life support — cannot be replaced by others.

What is necessary for sustainable development is the transfer to the future generation of aggregate capital stock no less than the one that exists now, if necessary, by substituting damaged natural capital (say) in the form of mineral resources with compensating investments in manufactured or constructed assets (such as roads, schools and machinery). This is in conformity with the concept of 'weak sustainability' mentioned earlier. Technology can be expected to continue to increase the potential substitutability among different forms of capital over time, but for many essential environmental services — especially global life support systems — there are no known alternatives available.

The scope for substitutability is also limited in assets such as natural forest scenery which enters consumption untransformed rather than as a produced output using forest materials (e.g. wooden furniture). It may also be necessary to maintain sufficient levels of some assets or natural capital for the future, particularly when their degradation may result in an irreversible loss for the well-being of the future generation. What this means is that while there is potential for substituting different forms of capital over a range, there are limits to such substitution from the perspective of the well-being of the people. Thus sustainability constraint in such cases is an expression of the so-called precautionary principle which enjoins the current generation to rule out, in advance, development activities that could result in natural capital depreciation beyond a certain threshold damage cost and irreversibility (i.e. loss of critical natural capital, life support services and the like).

This brings us to the concept of "limits" (of environmental capacity) which has a prominent place in the Brundtland definition. The "limits" idea — that the overall scale of economic activity needs to be "limited" or "bounded" by the capacities of natural environments — has a long lineage, from Malthus (1798), Ricardo (1817) and Marx (1867) to the Club of Rome's *The Limits to Growth* published in 1972. There are two possible sources for limits to economic growth — the limited capacity of natural environments to receive the wastes generated by economic systems and the finite nature of the exhaustible resources. The overall scale of economic activity thus must be limited so that it remains within the carrying capacity of the remaining natural capital.

Critics of the limits to growth theory ofcourse have argued that change and advances in technology, exploration and discovery of more natural resources, new measures to control the amount of waste entering the environment and improved pollution control technologies could expand the horizon beyond the so-called limits. In any case, given the uncertainties present, a precautionary approach needs to be adopted with a built-in safety margin.

Thus, many strands of thought have been woven into the concept of 'sustainable development' which has mostly been formulated through a deductive approach, on the basis of first principles or negotiated consensus. Though somewhat ambiguous, the concept has relevance and meaning as well as a broad appeal at national and international levels. In translating the concept into specific operational terms, it will be necessary to adapt its principles and values to specific economic, social and environmental circumstances. We will next examine as to which of these principles and rules are appropriate for promoting sustainable development in the mineral sector and how these need to be adapted for realizing this objective.

Sustainable Development and Mining

There is a view, sometimes championed by social and non-government activists, that the concept of sustainable development is incompatible with the extractive mineral industry and that mining is inherently unsustainable as it involves exploitation of the society's non-renewable resources. But at the same time, it must be remembered that these non-renewable mineral resources have no value if these remain under the ground. Mineral wealth of a society must be developed as minerals in the ground are its dormant asset. The material fabric of a society is largely built with mineral products and metallurgical and technological advances have defined advances in civilization from ancient times. Using mineral production to sustain economic well-being is important for local communities, for the region (especially a backward region) blessed with mineral resources and the entire nation itself. For many less developed areas, mining underpins industrial development which in turn leads to technological upgradation, skill development and diversification of the economic base.

Therefore, while looking at the sustainability issues in the mineral sector, the option of completely banning mining is not a realistic or viable one, just as switching off the electricity or gas is not a sustainable response to the problem of emission of greenhouse gases causing progressive global warming. In the energy sector, one looks for cleaner or more energy-efficient technological options and is even prepared to accept slightly higher average temperature as a trade-off against higher standards of living. Similarly, the challenge of sustainable development in the mineral industry is to ensure that mineral resources are developed in an efficient manner with least possible generation of wastes and that the damage or disturbance caused to the environment (including social environment) by mineral development is brought into balance with the planet's capacity for accommodating change" (Richards, 2002). This necessitates the use of efficiency-increasing technologies and continuous technological improvements in the mineral sector. Associated with this is the concept of "limits" which translates into the requirement that mineral development in a

region must be carried on within the "carrying capacity" of its remaining natural capital while avoiding excessive pollution which could threaten waste assimilation capacities of the life support systems. Given uncertainties, a precautionary principle must inform all mineral development activities.

In consonance with the Brundtland definition of sustainable development, the mineral sector has to demonstrate that it contributes to the well-being of the present generation without compromising that of future generations for a better quality of life. This implies that mining enterprises as production agents must have the ability and willingness to turn non-renewable (mineral) resources into a flow of wealth, beyond profit, that can be used to generate sustainable development (now and in the future) in the communities where they operate. What it means is that through compensating investments in manufactured and constructed assets, damaged natural capital can be replaced by man-made, human and social capital. This requires a systems approach which involves identification of the key sustainability issues and of direct stakeholders in mining operations, initiatives and action programmes to address different areas of concern, sharing of information and communication with stakeholders and progress evaluation of various activities with appropriate sustainability indicators.

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. It is also clear that encompassing all these is the issue of governance which is required to provide and maintain legal and regulatory framework in order to further support the sustainability of the minerals industry.

Economic viability of the mineral sector is essential for sustainable development as the industry can provide various economic benefits including employment and generation of wealth only when it makes profit. A mining company, like any other business entity, needs to perform well by minimizing costs and maximizing profits in order to provide competitive return to its shareholders.

Sometimes, an argument is made that application of sustainable development practices will increase costs and, therefore, affect profits adversely. This is not necessarily true. For, if society is not convinced that mining is in overall interests of the people and is not sustainable, there will be disruption and even stoppage of mining, as happened in the Bougainville copper mine in Papua New Guinea (1986) or in Bellary iron ore mining in Karnataka, India (2011). Also, there are many examples where environmentally sound technological developments (such as efficient strip mining techniques that improve land quality for post-mining agriculture or creation of revenue-generating recreation or brown field industrial sites through creative mine closure) are more economic and hence profitable. Besides, sound sustainability practices win for mining enterprises community and capital market approval which is essential for their continued operation. There is, thus, a business case for the adoption of sustainable development practices in the mineral industry.

Mining involves depletion of non-renewable resources and most of the risks of mining activities at the local level relate to environmental impacts as a result of the generation of large volume of wastes, air emission and discharge of liquid effluents. There are also problems relating to damage to land and destruction of habitat and visual impact of an open pit or waste dump. Mitigation of environmental impacts of mining and progressive rehabilitation of the affected area is fundamental to sustainable development in this sector. One of the major technological challenges relates to management of mine wastes including tailings and process water runoff. Mine closure and reclamation of mined lands after cessation of operations is an established practice in developed mining countries. It is possible to return the reclaimed mine sites to their previous natural state thereby recreating habitat or making these available for agriculture or for establishing public facilities such as sports and educational institutions, as has happened in Sesa Goa's Sanquelin mine in South Goa, India.

Reputable (mostly large) mining companies recognize this and take their environmental obligations seriously by adopting good environmental practices, sometimes beyond the prescribed legal obligations. Voluntary efforts are less common in case of small mines whose environmental behaviour is geared to meeting the legal and regulatory requirements relating to environmental mitigation. In any case, appropriate legal framework and regulatory mechanisms are essential for ensuring that both large and small mining enterprises take effective measures for the mitigation of environmental impacts of mining operations.

Social issues comprise the third dimension of sustainable development in mining. Dealing with society, particularly those directly affected by a mining project has been the weakest point of the mining industry. The motivation to ignore or even exploit people living in the vicinity of mining land has mostly been purely economic, to minimize costs. This has made society distrustful and even averse to mining projects. Sustainable development would require mining enterprises to align the interests of local communities with their own in areas they want to operate and develop mines with those communities on the basis of mature and respectful partnership. This calls for improved engagement with stakeholders during all stages of mining development.

Traditionally, in mining, government and mining enterprises were considered only two core stakeholders who negotiated the terms of mining operations. Increasingly a third direct stakeholder has emerged on the negotiating table — the local communities whose interests, both short and long term, are materially affected by mining projects. Locals or people residing in the vicinity of a mine must be distinguished from other advocacy groups including non-government organizations (NGOs) which are basically non-core actors in mining with objectives and interests of broader political and ideological nature. Mining enterprises must take note of this distinction and identify legitimate and core stakeholders for their respective projects for the purpose of engagement. These stakeholders (local communities) are directly affected by a mining project and have the right to receive regular information on various aspects of a mining project's operations. They must also participate in decision-making on issues affecting their lives.

There is also the issue of equity and fairness in the distribution of both costs and benefits of mining. Mineral development generates both benefits and costs. There are private costs and benefits for mine owners; there are also social benefits (like local or regional development) and costs (such as environmental degradation, disruption of social fabric, alcoholism, and crime). It is felt that in mining, the distribution of benefits and costs are not fair or equitable; most benefits go to mining companies where as social costs are borne by local communities resulting in what has been called the "resource curse" for the people living in mining areas. In order to make the distribution fair and equitable, it is necessary to involve all direct stakeholders (including local communities) in decision-making and devise a benefit-sharing system that is fair to all the parties.

Social sustainability and benefit-sharing involve more than just compensation for land use. Also simply doling out cash to local communities is not a sustainable solution. Compensating local communities for external damage caused to their habitat and creating alternate capital resource (in the form of physical and social infrastructure) for these communities have to come out of the benefits derived from mining operations through a proper benefit-sharing system. Through local area development, mining companies must make sure that local communities are left with other forms of capital or resources once the mine is depleted. To that extent, local area development becomes a corporate business obligation (CBO) as distinct from corporate social responsibility (CSR) which has an element of charity implicit in it. In other words, financial resources spent on environmental and social responsibility must be a component of the costs of doing business.

In the absence of a fair and equitable benefit-sharing arrangement which seems to be the case in some developing societies, the gains from mining are disproportionately appropriated by a small group of people (mine owners). In such a situation it is not surprising that "social license to mining" is under severe strain. It is in the interest of the mining industry to ensure that benefits are equitably shared with local communities and the negative effects of mining on environment are mitigated to the maximum possible extent.

A good governance system is also essential in order to meet successfully the economic, environmental and social challenges thrown up by mining. Besides, given the role that 'greed' plays in human affairs and the historical pattern of behaviour of the mining industry, the importance of good governance for the sector can't be overemphasized. Governance in relation to mining refers to the exercise of political and administrative authority for the management of the (mineral) sector's affairs. The governance framework comprises the laws and regulations to ensure sustainable mining including preservation of environmental and social integrity and the institutional and administrative capacity (including a competent and transparent bureaucracy) to regulate, monitor and enforce the activities of the sector in conformity with the legal provisions. Effective governance (management, control and policing) promotes the rule of law and its absence could result in illegal mining, loss of revenue and benefits, environmental degradation and exploitation of the local communities and human rights violations. In other words, good governance is the central pre-condition for achieving sustainable development in the mineral sector. In view of the large sums of money involved in mineral extraction and sale and the operation of mining

enterprises in remote areas, corruption (through bribery of politicians and officials) can undermine good governance (and hence sustainable development) in the mineral sector.

While governance no doubt plays a crucial role, in the final analysis it is the attitude and values of mining companies (and enterprises) and of their senior management and field executives that determine the substance and quality of the sustainability measures adopted on the ground. In view of persistent government failures (through incompetence, bribery and corruption) in many developing societies, the pressure is not on government to regulate business, but rather business to self-regulate.

"Sustainability" is now part of the modern *lingua franca* and increased public scrutiny of mining activities even in remote areas, through persistent media coverage, judicial examination, analysis and activism of non-government organizations and other public interest groups and in some cases violent agitation by indigenous communities, is putting the pressure on the mining industry world-wide to adopt transparent sustainability agendas for their operations. There is also a growing belief that a sustainable development approach is not only the right thing to do, but it "has the potential to add or destroy value for mining companies at a number of different stages via companies' commodity exposure, country exposure, mine development, operations and government procedures" (Jansen et al., 2006). Today a modern mine run by a responsible multinational mining company (or in India, some large mining companies , both in public and private sectors) makes considerable efforts to minimize environmental impact; and the number of mining companies publishing annual sustainability reports is growing over the years.

Thus, the movement for sustainable development is slowly changing the attitude and values in the mining industry which prompted the MMSD Report (2002) to recommend that "the fundamentals of sustainable development must become embedded in the culture of mining companies" (MMSD, 2002). It is, however not clear if this advice is being followed across the mining industry comprising multinational and national companies and also large and small mines with their obvious differential in attitude, values and capabilities.

Conclusion

'Sustainable development' is an all-inclusive, somewhat ambiguous concept which also includes the concepts of "needs" (of the poor) and "limits" on the environment to meet the present and future needs. It basically means economic and social development that endures over the long-term and its core ethic is intergenerational equity. For the mineral sector what it translates into is that mining should contribute to the well-being of the present generation without compromising that of the future generation for a better quality of life. This is possible if mining enterprises are able to substitute, in their project areas, damaged natural capital (mineral resources) with compensating investments in other forms of (man-made or constructed) assets such as physical infrastructure, human and social capital that will guarantee income for the affected people in a mining project area even beyond the life of the mine. This requires a systems approach which involves identification of key stakeholders and sustainability issues in mining operations such as stakeholder engagement and attending to

their concerns, local area development, and sharing of information and communication with stakeholders as well as good governance and management of the mineral sector.

In the next chapter, we will examine how sustainability considerations can play their role in different stages of the mining cycle.

Chapter 3

SUSTAINABILITY AND THE MINERAL CYCLE

Mining and agriculture have been the two basic activities of mankind that have advanced human civilization over the centuries. However, unlike agriculture which has some flexibility in the choice of location, mining can take place only where minerals are present and are economically viable to exploit. Mining involves exploration for and exploitation of mineral deposits by surface and underground methods, both involving change to environment and serious environmental and social consequences.

In considering the subject of the application of sustainable development principles to mining cycle operations, the discussion in this study is restricted to surface mining methods, mainly in respect of metalliferous ores. It is felt that such an approach will keep the study within manageable limits while at the same time providing a meaningful insight into the main issues involved.

A mining project normally has the following phases of mine life cycle:

- Exploration
- Mine planning
- Construction
- Mineral Extraction
- Mine closure
- Reclamation and Rehabilitation (post-closure scenario)

Interfacing with all these stages, in fact with the mining project in entirety, are the reactions and expectations of the local community of the area where the mining project is established or proposed to be established.

Sustainability means, as the 1998 sustainable development policy of the Canadian gold mining company Placer Dome had stated, “the exploration, design, construction, operation and closure of mines in a manner that respects and responds to the social, environmental and economic needs of the present generation and anticipates those of future generations in the communities where we (mining companies) work” (Hilson and Murck, 2000).

The sustainability principles that have relevance for all the different stages of the mining cycle may be summarized as follows:

- Environmental management and mitigation of environmental impacts
- The Precautionary principle

- Economically viable mineral development within the carrying capacity of the environment
- Scientific mining with efficiency-increasing technologies, mining and management practices
- Continuous technological improvements in mining
- Management of socio-economic impacts and creation of substitute capital in the form of social and physical infrastructure
- Inter and intra-generational equity
- Stakeholder engagement and consultation with local communities
- Transparency and effective communication

These principles apply to different phases of the mining cycle simultaneously, not in a sequential manner. Through the interaction of these principles with the activities carried out in the different stages of the mining cycle, an appropriate framework for sustainable development is established.

For achieving sustainability, what is required is that a mining project should be economically viable, financially profitable and technically efficient. This will enable the project to have the capability to maintain continuous environmental and socio-economic improvements, from mineral exploration, through operation, to closure. In operational terms, sustainable development in the mineral sector implies a mix of scientific mining, improved environmental management including pollution control and enhanced socio-economic development, especially for local communities in mining areas.

Scientific Mining

Scientific mining comprises mining methods and practices originating from a systematic approach to mine development and operation. It involves adoption and continuous development of technology reflected in the advances in equipment and management practices. Scientific mining ensures resource efficiency, both in the management and extraction of minerals. There are many examples of non-sustainable mining practices, a common one in many developing country mines being extracting only the highest-grade material in a deposit, ignoring the lower grades, for short-term gains. Scientific mining is essential for the conservation of a non-renewable resource and its optimum and efficient utilization and thus constitutes the first step for environmental sustainability in mining.

Minimizing Environmental Impacts

In order to contribute to sustainable development, a mine must minimize environmental impacts throughout the mining life cycle from exploration, through construction and extraction to closure and reclamation. This is achieved through the adoption of effective environmental management which includes the following elements:

- Environmental Impact Assessment (EIA) and preparation of Environment Management Plan (EMP) during mine planning(or pre-feasibility/feasibility stage);
- Biodiversity management including mitigating the effects on flora and fauna and preventing pollution of rivers, streams and creeks;
- Pollution control in respect of airborne contaminants, noise and vibration;
- Management of hazardous substances including process reagents, oil and fuel;
- Managing acid mine drainage;
- Tailings management including recycling and reuse;
- Management of water including that generated during mining operations, mineral handling and processes.

The details and relative emphasis placed on the individual elements differ from one stage of the mining cycle to other with major focus on actual mining operations. All the same, there is an increasing recognition that for mining to maintain its "social license to operate", mining enterprises must respond to expectations and pressures from society for adopting measures to conserve and suitably manage resources. A major concern has been that mineral extraction, processing, transportation and other associated activities must be carried on within the available carrying capacity of the physical and social environment including infrastructure facilities. Mining companies are also increasingly being called upon to avoid locating projects in ecologically sensitive and pristine areas (the so-called 'no-go' areas) and change the project development cycle in case there is insufficient baseline information or where scientific uncertainty mandates a precautionary approach concerning mitigation or avoidance of impacts on biodiversity.

In environmental management in mining, disposal of mine wastes (including overburden, waste rock and solid tailings) is a significant issue. According to Stewart and Petrie (2000), generation of waste, both its quality and quantity, is "a direct function of technology choice" and "improvements in environmental performance are realized primarily by changes in technology — not simply in hardware choice, but also operating and management practices." Proactive environmental management would require mines to adopt technologies and mining practices that can tackle, to the extent possible, environmental problems (including waste generation) at the source and to adopt a holistic approach that applies to the entire mine lifecycle, from exploration, through extraction to closure and rehabilitation. Some significant recent changes in technology have been spurred by public concerns over adverse environmental effects and strict environmental regulations (in many countries) for mitigation of these effects (Warhurst, 2000).

Technological Advancement

Most technological advances in recent years have taken place as a result of the application of information technologies (IT) and computers to mining methods at different stages of mining operations. In exploration, for example, a significant development has been the automated processing of a large volume of geo-statistics through the use of computers.

The interpretation of various types of data helps to prepare models of mineral occurrences and to orient drilling operations, thereby reducing environmental damage and reducing waste. Significant advances in geochemistry and geophysics (including airborne geophysical and geochemical analysis) have increased the accuracy and range of data for interpreting geophysical environment. Other innovations in mineral exploration include satellite, remote sensing technology, 3D modeling, the use of global positions system (GPS) and low-impact seismic methods that minimize environmental damage and increase productivity.

In extraction and processing, mechanization and advances in equipment capacities, automation and continuous movement machinery (such as conveyor belt), improvements in (computer aided) mine design and management, automated handling systems and adoption of scheduled preventive maintenance of machinery as a standard operating practice have increased the efficiency of mining operations that have contributed to the reduction of environmental damage. Mechanization, increase in equipment capacities and automation of the extraction process have been the most significant advances in mining in recent years. Major developments have included increase in the capacity of haul trucks (200-240 tonnes), shovels (including electric mining shovels and draglines with significantly greater bucket capacity), hoisting machinery, front end loaders, generators, pumps and compressors. Very effective software programmes are being used with applications in areas such as blasting operations and grinding processes in mining. The quality of explosives have been improved considerably that allows ‘cast’ or ‘throw’ blasting where the waste material is thrown directly into storage areas allowing the machinery to extract less waste material (Andrews, 1992).

Significant technology advances have also taken place directly in the environmental protection area. For instance, technology has been developed which helps in achieving proper pH balance in waste material through addition of bacteria to retard and control the acid formation process. Sophisticated plants and equipment have been designed and set up for monitoring and disposal of hazardous wastes and pipelines, in use since the 1970’s, have provided a safe and cost-effective method for transport of iron ore and copper concentrate in slurry forms from inland location to seaports (Andrews, 1992).

Mine Closure and Rehabilitation

The final stages of the mining cycle, namely mine closure and associated reclamation and rehabilitation of lands earlier utilized for mineral extraction have perhaps the most important significance for sustainable development in the mineral sector. For, properly executed in a holistic manner and with sound reclamation practices, the processes in these stages have the potential to establish that mining and quarrying are only temporary uses of land. The principles of sustainability would require these lands to be returned for some other beneficial use once mining operations are finally over.

Mine closure refers to the final stages of mining activity, after production and processing have permanently ceased leading to decommissioning of site infrastructure, relinquishment of the rights to mineral concession and rehabilitation planning for the mine. Reclamation is the process of creating land-use — agricultural, industrial, commercial, and

recreational and the like — on a site where mining operations have completely ceased. Rehabilitation has the same meaning as reclamation with an added rider that the after-uses are related to the use on the site prior to mining.

Historically, when an ore body was exhausted and production ceased permanently, mines were closed and abandoned. Today mine closure normally requires the reclamation and rehabilitation of the land in and around the mine concerned. Reclaimed mine sites may then be returned to their natural state thereby recreating habitat (such as forests).The design and phasing of the closure must identify and manage the factors that will make for the security and safety of the mine site. The aim of the closure process including reclamation/rehabilitation is to restore "the surrounding environment to a state, resembling as closely as possible that which existed prior to the commencement of mining, as measured by both chemical and biological parameters" and "to ensure that environmental restoration is adequate to allow the establishment of a diverse and functional ecosystem in the area" (Heikkinen et al*.,* 2008).

The closure process, therefore, must take care that the environmental problems arising during mining operations and those likely to arise during the post-closure scenario are comprehensively addressed. Also the socio-economic issues of mine closure and its impact on local communities, workers and their families and the local economy need to be assessed and managed.

Environmentally, a mine closure plan must ensure that:

- The mine infrastructure (roads, buildings, spoil heaps, tailings and waste rock areas etc.) is evaluated and those posing safety risks are removed from the site.
- Hazardous substances are identified and disposed off in a controlled manner according to hazardous waste management regulations.
- Post abandonment risks are minimized.
- A healthy environment is made available for the future.
- Adequate (surface and ground) water supplies, clean air and productive land are made available for future operations.
- Progressive rehabilitation and revegetation of land takes place along with appropriate landscaping for any future land use activities planned for the area.
- Opportunities for beneficial uses of land exist for future landowners and other users of land.

There are also serious socio-economic implications of mine closure, with respect to employment, income, services and well-being of the community in the mining area. The economic effects of mine closure on local business and service providers as well as landholders and other economic interests can often be serious. Therefore, the objective should be to minimize potential adverse impact on the local economy and provide for long-term needs of the surrounding communities.

Local communities in mining areas often become dependent on mining companies directly providing or subsidizing facilities and services such as schools, hospitals, community centres, sports facilities, roads, self-help activities etc. These services face the possibility of disappearance on mine closure and consequent withdrawal of the mining company from the area. To provide sustainability, these benefits must continue after closure. A more sustainable strategy will be for both the industry and community to co-operate, ideally from the beginning of the mining operation, to develop the local capacity to provide social services and to ensure easy transition when mine closure occurs. Also, they should build non-mining activities and other productive assets that will last beyond the life of the mine and guarantee income for the future generations. If mine closure planning is linked with local development plans the resultant integrated development plans "can ensure that post- mining land uses are compatible with surrounding development initiatives" and "investments of the mine in human capital and infrastructure can meet local/regional development needs and create a mechanism of economic growth post closure" (Limpitlaw, 2004). Thus, when mine closure is done properly and effectively it can be a mechanism for transferring capital extracted from mining to future generations (Sheldon et al., 2002).

There are two other aspects of mine closure which need to be mentioned in the context of sustainable development. First, it is quite evident that for the process of mine closure to occur in an orderly, cost-effective and timely manner, it should be initiated as early as possible during the mine life cycle, preferably during the course of pre-feasibility/feasibility studies and mine planning. This will enable the mine to plan for and adopt environmental protection and pollution prevention measures during mining operations, keeping the ultimate mine closure in perspective, leading to cost-effective strategies for operationalizing sustainable mineral development. Also, since the 'polluter pays' principle obliges the mining company to meet the costs of rehabilitation and mine closure, it will be able to adjust the ways in which it conducts its activities to maximize profits with all costs internalized. Integrating environmental management by planning for closure from the beginning will enable the mining enterprise to spread the costs throughout the project life, thereby reducing the cost burden at the time of closure (Warhurst and Noronha, 2000).

The second important issue is that local communities and all other stakeholders must be proactively involved in the closure process so that their views and interests are reflected in the closure plan and benefits of mining are sustainable for future generations. There is also "evidence to suggest that there are benefits to all if the local community is involved with the rehabilitation planning and process from the start" (Warhurst and Noronha, 2000).

Stakeholder Engagement

In fact, stakeholder engagement that includes effective consultation with local communities is an inclusive process which encompasses all interested parties and should occur throughout all the phases of the mine life cycle: exploration, evaluation, construction, operation and post-operation. The substantive issues of consultation will of course differ from one stage to the other depending on the nature of the mining activity in a particular phase and its potential impact on the community. Community relations and consultations should,

however, be a continuous process as it enables a mine to obtain its "social license to operate" and avoid community opposition and confrontation that can disrupt mining operations in any phase.

The purpose of these consultations is to inform the community about all aspects of a mining project (in its different phases) and address their concerns, needs and their suggestions. The approach has to be community-centered and not project-centered. That is, the attempt should not be to sell the project by public relations techniques (as was the case earlier): instead the focus needs to be on community interests — showing how the project will contribute to ecologically sustainable development by its contribution to the social and economic life of the community, demonstrating benefits to the people and explaining the mining enterprise's (mitigation) plans to meet the community concerns relating to environmental pollution, land degradation and other negative consequences of mining. Enlightened mining companies use structured mechanisms and procedures including dedicated community liaison teams to maintain regular and open dialogue with stakeholders, particularly local communities and undertake various community-related initiatives including preferential employment of local people, training and skill-development in local enterprises, promoting and assisting local small businesses and self-help activities. This enables them to maintain their 'social license' to do business in mining. In a way, they are responding to an emerging trend of increasing assertiveness on the part of local communities, spurred by improved information and communication, emergence of grassroots movements and an urge to manage social change among their people. Rio Tinto's Chief economist, David Humphrey summed up the position neatly when in 1996 he noted, "The bigger challenge is not a technical one. Rather it lies in the development of interactive and lasting relationships with the communities, regions and countries in which the (mining) industry operates" (Epps and Brett, 2000).

Local Community Development

Community engagement is closely linked to community development which, besides interactions with the community, implies "the process of increasing the strength and effectiveness of communities, improving people's quality of life, and enabling people to achieve greater long-term control over their lives" (World Bank, ICMM & ESMAP, 2005). In operational terms community development involves designing and implementing local area development plans, programmes, and projects, often in co-ordination with government and non-government agencies operating in a mining project area. For, it is only through investments for the development of physical and social infrastructure and human resources development in its (project) area that a mine will be able to create substitute capital in order to compensate for the loss of natural resources (capital) as a result of its mining operations.

There are opportunities for socio-economic investments in different stages of a mining project's life cycle, as illustrated in the table below:

Table 3.1: Opportunities for Local Area Development

Project Stage	Opportunities
Exploration and Mine Planning	- Identification of local stakeholders, their empowerment through engagement and participation in Planning. - Initiating partnerships with stakeholders. - Support for local infrastructure such as site clearance, roads and water supply (bore holes) - Human resources development
Construction	- Land clearance and development, building access roads and utilities - Displacement and relocation of communities and building infrastructure for them. - Short-term job opportunities - Training and skills development
Extraction and operation	- Mining operation serving as catalyst for local economic development - Development of local enterprises for providing goods and services to the mine including maintenance services - Human resources development and education programmes in the project areas - Social infrastructure such as schools (including technical institutes), hospitals and health facilities, sports facilities etc. - Promotion of economic opportunities in agriculture, soil conservation, minor irrigation, small enterprises development, local handicrafts and other various self-help activities.
Mine closure and rehabilitation	- Assistance in diversification of the local economy. - Development of strong asset and infrastructural base for post-closure economic activities.

Source: Adapted from Sam Choshi, "Mining and Society-Local Development", African Institute of Corporate Citizenship, July 2001

However, in the ultimate analysis, the most beneficial and sustainable legacy of a mining operation could be to leave behind in a community skills and capacities that education and training programmes provide to the local people in a mining area. This will ensure sustainability in as much as one local asset (non renewable natural resource capital) will be replaced by another asset, namely local human and social capital.

A mining company thus, can be a catalyst for the development in its area of operation, as also for building up other non-mining sustainable income sources in the area so that communities can develop independent of the mine and can survive after mine closure. In order to make effective use of its investments, it has to coordinate with other local development prgrammes run by government and non-government agencies operating in its mining area. And if communities benefit greatly from a mining operation, then they will develop significant stake in the operation, thereby enabling the mining company to obtain its "social license" to operate, enhance its reputation and overcome various hurdles that could adversely affect its business. "In other words, community development is a reciprocal

process. By helping communities to develop themselves in a sustainable manner, a mining company is simultaneously helping its own business succeed. If we can all move beyond the donor/recipient model of community relations and view mining operations and their community development programmes as a mutually beneficial partnership process, the goal of sustainability will become more achievable" (World Bank, ICMM & ESMAP, 2005).

From the analysis, it is clear that the process of planning for community development (including identification of relevant stakeholders) must begin from the exploration and mine planning stage. In fact, the first task should be for a mining company to prepare a Socio-Economic Impact Assessment (SEIA) for the local area surrounding its mine (to be defined). This should be followed by a long-term (strategic) Integrated Development Plan (IDP) providing for local economic and human resources development over the mining-lease period and committing financial resources for implementing the plan. The long-term plan could later be broken into short-term (one/five years) operational plans/programmes aligned with the local government development plans for implementation. Ideally, preparation of SEIA and IDP could be made a part of the permitting process for the grant of mineral concessions to a mining company.

The Socio-Economic Impact Assessment (SEIA) examines how a proposed (mineral) development will affect the social, cultural and economic life of the surrounding community. This should include identification of different categories of stakeholders with varying levels of interest in the project, drawing-up of a socio-economic and cultural profile of the community through a baseline study and at the same time, identifying their competencies and existing institutional framework in the area and evaluating both positive and negative (socio-economic) impacts of the mining project.

Having identified possible impacts, it should then propose how to minimize risk and identify the best methods to mitigate negative impacts and maximize socio-economic opportunities. Following the socio-economic assessment, a mining company can prepare a strategic vision, a long-term plan and later operational plans/programmes/projects and also a framework for implementation.

Very often, socio-economic impact assessment is undertaken as an adjunct to EIA that pushes the socio-economic study to the backseat and reduces its importance. It is advisable to separate the two processes and make socio-economic assessment, an integral part of the process for granting mineral concession, to be administered and monitored by the government agency dealing with mining leases and monitoring its administration. It can then ensure that the mining company concerned implements the approved local area development plans in its project area.

Another issue that is of significance is the formation of partnerships for resolution of "community or collective dilemmas by minimizing free riding, facilitating consensus building, and helping to increase social capital, in the forms of knowledge, policy (i.e. rules of the game), global consensus and social infrastructure" (Epps and Brett, 2000). In a way partnerships are very essential for sustainable development, involving communities,

governments and non-government organizations and mining companies and operating in a structured fashion. The advantages of building these partnerships include providing of resources, transfer of knowledge, community mobilization, securing public and political mandate and building understanding between potentially adversarial groups. Therefore, some of the larger multinational mining companies enter into direct partnerships with communities with a view to securing community endorsement to function.

Also, benefit-sharing of mineral resources revenue with key stakeholders in an equitable and transparent manner must be seen as an instrument for attaining sustainable local area development. For example, a proportion of government revenues from mining royalty or taxes are, in many countries, diverted for use in the local development activities. Some multinational mining companies use the legal mechanisms of "trust" and "foundation" to provide funds for the development of community infrastructure and local businesses and for providing education and health facilities. These, in a way, are forms of forging partnerships for catalyzing local development in a mining project area.

Effective communication with all the stakeholders and transparency must remain a lynch-pin of sustainable development. Sustainable development is a concern for all, most importantly for the people directly affected by a mining project. Therefore, local communities (who are direct stakeholders) must receive regular and transparent information about issues and conditions that affect their lives. They should be given opportunities through formal institutional arrangements to express their concerns which should be treated with respect and acted upon. Also, they must participate in decision-making on issues affecting their life and livelihood and stakeholder representatives should be invited to serve on planning and other relevant bodies and committees concerned with the development of the mineral project, more specifically in areas such as local area development, resettlement and rehabilitation, mine closure and reclamation of mined out land for use in the future.

Finally, an integrated system of sustainable development indicators could be a useful tool for both the stakeholders (including government agencies) and mining companies in measuring environmental and socio-economic dimensions of sustainable development, most importantly the effectiveness and efficiency of performance and the qualitative and quantitative dimensions of change in the community's quality of life, environment, health and economic well-being.

Regulation and Self-regulation for Sustainable Development

From the nature of the sustainability measures identified for the mineral sector, it is quite obvious that their successful implementation is dependent on both regulation (by governments) and self-regulation (by mining company and industry).

Since in most nations, minerals belong to the state or the community, it is but natural for mineral exploitation and usage to be regulated by public legislation and administered by designated government agencies. In some countries national mineral policies provide a summary of government position on various aspects of mineral sector development including

policies relating to sustainable development. However, policies have no meaning unless these are given concrete legal shape through statutes (laws) and associated regulations, rules orders etc. which have legal validity and these are enforced through effective administrative action by relevant government or public agencies. It is rare for any country to have a specific law dealing exclusively with sustainable development in all its aspects (in respect of the mineral sector). Normally, these are incorporated in mining laws, environmental laws (including air and water laws) and land laws.

In many countries, mining statutes, in addition to providing for exploration and mine operation activities and mines leases contain provisions relating to sustainable development, especially for safeguarding the mine environment and minimizing environmental degradation due to mining. Most countries have put in place policies and legislation for comprehensive mine closure, in many cases making its compliance a pre-condition for acquiring mining licenses. But, "only a very few countries and/or their individual provinces/states, have enacted and implemented actual mine closure laws e.g. the United Kingdom, the Province of Ontario (Canada) and the state of Nevada (USA). In most countries, mine closure requirements occur either within the mining law, and/or its associated Implementing Rules and Regulations (IRRs) for the mining laws or within specific environmental legislation that is applicable to the mining sector" (Clark and Clark, 2005).

In the past the mining industry frequently showed a lack of concern for the environment. In recent time, however, the greater awareness of the importance of environment has led to tighter environmental legislation and increased stringency in standard for environmental protection in and around mines, with a view to lessening mining's negative impacts. For example, all mining lease-holders may be required to submit environmental impact assessments before commencing mining and to submit a bond to cover eventual reclamation cost. However, not many countries have mandatory legislative provisions for mining companies to undertake socio-economic development measures in their respective mining areas as part of sustainable development activities. In fact, there is no country that has an adequate legal regime for dealing with socio-cultural issues as they relate to mineral resource development projects (Otto, 2000).

Framing laws, incorporating all possible "best practices" and putting them on the statute book, though necessary, are not enough to ensure sustainability in mining operation, unless these laws and associated rules and regulations are implemented efficiently and effectively. For this to happen, there must be adequate government capacity and willingness to enforce these laws in respect of specific mining projects faithfully and monitor their implementation effectively. This is the area where there is a difference between developed and developing countries where government failure appears to be a recurring pattern. This has led Ostensson (2000) to remark that "developing country governments are likely to see environmental protection and other elements of sustainable development as important objectives and accord them a higher priority. They face great difficulties, however, in realizing these objectives. The enforcement of regulations concerning existing operations in developing countries faces considerable problems and may be less effective than in the developed ones." Since good governance is a *sine qua non* for attaining sustainability,

persistence government failure on this front may create serious hurdles in achieving mineral sector sustainable development (in many developing countries).

Regulation (by government) alone, however, will not succeed in ensuring sustainable development in the mineral sector. For credible results, there has to be a genuine commitment to the principles of sustainability on the part of mining enterprises – large, medium and small – and also a realization on their part that sustainable development also makes for good business as it results in minimizing social risks and its potential to adversely affect mining investments. This means that government regulation should be supplemented by self-regulation by the mining industry and mining enterprises and their environmental behavior should go beyond mere compliance to the provisions of law.

There is some evidence to suggest that while profitability concerns are most dominant in mining investments, sustainability issues are also beginning to influence decision-making processes in mining operations. There is of course considerable differences in the behavior of different categories of mining enterprises on this score. The differences arise from the inter-connected factors of technological and production efficiency, size, management culture and locations of mining enterprises.

Access to technology and technical know-how, capacity to innovate in technical and management practices and production efficiency are powerful determinants of good environmental behavior of mining enterprises. These attributes and technological competence are more likely to the found among large mining enterprises. Therefore, large mining companies, especially multinational companies have an advantage over smaller enterprises in their ability to organize resources and harness technological and management practices to reduce production and environmental costs. In the case of smaller enterprises, all available resources are tied up in carrying out routine operations, thus leaving them with hardly any surplus resources for monitoring and managing environmental impacts including rehabilitation of mined out areas or undertaking local area development in the areas of their operation. Also, environmental degradation tends to be greatest in low productivity operations with obsolete technology, limited capital, inefficient energy use and poor human resource management (Warhurst and Noronha, 2000).

Some of these problems are endemic among mining enterprises of many developing countries which also present additional problems due to lack of political will among government leaders to implement laws embodying sustainable development principles and prevalence of corruption in extractive industries .

Also, large national and multinational mining companies tend to incorporate sustainability objectives into their corporate culture, thinking and behaviour and sensitize their senior managers and mines executives with sustainable concepts. Websites of many of these companies and their annual reports reaffirm their commitment to sustainable development. Some of them publish annual sustainability reports and detailed action plans for promoting sustainable development in company operation. In comparison, smaller mining enterprises tend to place less emphasis in the formal adoption of sustainability concepts and

objectives. Their managers and executives also exhibit less sensibility to these issues, with their major focus being on extracting minerals (from their mines) to the maximum extent in order to maximize profits.

Conclusion

Sustainability principles have application for all stages of mine life cycle – exploration, mine planning, construction, mineral extraction, mine closure and post-closure reclamation and rehabilitation. These principles include elements such as intra and inter-generational equity, the precautionary principle, scientific mining, management of socio-economic impacts and creation of substitute capital in the form of social and physical infrastructure and stakeholder engagement. It is through the interaction of their principles with the activities carried out in the different stages of the mining cycle that an appropriate framework for sustainable development (in mining) is established. In operational terms, the sustainable development in the mining sector implies a mix of scientific mining and technological improvements, improved environmental management including pollution control, enhanced socio-economic development of local areas and communities, stakeholder engagement and transparency in communication. Effective regulation (by government) and good governance as well as self-regulation and ethical conduct on the part of mining enterprises play a crucial role in the achievement of sustainable mineral development.

Thus, to sum up our discussions of sustainability in this and the preceding two chapters, it may be stated that although "sustainable development" is a broad and somewhat ambiguous concept, it can be translated into a few operational principles for the purpose of achieving its objectives in mineral development. Sustainability in mining operations can be conceived in terms of a framework comprising the following elements: (i) scientific mining, (ii) environmental protection, especially minimizing the impacts of mining practices on biodiversity, (iii) local stakeholder engagement, (iv) enabling local socio-economic development (in the areas of mining operations) and (v) accountability and transparency.

However, two main pre-conditions for achieving sustainability through these mechanisms are the existence of good governance and self-regulating mining enterprises which are economically viable, financially profitable and technically efficient.

In the following sections, we will examine the present conditions in the India's mineral industry, including the nature of sustainable practices being adopted in some selected mining states of the country, and the environmental and sustainability practices being followed in a few foreign countries and by selected major multinational companies. In the light of the analysis, we will identify a few areas of concern and then suggest a possible framework for sustainable development for India's mineral sector.

Section II
INDIAN MINING INDUSTRY:
Brief Profile and Regulatory Regime

Chapter 4

INDIAN MINING INDUSTRY: A Brief Profile

The industrial sector in India consists of three sub-sectors: (i) manufacturing, (ii) mining and quarrying and (iii) electricity, gas and water supply. During the year 2010-11, the share of the industry sector in Gross Domestic Product (GDP) at factor cost and current prices was about 18.2 per cent and the 'mining and quarrying' sub-sector had a value added component of around 14.4 per cent in the industrial sector. Thus, its contribution to GDP was around 2.6 per cent (Press Information Bureau, GOI, Revised Estimates, 2011).

Though minerals account for a small share of the country's production, their supply is essential for the development of India's modern economy. They are basic and strategic raw materials for the production of a wide range of industrial and consumer products, military and transport equipment, infrastructure, energy, communications and many other essential services.

Economic minerals, i.e. the minerals that can be marketed for productive purposes can be classified into three categories:-

(i) Energy or fuel minerals (coal, gas, oil, uranium);
(ii) Metallic minerals: ferrous (iron ore, chrome ore, titanium); basic metals (bauxite and copper) and precious (gold, silver, platinum); and
(iii) Non-metallic minerals (diamond, gems , salt, bricks and stones)

Mineral resources reserves in India are extensive and cover all these three categories comprising a wide variety such as barite, bauxite, chromite, coal (bituminous), copper, diamond, gold, iron ore, manganese, petroleum/oil, zinc and a host of other industrial minerals. The estimated reserves of major mineral commodities have been indicated in Annexure 1. The country's barite, bauxite, chromite, coal, limestone and manganese reserves or resources are among the ten largest mineral reserves in the world.

India, today, is a major minerals producer ranking among the world's leading producers of chromite, coal (bituminous), iron ore, manganese, bauxite and zinc (Annexure 2). There are as many as 84 minerals produced (in 2008-2009) in the country which included 4 energy (fuel) minerals, 10 metallic and 44 non-metallic (industrial) minerals, 3 atomic minerals and 23 minor (building and other) materials (GOI, 2010). In meeting the demand for primary mineral raw material for its domestic mineral-based industries, India is by and large self-sufficient in bauxite, chromite, iron and manganese ores, coal (with the exception of very low coking coal required in steel plants), lignite, ilmenite and rutile among metallic minerals and almost all industrial minerals with very few exceptions.

The total value of mineral production (excluding atomic minerals) during 2010-11, estimated at Rs. 200609.38 crores, was an increase of 11.83 per cent over that of the previous year (Annexure 3). In the total value of mineral production, the share of the fuel (energy) minerals was 67.42 percent. The rest accrued from the metallic minerals (20.85 percent), non-metallic minerals (2.4 percent) and minor minerals (9.33 percent) (Table 4.1). Annexure 3 and Annexure 4 provide details relating to the value and quantity of mineral production during the period 2006-07 to 2010-2011.

Table 4.1: Value of Mineral Production (2008-09 to 2010-11)

(In Rupees Crores)

Mineral	2008-2009	2009-2010	2010-2011
All Minerals (excluding atomic minerals)	174240.31	179384.01	200609.38 (100)
Fuel Minerals	115371.31	124088.33	135243.81 (67.42)
Metallic Minerals	36067.76	32274.29	41828.44 (20.55)
Non-Metallic Minerals	4066.79	4286.94	4802.69 (2.40)
Minor Minerals	18734.45	18734.45	18734.45 (9.33)

Note: Figures in brackets are percentages
Source: Annual Report 2010-2011, Ministry of Mines, Government of India, 2011

It is also seen that in the group of metallic minerals, most of the contribution to production is by bulk or surface minerals like iron ore, manganese ore, chromite and bauxite. The contribution of basic (base) minerals like lead, zinc, copper and nickel and of noble or precious minerals like gold and diamond is quite less. This is a reflection of the situation in India where most minerals found near the surface and easily extractable (bulk minerals) have been explored and are being exploited. Exploration is yet to take place for base and noble minerals in more difficult terrain, needing sophisticated technology and expertise. The potential of these minerals has not been realized and therefore, exploration and exploitation of these minerals should receive greater attention in the future.

During the years 2004-05 to 2010-11, there has, however, been a steady increase in both the quantity and value of the minerals produced. Table 4.2 states the index of production over the seven years for the overall mineral sector as well as for various categories of minerals. The overall index of mineral production during 2010-11 was 204.8 as compared to 193.4 for 2009-10. The trend of index of mineral production is depicted in figure 4.1 and those for the value of mineral production and the value of minerals by groups are depicted in figures 4.2 and 4.3 respectively.

Table 4.2: Index of Mineral Production 2004-05 to 2010-11 (excluding atomic minerals) (Base 1993-94 =100)

Item	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Index of Mineral Production (1000)	154.16	157.40	167.08	173.55	176.63	193.4	204.8
Coal and lignite (324.63)	154.66	163.84	173.27	184.06	197.27	-	-
Crude petroleum and natural gas (532.55)	141.67	138.75	143.03	144.42	143.39	-	-
Metallic Minerals (80.76)	221.07	240.17	283.36	311.28	299.00	-	-
Non-metallic minerals (42.33)	184.66	191.18	211.30	210.63	218.39	--	-
Minor minerals (19.73)	143.76	143.76	143.76	143.76	143.76	-	-

Note: Figures in brackets indicate the weights attached to respective groups

Sources: Indian Mineral Year Book, 2007-2009, Indian Bureau of Mines, Ministry of Mines, Government of India, and Quick Estimates(QE) of Index of Industrial Production for March, 2011, Central Statistical Office, Ministry of Statistics and Programme Implementation, Government of India, May 2011.

Figure 4.1: Trend in Index of mineral production (Base 1993-94 = 100)

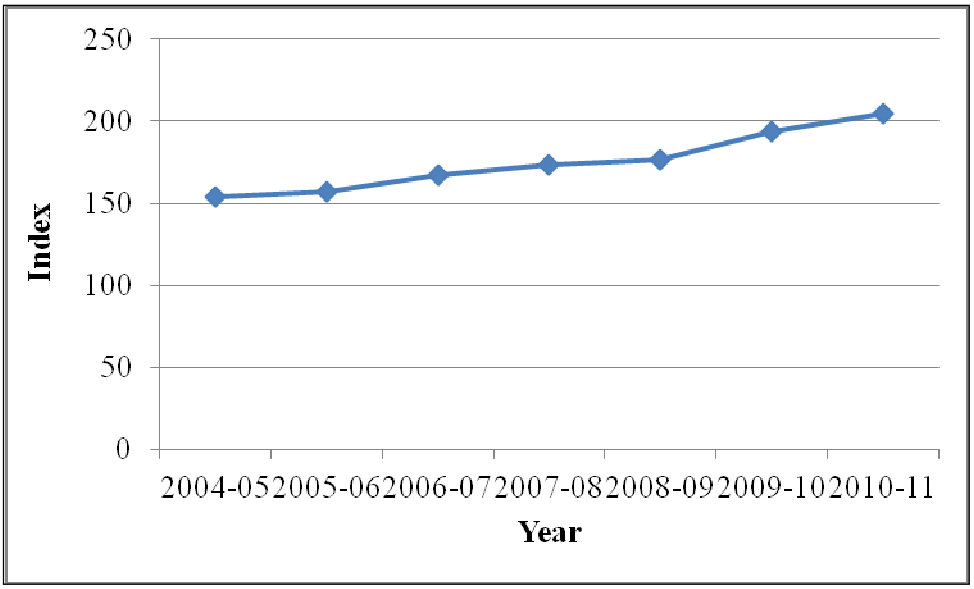


Figure 4.2: Trend in value of mineral production

(In Rupees Crores)

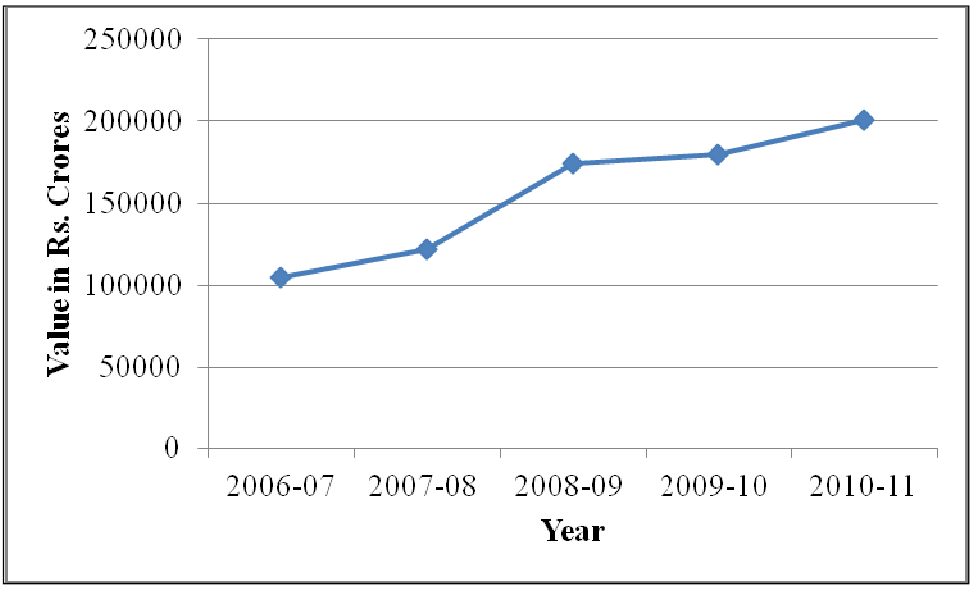
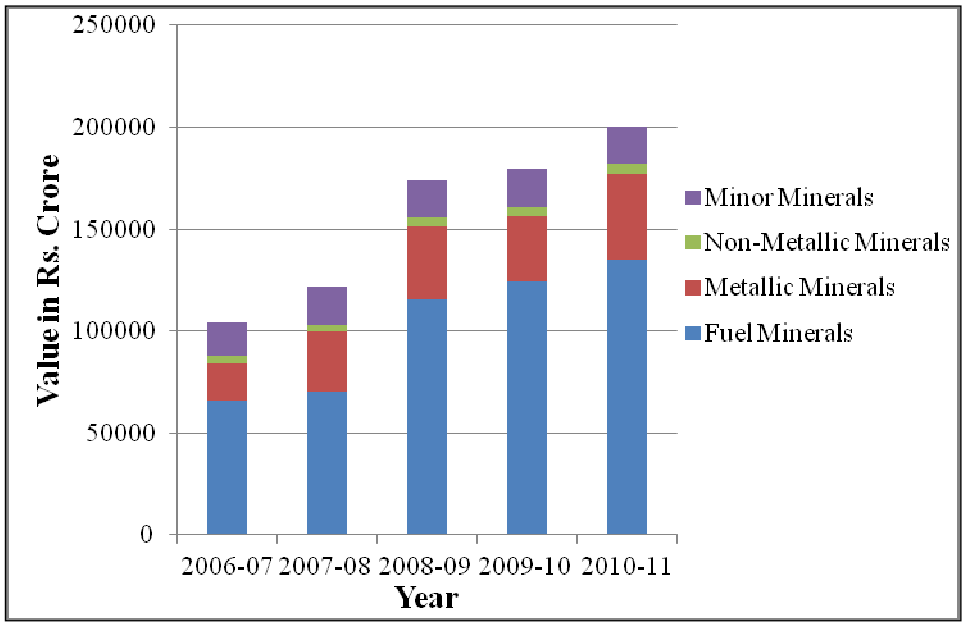


Figure 4.3: Trend in value of minerals by groups

(In Rupees Crores)



The economic importance of individual industries, including the mineral industries to the national economy is measured by its contribution of gross value added to Gross Domestic Product (GDP). Value added is arrived at by deducting the costs of bought-in inputs from the ex-mine sale value of mineral production. The gross value added of the mineral industries as a whole is included in the national accounts under the heading "Mining and Quarrying" which also includes the extraction of natural gas and petroleum. The "Mining and Quarrying"

subsector's contribution to GDP hovers around 2.6 percent as can be seen from the data given in Table 4.3 below.

Table 4.3: Contribution of the Mineral Sector to GDP at factor cost (current prices)

(In Rupees Crores)

Industry	2008-09	2009-10	2010-11
GDP at factor cost	5,282,086 (100)	6,133,230 (100)	7,306,990 (100)
Industrial Sectors	1,039,030 (19.6)	1,152,164 (18.8)	1,328,887 (18.2)
Mining and Quarrying	1,38,649 (2.6)	1,54,269 (2.5)	1,91,565 (2.6)

Note: Figures in brackets indicate percentages

Source: Press Information Bureau, GOI. 2011. "Revised Estimates of Annual National Income, 2010–11 and Quarterly Estimates of Gross Domestic Product, 2010–11," released by the Central Statistics Office (CSO), Ministry of Statistics and Programme Implementation, Government of India, May.

During the 2008-09, within the total mineral sector (excluding atomic minerals) gross value added (100), the share of the fuel (energy) mineral was the highest (53.71%), followed by the metallic minerals (27.86%), minor minerals (16.5%) and non-metallic minerals (2.29%). Coal and lignite (30.52%), natural gas and petroleum (23.19%) and iron ore (22.42%) were the extractive industries which made the largest contributions to the mineral sector's gross value added and in that sense dominated the mineral industry (Annexure 5).

Similarly, mineral fuels (petroleum products) accounted for nearly 16 per cent of the total exports from the country during 2009-2011 with iron ore accounting for a little less than 2-3 per cent of the total exports (Annexure 6).

Table 4.4: **Percentage share of major minerals in India's exports**

Item	2009-10	2010-11
Ores and minerals (including iron ore)	4.8	4.2
Iron Ore	3.3	1.8
Petroleum Products	15.8	16.5
Total exports	100	100

Source: Handbook of statistics on Indian economy 2010-11, Reserve Bank of India, Mumbai, 2011.

In the area of imports, petroleum crude and products accounted for more than 40 per cent of India's imports during the years 2009-2011, while two groups, namely, metalliferrous ores, metal scraps etc and coal, coke and briquettes each accounting for around 3 per cent (shown in Table 4.5 and Annexure 7).

Table 4.5: Percentage share of major minerals in India's imports

Item	2009-10	2010-11
Metalliferrous ore, metal scrap etc	2.7	2.7
Coal, coke and briquettes	3.1	2.7
Petroleum crude on products	43.4	42.7
Total imports	100	100

Source: Handbook of statistics in the Indian Economy 2010-11, Reserve Bank & India, Mumbai, 2011

Mineral Prices

The world mineral markets are generally volatile and mineral prices have shown great volatility since the Second World War in response to changes in the market conditions. However, till 1991 market liberalization, the minerals market in India had limited exposure to the world market as most mineral production was utilized in the domestic market which was protected and mineral prices were determined by the government. Even then in respect of the prices of crude oil and the minerals in respect of which India participated in the external trade, the changing mineral prices had their impact on the Indian business and economy. It is, therefore, worthwhile to discuss the broad trends in the world mineral prices in a historical perspective, in order to have a proper understanding of the emerging developments in the country's mineral sector.

From the end of the Second World War till about 1974 there was a high demand for minerals due to strong world economic growth. During 1950-73, crude oil prices were effectively controlled by the so-called "Seven Sisters" and remained practically constant in real sense. During the same period, metal prices were subject to considerable fluctuations around an upward trend. Positive and increasing long-run growth rates were viewed as a durable feature of the mineral markets.

From the first oil crisis in 1973-74 until the early 1980s, oil prices began to climb steeply, largely due to the increased market control by OPEC (Organization of the Petroleum Oil Exporting Countries). Metal prices, on the other hand, began a long-term declining trend that reflected slower world economic growth, reduced intensity of metal use in many countries, acute competition among producers and the building of the excess supply capacity. Crude oil prices also began to decline in real sense in 1985 due to the discovery of new reserves in non-OPEC countries. The depressed mineral prices of the 1980s and 1990s meant that these instead of being treated as strategically important for economic development were increasingly seen as simple commodities. This perception had its impact on public policy orientation and led to a trend towards privatization, deregulation and increased openness to foreign direct investment (FDI) in many developing countries.

Towards the end of the 1990s, there was a change in the situation, oil prices started climbing since 1999 (following the agreement signed between the OPEC and non-OPEC members in 1998) and more spectacularly from 2003 due to the geopolitical instabilities in West Asia. The prices of metallic minerals suddenly started climbing since 2004 due to the combined effect of strong demand and supply constraints. Resource-intensive growth of China and to some extent India and other emerging markets put a pressure on the prices of oil and metals. The price rise was also due to slow supply responses as the prolonged period of low mineral prices had resulted in the closure of high-cost production installations and reduced investment in human resources, production and refining capacity. Low levels of stocks, geo-political instability and unpredictable events (like strikes and natural disasters) put additional upward pressures in prices. This is reflected in the rising trend of world mineral price indices (2000 = 100) over the period 2000 to 2010 (Annexure 8) depicted in Figure 4.4 below. Figure 4.5, based on the data (Annexure 9) relating to Brazilian iron ore (64.5% Fe) also indicates the rising trend in the prices of iron ore in the international market.

These developments, reflective of the rise in aggregate demand for minerals, have had their impact on the prices of minerals in India as well. Figure 4.6 shows the trend in Indian wholesale price indices (1993-94 = 100) of all minerals and separately of iron ore during the years 2000-01 to 2009-10 (Annexure 10). There has been a massive increase in the wholesale price index for iron ore during the period.

Figure 4.4: World Free Market Price Indices of Mineral Ores and Metals, 2000-2010 (Base: 2000=100)

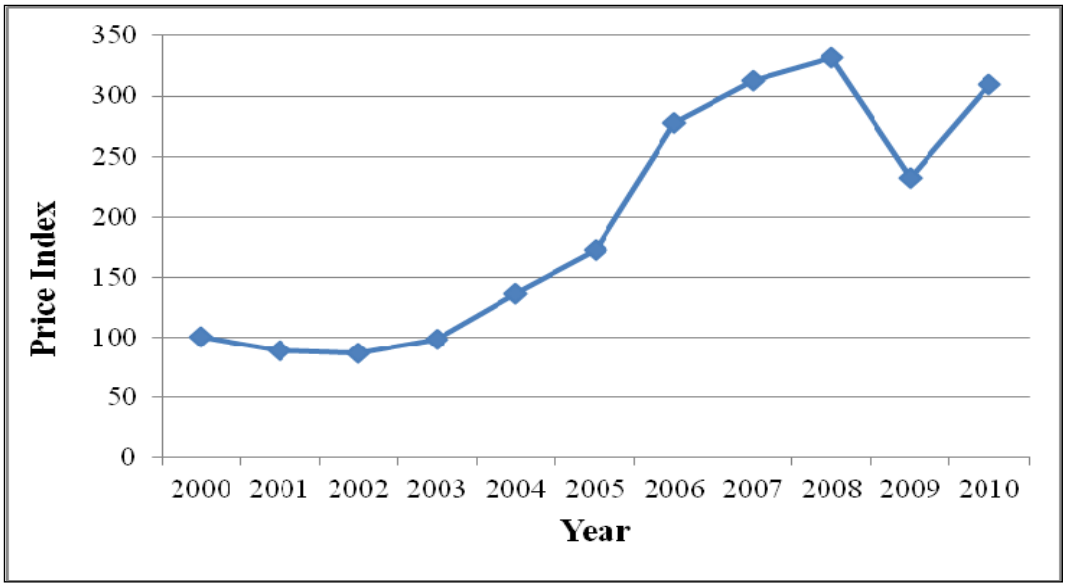


Figure 4.5: World Free Market Commodity Prices (annual) of iron ore (Brazilian ore to Europe, Vale Itabira SSF, 64.5% Fe content)

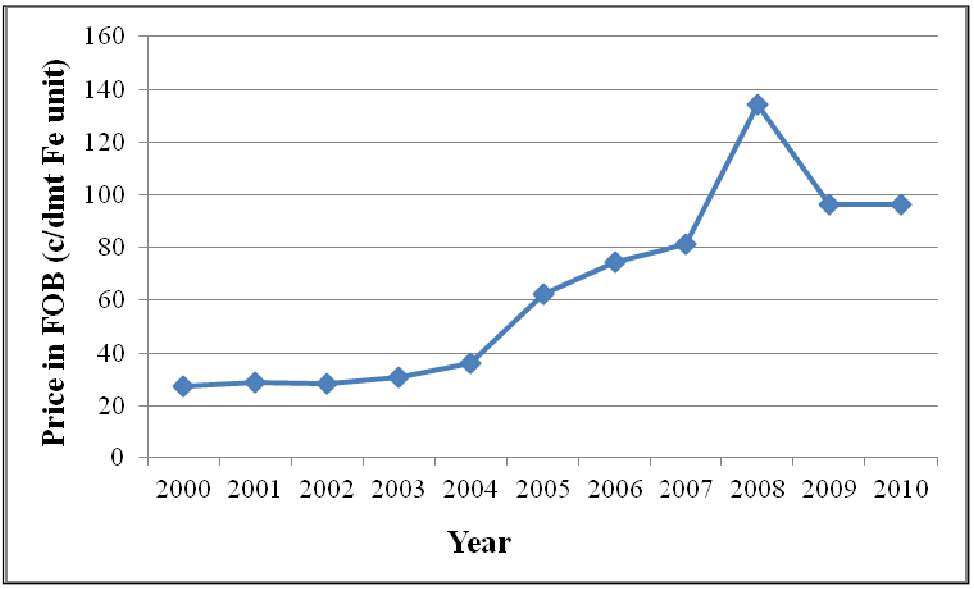
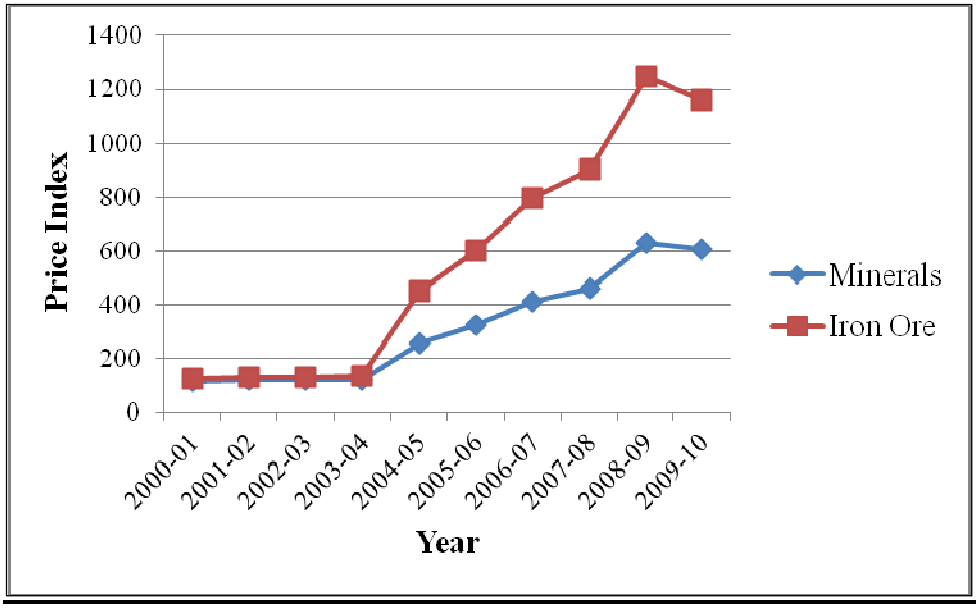


Figure 4.6: Indices of wholesale prices of minerals and iron ore in India



The sharp rise in the prices of minerals in the first decade of the 21st century has had a significant impact on mineral development in the country, raising production levels of minerals along with concerns for the nature and sustainability of mineral operations.

Structure of Mineral Industry in India

The Indian mineral industry has a complex structure comprising large and small mines, public and private sector enterprises as well as an informal sector that covers most minor minerals being extracted in the states. In the private sector, only a few are public limited companies. The rest comprise individuals (proprietors), partnership firms and private

limited companies that have ownership of mineral concessions. Also, more than ninety percent of bulk minerals like limestone and bauxite and nearly 20 percent of iron ore are captive to mineral-processing industries for meeting their raw material requirement. All these make the task of envisaging a uniform framework for sustainable development rather difficult.

The total number of working mines (excluding atomic minerals, petroleum (crude) and natural gas and minor minerals) in India was 2628 in 2010-11 compared to 2999 in 2009-10. Their distribution among various groups of minerals is shown in the following table (Table 4.7).

Table 4.7: Number of Operating Mines in 2009-10 and 2010-11

	2009-10	2010-11
All Minerals *(excluding atomic minerals, Petroleum, natural gas and minor minerals)*	2999	2628
Coal	574	574
Metallic Minerals	700	608
Non-Metallic Minerals	1725	1446

Source: Annual Report, 2010-2011, Ministry of Mines, Government of India, New Delhi, 2011

Out of 2628 reporting mines (in 2010-11), 90 per cent were located in 11 states as indicated in Table 4.8 below.

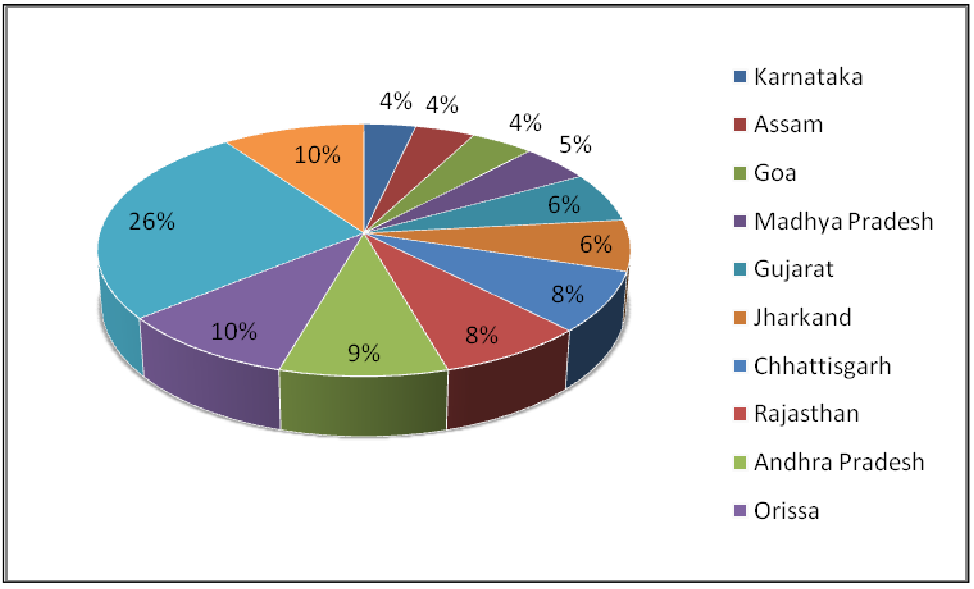
Table 4.8: Number of Reporting Mines in various states, 2010-11 (excluding atomic and minor minerals)

State	Number of Mines
Andhra Pradesh	372
Chhattisgarh	135
Gujarat	377
Jharkhand	288
Karnataka	211
Madhya Pradesh	251
Maharashtra	142
Odisha	159
Rajasthan	215
Tamil Nadu	156
West Bengal	111
Others	211

Source: Annual Report 2010-11, Ministry of Mines, Government of India, New Delhi, 2011

As would be expected, more than 90 percent of the value of mineral production in 2010-11 originated from ten states (including offshore areas) as may be seen in figure 4.7. While the offshore areas contributed the largest share (26.03 percent), Odisha was the leading state with a share of 9.63 percent in the value of mineral production followed by Andhra Pradesh (8.98), Rajasthan (7.93), Chhattisgarh (7.77 percent) and Jharkhand (6.54 percent).

Figure 4.7: Share of States in Value of Mineral Production 2010-11



Source: Annual Report 2010-11, Ministry of Mines, Government of India, New Delhi, 2011

The mining industry is characterized by a large number of small mines and a few large mining operations. Small mines are normally operated as proprietory or partnership ventures where as large mines are mostly run as public or private limited companies.

Table 4.9 gives area-wise distribution of mining leases (excluding fuel, atomic and minor minerals) as in March 2011. The data shows that large leases (i.e. those with area of more than 100 hectares each) constitute about 9 percent of the total leases, though they account for 70 percent of the total mining lease area. Nearly 51 percent of the total leases (with 4 percent of the total area) are accounted for by tiny leases of less than 5 hectares each. This means that a large number of very small mining operations are dotting the country's mining areas with serious consequences for the environment.

Added to this is the existence of a considerable number of mines or quarries extracting minor minerals in different states of the country. The value of production of minor minerals in different states was estimated at Rs. 18734.45 crores in 2009-10 with Andhra Pradesh accounting for nearly 54 percent of this production. Rajasthan (16.6 percent) and Uttar Pradesh (12.4 percent) were the other two states with substantial production of minor minerals with other states each producing less than 5 percent of the value of total production in the country. Road metals, building stones, bricks, ordinary sand and gravel have the largest

share in the value of minor minerals. Other minor minerals include marble, limestone, quartzite and sand stone, kankar, and morrum (GOI, 2010).

Table 4.9: Distribution of mining leases in India (March 2011) (By area groups)

Frequency group (area in hectares)	Number of mining leases	Percentage of total leases	Area (in '000 hectares)	Percentage of total area
All groups	10488	100	507	100
Less than 5	5318	51	18	4
5-10	1023	10	7	1
10-50	2348	22	59	12
50-100	891	8	66	13
More than 100	908	9	357	70

Note: Excluding fuel, atomic & minor minerals.
Source: Indian Bureau of Mines, Nagpur, 2011.

These operations (for extracting minor minerals) often carried out by small traders mostly operating in the informal sector cause considerable damage to the environment which becomes difficult to regulate because of the dispersed nature of the operations, local-level politics and corruption.

Both public and private sector enterprises are involved in mineral development in India. This is reflected in the distribution of mining leases and in the profiles of the mining enterprises operating in the country. The distribution of mining leases between public sector enterprises (both state and central) and private sector entities is given in Table 4.10 below.

Table 4.10: **Distribution of mining leases between public and private sector enterprises in India (March 2011)**

Sector	No. of leases	Lease area (Hectares)
Total	10488	507403.84
Public sector	521	148932.76
Private sector	9967	358471.08

Source: Indian Bureau of Mines, Nagpur, 2011.

A list of mining and associated processing companies comprising the structure of the mineral industry in India is shown in Annexure 11. Also, top 30 mining companies (excluding those producing fuel and atomic minerals) in terms of the value of production (2010-11) have been listed in Table 4.11 below.

Table 4.11: Top thirty producers of minerals in terms of value of production in India (2010-11)

SNo	Name of leaseholder	Minerals	% share in All India Value
1	National Mineral Dev. Corpn. Ltd., Hyderabad	Diamond, Iron Ore	18.54
2	Sesa Goa Ltd., Goa	Iron Ore	6.99
3	Orissa Mining Corpn. Ltd., Orissa	Chromite, Iron Ore, Manganese Ore	6.09
4	Hindustan Zinc Ltd., Rajasthan	Lead & Zinc Ore, Lead Concentrate, Phosphorite, Zinc Concentrate	3.97
5	Rungta Mines (P) Ltd., Kolkata	Iron Ore	3.49
6	Tata Iron & Steel Co. Ltd., Mumbai	Chromite, Dolomite, Iron Ore, Manganese Ore, Pyroxenite	3.28
7	Essel Mining & Industries Ltd., Kolkata	Iron Ore	3.23
8	Steel Authority Of India Ltd., New Delhi	Dolomite, Iron Ore, Limestone	2.81
9	Cosme Costa & Sons, Goa	Iron Ore	2.23
10	Bonai Industrial Co. Ltd., Orissa	Iron Ore	1.87
11	Sarda Mines Private Limited, Orissa	Iron Ore	1.85
12	Rungta Sons (P) Ltd., Jharkand	Iron Ore, Manganese Ore	1.62
13	Manganese Ore India Ltd., Nagpur	Manganese Ore	1.6
14	Ramesh Prasad Sao, Jharkand	Iron Ore, Manganese Ore	1.42
15	Rajasthan State Mines & Minerals Ltd., Rajasthan	Fluorite (Graded), Gypsum, Limestone, Phosphorite	1.4
16	Kamaljeet Singh Ahluwalia, Orissa	Iron Ore, Manganese Ore	1.23
17	Sesa Mining Corporation Ltd., Goa	Iron Ore	1.14
18	Hindustan Copper Ltd., Kolkata	Copper Ore	1.1
19	Mysore Minerals Ltd., Bangalore	Bauxite, Chromite, Dolomite, Dunite, Felspar, Fireclay, Iron Ore, Kaolin, Limestone, Magnesite, Quartz	1.08
20	Khatau Narbheram & Co., Orissa	Iron Ore	0.97
21	Ultra Tech Cement Ltd., Mumbai	Limestone, Marl, Shale	0.93
22	V.M. Salgaocar & Brothers (P) Ltd., Goa	Iron Ore	0.93
23	Hutti Gold Mines Co. Ltd., Bangalore	Gold, Silver	0.86
24	Serajuddin & Co., Kolkata	Iron Ore	0.83
25	Feegrade & Co. (P) Ltd., Orissa	Iron Ore	0.82
26	Smt Indrani Patnaik, Orissa	Iron Ore	0.8
27	Chowgule & Co. Ltd., Orissa	Iron Ore	0.79
28	V.S. Lad & Sons, Karnataka	Iron Ore	0.78
29	Aryan Mining & Trading Corpn. (P) Ltd., Kolkata	Iron Ore, Manganese Ore	0.72
30	Veerabhadrappa Sangappa & Co., Karnataka	Iron Ore	0.72

Note: Provisional figures
Source: Indian Bureau of Mines, Nagpur, 2011

This data, along with mineral production statistics, show that the public sector continues to play a dominant role in various key mineral sub-sectors such as coal and lignite, petroleum, iron and steel, copper, and bauxite and aluminium production. During 2009-10, the public sector accounted for 74.48 per cent (Rs. 1, 19, 385.86 crores) of the total value of mineral production. In terms of quantity, the entire production of copper ore, diamond, dunite, fluorite (concentrated and graded), phophorite/rock phosphate, rock salt, selenite and sulphur was from the public sector. Enterprises in the public sector also produced 99 per cent of lignite and gold, more than 90 per cent of coal and barite, 86 per cent of petroleum (crude), 77 per cent of natural gas (utilized), 84 per cent of sillemanite, and 60 per cent of magnesite (GOI, 2010).

Coal mining companies are almost exclusively government-owned with Coal India Ltd. and its seven subsidiary companies undertaking coal mining in different regions of the country following the nationalization of coal mines in the 1970s. Neyvelli Lignite Corporation is involved in lignite mining along with production of power. Steel Authority of India (SAIL), National Mineral Development Corporation Ltd. (NMDC), National Aluminum Company Ltd. (NALCO), Manganese Ores India Ltd. (MOIL), and Hindustan Copper Ltd. (HCL) are the other major (central) public sector companies engaged in mining operations. There are state government-owned public sector companies like the Orissa Mining Corporation (OMC) and the Andhra Pradesh Mining Development Corporation which play a significant role in mineral development.

The private sector is also dominated by a few large companies although in terms of sheer number small mines occupy a disproportionately a large space in India's mineral sector. Tata Steel, the Vedanta group of companies comprising Vedanta Resources, Sesa Goa Ltd., Sterlite Industries (India) Ltd., BALCO and Hindustan Zinc Ltd., and Hindalco Industries Ltd. are the major companies in the private sector. Some of these companies are also producers of metal products and carry on mining operations as adjunct or captive to their metallurgical industries.

Many moderately large companies such as Ambuja Cement, Century Cement, the Associated Cement Company Ltd., Larsen and Toubro Ltd. Orissa Cement Ltd. and JK Cement are prominent in cement industry and associated limestone mining.

Finally, the mining industry provides both direct and indirect employment to the people. Indirect employment is generated by mining's boost to spin off activities such as wholesale and retail trade, construction and other associated activities. The average daily employment in the mining sector in 2009-10 was estimated at 5,19,835 persons. The public sector accounted for 81 per cent (4,32,761 persons) and the private sector accounted for 19 per cent (97,074 persons) (GOI, 2010)

Conclusion

Though the mineral sector's contribution to India's GDP is around 2.6% (2011), its importance arises from the fact that it supplies basic and strategic raw materials for the country's industrial and economic development.

India has extensive mineral resources, produces as many as 84 minerals and is among the world's leading producers of a number of minerals. However, whereas its reserves of bulk or surface minerals (like iron ore, manganese and bauxite) have been explored and are being exploited, exploration and exploitation of base and noble minerals (like lead, zinc, copper, nickel, gold and silver) must receive greater attention in the future.

Due to the sharp rise in prices and demand of a number of mineral commodities, the production of many minerals has shown steady increase, both in quantity and value since 2004-05.

The Indian mineral industry has a complex structure comprising large and small mines, public and private sector enterprises as well as an informal sector that covers most minor minerals being extracted in the states. There are a large number of individuals (proprietors), partnership firms and private limited companies among mining concessionaries in the private sector, which is, however dominated by a few large public limited companies. Many mines (in case of bulk minerals like limestone, bauxite and iron ore) operate as captive to the relevant mineral-processing industries. A large number of very small mining operations (including those for minor minerals) are dotting the country's mining landscape with serious adverse consequences for the environment. The public sector continues to play a dominant role in various mineral sub-sectors (such as coal, lignite, petroleum, iron and steel, bauxite and aluminum production) accounting for nearly 74% of the total value of mineral production in 2009-10.

In the subsequent chapters, we will discuss the legal framework and environmental regulatory system that govern mining operations in India.

Chapter 5

LEGAL REGIME AND THE ROLE OF GOVERNMENT

Under India's federal structure, the proprietary title to onshore minerals vests in the constituent states; the minerals situated in the offshore areas, on the other hand, are under the exclusive control of the Central Government. The Constitution of India, through various entries in the Union List (List 1), State List (List II), and the Concurrent List (List III) included in its Schedule VII assigns functions and legislative powers to both the centre and the states. Entry 23 of List (State List) empowers the state governments to make laws relating to "regulation of mines and mineral development subject to the provisions of List 1 with respect to regulation and development under the control of the Union". Entry 54 of List 1 (Union List) dealing with the same subject empowers the central government to make laws relating to the "regulation of mines and mineral development to the extent to which such regulation and development under the control of the Union is declared by Parliament by law to be expedient in the public interest". The conditionalities outlined in clauses (1) to (3) of Article 246 of the Constitution, which deals with the law-making powers of the Parliament and the state legislatures and the formulation of the two entries of Schedule VII, referred to earlier, leave no doubt about the predominance of the central government's powers in the area of regulation of mines and mineral development. This, in effect, means that the states' ownership rights in respect of the onshore minerals are subject to the regulation of the central government in terms of the laws enacted by the Parliament to sub serve national interests. The Mines and Minerals Development and Regulation (MMDR) Act 1957, enacted by the Parliament in pursuance of this power, confers the right to allow exploitation of minerals by way of granting licenses and leases on the state governments, but in accordance with the provisions of the (MMDR) Act and its Rules which require mandatory prior approval of the central government for the grant of such licenses and leases. In fact, with respect to major minerals (known as Schedule 1 minerals), the states have little powers except possession, receiving royalty and a few other payments. Even in respect of royalty and associated dead rent, the rates are prescribed by the central government under the relevant legal provisions of the MMDR Act 1957. Only with respect to minor minerals, the states can make their own rules and regulations.

Additionally, the Constitution confers legislative powers on the central government for the regulation and development of oil fields, mineral oil reserves, petroleum and petroleum products and safety of mines and oil fields as also for the Geological Survey of India which is the premier public sector agency for undertaking geological surveys in the country (entries 53, 55, and 68 of the Union List – List 1).

Mineral Policy

From the initial years after independence, the government policy in India has always considered minerals to be of 'basic' and 'strategic' importance for the country. Accordingly, the Industrial Policy Resolution of 1948 provided that coal and mineral oils would be two of the six industries where establishment of new undertakings would be the exclusive responsibility of the public sector. Additionally, other minerals were also treated as 'basic industries' requiring planning, regulation and control of the Central Government.

The landmark Industrial Policy Resolution (IPR) of 1956 went a step further in pursuance of its objective of realizing a 'socialistic pattern of society' in India and put major minerals such as coal and lignite, mineral oils, iron ore, manganese ore, chrome ore, copper, lead, zinc, atomic minerals and a few others in its Schedule A which was exclusively reserved for the public sector. These minerals were described as belonging to the group of industries which were of 'basic and strategic importance' for the country's economy and development. All other minerals except minor minerals were put in Schedule B which included industries where private sector participation was allowed along with increasing participation of the State in establishing new undertakings.

The restrictive approach of IPR was reflected in the Mines and Minerals (Regulation and Development) (MMDR) Act 1957, meant for the regulation and development of minerals in public interest, as well as in the Mineral Concession Rules (MCR) 1960 and the Mineral Conservation and Development Rules (MCDR) 1988 framed under it. Further, the MMDR Act 1957 was amended in order to enhance government control over mining including the power to reserve areas for the public sector enterprises. In 1988, the MCDR was also revised in order to enable the Central Government's technical agency IBM (Indian Bureau of Mines) to monitor and regulate mining activity. The severe regulatory regime of IPR and the MMDR Act 1957 and its Rules continued till the early 1990s. As late as August 1990, the National Mineral Policy, announced by the Government of India conferred on the State the exclusive or predominant responsibility for the development of mining and processing of specified minerals of basic and strategic importance. The public sector companies dominated the mining sector during the period. After sometime, there was an overlap of the government's powers to regulate the mining activity and its assumed responsibility to develop mines through government undertakings. It was basically the consequence of a public policy, existing in many developing countries in the 1960s and 1970s, that was concerned with retaining sovereignty over natural resources and therefore developing the mineral sector primarily through the public sector. In the limited area where private investment was allowed, the insistence was on retaining majority local ownership, with minimum (not more than 40%) of foreign participation.

By 1991, there was a growing awareness that the inward looking import substitution and the associated restrictive policies, followed in various domestic production sectors since the 1950s, were creating inefficiencies and a high cost domestic production structure that was out of line with the world prices. There were also limited entrepreneurial efforts in many

areas. Economic liberalization, introduced following the foreign exchange crisis in 1991, emphasized both the external sector reforms in trade, exchange rate and foreign investment policies and also internal reforms in the areas such as industrial policy, mining policy, price and distribution controls as also financial and public sector reforms. Besides, emerging globalization and India's membership and commitment to World Trade Organization (WTO) created new challenges for economic growth. Even then the Statement on Industrial Policy 1991, which aimed to bring in industrial de-regulation and liberalize the provisions relating to domestic and foreign investment had in its Annex I, continued the reservation of the major minerals for the public sector. It was only in the National Mineral Policy (NMP) announced in March 1993 that for the first time introduced the idea of encouraging private investment including foreign technology and foreign participation in the exploration and development of mines.

The policy reform in the mining sector is driven by the realization by the policy makers, that the past restrictive policies have stunted the growth of India's mineral sector compared to other mineral-rich countries like Australia, South Africa and South America which along with India formed a continuous landmass before the breaking up of Gondwana land and therefore, have the similar geological and metallurgical history. Besides, most of the mineral deposits, which are found on the surface and easily extractable, have already been explored. Exploration now has to look for increasingly difficult terrain and search for minerals at greater depth. This requires huge capital resources, more sophisticated technology and large-scale operations. India's main (government) exploration agency, the Geological Survey of India (GSI), neither has the resources nor the up-to-date technology to undertake this task. This necessitates import of technology, capital and expertise from abroad. In order to attract foreign investment and technology into the mining sector, comprehensive liberalization is required. However, in the Indian context, it has been difficult to undertake bold reforms in one-go, mainly due to the hangover of the past 'socialistic' or 'restrictive' mind-set. As in the case of many other areas, policy reform in the mining sector over the past two decades has also been slow and gradual which has limited the benefits to be derived from such reform.

Also, there are two issues that are relevant while considering the implications of a policy statement (like the National Mineral Policy) in respect of the mining sector which is a relatively small sector of the Indian economy. Firstly, the mineral policy is only a part of the overall policy framework and regulatory system that includes, among other things, the policies and legislations on environment, forest conservation, foreign investment and foreign exchange, industrial development, trade, company affairs, labour, etc. Secondly, a policy announcement in respect of an economic sector (like the National Mineral Policy) by itself is of little consequence unless its prescriptions are translated into legislative measures through the creation of new legislation and/or amendments to the existing laws governing the sector.

The National Mineral Policy 1993, which applied to only the non-fuel and non-atomic minerals, is a general but comprehensive statement covering a wide gamut of areas such as the strategy of mineral development covering survey, exploration, scientific methods of

mining conservation and beneficiation and their economic utilization. Other aspects covered are mineral exploitation in the sea bed, proper linkages between exploitation of minerals and downstream units, development of small deposits, preservation of forests, environment and ecologically fragile and biologically rich areas, export of minerals and their value added products, recycling of metal scraps etc.

The Mineral Policy, however, for the first time introduced the idea of encouraging private sector and foreign participation in exploration and mining. Foreign equity investment and technology transfer in joint ventures in mining promoted by Indian Companies were encouraged. As regards direct foreign equity participation, the policy provided that while this would normally be limited to 50%, this limitation would not apply to captive mines of any mineral processing industry. Enhanced equity holding beyond his limit could also be considered on case-by-case basis. These provisions, though an improvement on the previous regime, also indicated a reluctance to bring about a full-scale liberalization in the mining sector that would have permitted fully owned foreign companies to participate in mining industry.

The gradualist approach is further evidenced by the fact that the 1993 policy announcement was followed by a series of reviews in 1994, 1996, 1997, 1999 and 2000 in order to facilitate both the private and foreign participation in the mineral industry and empower the State Governments in decision-making without permission from the Central Government. The Mines and Minerals (Regulation and Development) Act 1957 and MCR 1960 and MCDR, 1988 were also amended from time to time in order to give effect to these liberalizing measures. Some of the major provisions are described below.

Thirteen major minerals – iron-ore, manganese ore, chrome ore, sulphur, gold, diamond, copper, lead, zinc, molybdenum, tungsten, nicked, and platinum group of minerals – which were earlier reserved exclusively for public sector exploitation were thrown open for exploitation by the private sector.

The minerals (except fuel minerals and atomic minerals) which require prior concurrence of the Central Government for the grant of mineral concession were reduced to ten that include asbestos, bauxite, zinc, chrome ore, precious stones, copper ore, manganese ore, gold, lead and iron ore. The State Governments could give permission/concessions (without consulting the Central Government) in respect of all other non-fuel and non-atomic minerals. The State Governments were also delegated powers for permitting renewal of lapsed prospecting licenses and mining leases, transfer of mining leases, amalgamation of two or more adjoining areas and in a few other fields.

The concept of reconnaissance operation as a stage of operation distinct from and prior to actual prospecting operations was also been introduced. The Reconnaissance Permit (RP) holders will automatically have preferential right for grant of Prospecting License (PL).

Foreign direct investment (FDI) in the mining sector was not encouraged in the first four decades following independence presumably because of its strategic importance. Local ownership with foreign holding limited to 40% was required for Indian companies to obtain mineral concessions in the limited areas where private sector participation was allowed. With the formulating of NMP in 1993, FDI was allowed up to 50% with no limit for captive mines. However, all FDI proposals required clearance by the Government through the Foreign Investment Promotion Board (FIPB). In 1997, FDI up to 50% was taken out of the jurisdiction of FIPB and put on automatic approval by the Reserve Bank of India (RBI). For exploitation and mining of diamonds and precious stones, FDI was allowed up to 74% under the automatic route in February 2000; for all other minerals, foreign equity up to 100% was allowed through the automatic route. In February 2006, more than a decade after the initial steps for liberalization was taken; the mining sector was fully opened to 100% FDI, thus finally paving the way for the mining multi-national corporations (MNCs) to enter the fields. This shift signaled a move towards "commoditization" of the minerals instead of treating them as "strategically" important as was being done prior to 1990.

In spite of these liberalization measures, there has been a growing feeling among India's policy-makers that investment, both domestic and foreign, in the high-risk mining ventures has been inadequate. For example, over the period April 2000 to June 2011, of the total FDI inflow into the country of Rs. 640,885.94 crores (US $ 1,43,157.97 million), the inflow into the mining sector is Rs. 3,888.32 crores (US $ 905.36 million) which works out to 0.63 percent of the total (DIPP, 2011). This is a very small share given the potential of the sector and the fact that mining contributes to 2.6 percent of India's GDP. Moreover, only one multinational company (excluding Vedanta), namely Rio Tinto, has obtained license for mining operations in India.

In the meantime, however, due to the structural shift in demand and resource-intensive growth of China, India and other developing countries, the long-lasting decline in world prices of minerals came to an abrupt end in 2004 and since then both the domestic and international prices of metals and minerals kept on rising. This price boom resulted in increased interest in mining activities both by the national and international companies and has significantly changed the world mineral scenario. In today's globalized economy, investments in mining and high-risk exploration flow into those countries which have an investor-friendly regulatory regime, besides having mineral potential. This puts a handicap on a country, which is bureaucracy-ridden and procedure-bound in its regulatory system. In a study conducted by the World Bank in 2001, covering mining sector reforms and investment world-wide, India was found to have one of the lowest scores in various parameters of interest to investor compared to Australia, Brazil, Indonesia, China and a few other resource-rich countries.

Therefore, following the mid-term appraisal of the Tenth Five-year Plan, which showed that the 1993 Mineral Policy had not been able to attract any significant private investment and associated high end technology for exploration and mining, the Planning Commission in September 2005 appointed a High Level Committee under the chairmanship

of one of its members (Sri Anwarul Hoda) in order to review the existing policies, laws and procedures and make appropriate recommendations for bringing about changes in them in order to attract large-scale private investment (including foreign investment) into the mining sector. The Committee submitted its report in December, 2006.

The main focus of the high-level Hoda Committee's recommendations has naturally been on suggesting changes in the mining policy, laws and procedures as also associated practices and procedures for assessing proposals for forest conservation and environmental clearances (in respect of mining projects) so as to facilitate private sector investment including FDI. To that end, it has suggested bringing the mining laws and practices to conform to international best practices. In order to achieve this objective, some of the measures suggested are the following: revision of the procedures for grant of reconnaissance, prospecting and mining licenses so as to make these seamless and the licenses accorded security of tenure, unbundling of reconnaissance, prospecting and mining activities in order to maximize private investment, establishment of an arm's length relationship between the State as a regulator and state-owned public sector enterprises engaged in commercial activity, disposal of ore bodies fully prospected by public sector agencies through tender or auction and providing for more objectivity, transparency and also reduction in the total time taken for considering the proposals for forest and environmental clearances in respect of mining projects. There is also a suggestion for establishing a Sustainable Development Framework (SDF) to take care of the concerns relating to environmental integrity and social problems in the mining areas.

Based on these recommendations, the Government of India announced in March 2008 a new mineral policy in order to replace its 1993 variant with the main objective of improving the regulatory environment in order to make it more conducive to private investment and inflow of modern technology into the mining sector. The National Mineral Policy (NMP) 2008, like its predecessor, is a comprehensive document covering areas such as regulation of minerals, survey and exploration, strategy for mineral development, research and development, foreign trade and other fiscal aspects and the role of the State in mineral development. Its coverage is also limited to non-fuel and non-atomic minerals.

The Policy announces that in order to make the regulatory environment favourable to private investment, there will be transparency in the allotment of mineral concessions, assured right to next stage concessions and transferability of these concessions while recognizing prospecting and mining as independent activities. There will be an arm's length distance between the State as the regulator and its public sector undertakings engaged in commercial activities. It recognizes that the private sector would in future be the main source of investment in reconnaissance and exploration. In order to attract large investments and new technology an open sky policy of non-exclusivity for reconnaissance work would be adopted and a new instrument called Large Area Prospecting License (LAPL) would be introduced.

The Policy further announces that mining would be treated as an economic activity on its own right and not merely as an ancillary to manufacturing with the domestic processing industry obtaining its minerals at the prevailing market prices. The user industry would also be encouraged to develop long-term linkages with the mineral producing units including equity participation in these mining companies.

NMP 2008 also seeks to develop a Sustainable Development Framework (SDF) for the optimum utilization of the country's mineral resources for industrial growth while maintaining environmental integrity, protecting forests and ecologically fragile areas and at the same time interest for improving the life of the people living in the mining areas which are generally located in the tribal and backward regions of the country. To that end, it mentions about measures such as social impact assessment, appropriate relief and rehabilitation of displaced persons due to mining and scientific mine closure plans in order to take care of the socio-economic aspects of such closure.

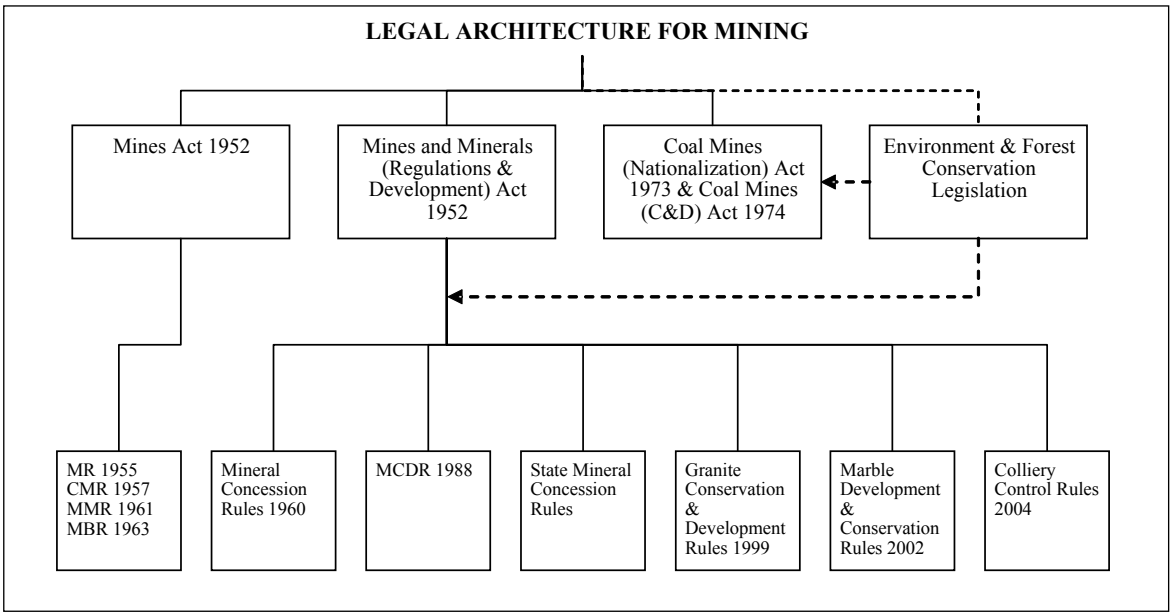
Since mere policy-announcements are of little practical consequence, NMP 2008 also announces that MMDR Act, MCR and MCDR will be suitably amended in order to operationalize its prescriptions. Following extensive discussions with the state governments and other stakeholders, the Government finally introduced the Drafts Mines and Minerals (Development and Regulation) (MMDR) Bill 2011 in the Lok Sabha (Parliament) in December 2011 for its consideration. Thus, nearly five years after the Hoda Committee submitted its recommendations, the Government of India is still in the process of putting in place a regulatory legal framework which is supposed to give a boost to both domestic and foreign private investment in India's mining sector!

Legal Architecture for Mining

The legislative framework governing the mining industry (excluding petroleum and gas) in India is depicted in figure 5.1.

The Mines Act 1952 together with rules and regulations framed under it and the Mines and Minerals (Development and Regulations) (MMDR) Act 1957 and the rules framed there under constitute the basic laws governing the mining sector in India. The Mines Act 1952 seeks to regulate the working conditions of labour in mines by providing for the measures to be taken for their safety. To implement the provisions of the Act, a number of rules and regulations have been framed by the Central Government. These are the Mines Rules (MR) 1955, the Coal Mines Regulations (CMR) 1957, the Metalliferous Mines Regulations (MMR) 1961 and the Maternity Benefits (Mines) Rules (MBR) 1963. The health and safety of the workers is governed by the Mines Rules 1955. The Director General of Mines Safety (DGMS) is responsible for enforcing the provisions of the Mines Act.

Figure 5.1: Legislative Framework of the Mining Industry



The MMDR 1957 is basically the main legislation which lays down the (legal) framework for the regulation of mines and development of minerals other than petroleum and gas. Since its enactment, the Act has undergone a series of amendments from time to time. Prior to 1990, the amendments made in the Act (in 1972 and 1986) basically enhanced government control on mining. On the other hand, the amendments carried out in 1994 and 1999 and the associated revision of the relevant rules have somewhat liberalized the procedures for granting mineral concessions and facilitating private sector including foreign investment into the sector. Also, provisions relating to environment have been introduced through those amendments.

The MMDR Act 1957 as amended is divided into the following broad areas:-

- Preliminary (Section 1-3)
- General restrictions on undertaking reconnaissance, prospecting and mining operations (Sections 4-9a)
- Procedure for obtaining reconnaissance permits, prospecting licenses or mining leases in respect of land in which the minerals vest in the Government (Sections 10-12)
- Rules for regulating the grant of prospecting licenses and mining leases (Sections 13-16)
- Special powers of the Central Government to undertake reconnaissance, prospecting and mining operations in certain cases (Sections 17-17A)
- Development of minerals (Sections 18-18A)
- Miscellaneous issues (Sections 19-33)
- The First Schedule – Specified Minerals
- The Second Schedule – Rates of Royalty
- The Third Schedule – Rates of Dead Rent

Section 4 lays down that reconnaissance and prospecting for minerals and subsequent mining operations can be undertaken only after obtaining the relevant concessions from the Government in the form of reconnaissance permit, prospecting license or mining lease respectively. This and the following sections 4A to 8 prescribe various conditionalities under which these concessions can be granted by the concerned State Governments in respect of the minerals present in their respective territories.

The main limitation and condition governing the State Government's powers to grant mining licenses and leases is the requirement in Section 5 that "in respect of any mineral specified in the First Schedule no reconnaissance permit, prospecting licenses and mining lease shall be granted except with the previous approval of the Central Government". Most of the important major minerals like coal and lignite, (part of Schedule I) atomic minerals, (Part B) iron ore, zinc, gold, zinc and precious stones (Part C) are covered by this condition.

Another requirement laid down in Section 5(2)(6) is that no mining lease can be granted by the State Government unless it is satisfied that there is a mining plan duly approved by the Central Government (or the State Government in specified areas) for the development of mineral deposits in the area concerned.

Section 6, 7 and 8 prescribe the maximum area and period for which reconnaissance permits (ten thousand square kilometers and three years), prospecting license (twenty five square kilometers and five years) and mining leases (ten square kilometers and thirty years) can be granted. The Central Government, however, has the power to relax the area ceiling if such relaxation is considered necessary for mineral development. There are also provisions for renewal of mining leases by the State Government with the rider that the renewal of mining leases in respect of coal and lignite and atomic minerals prior approval of the Central Government will be mandatory.

Section 11 gives preferential right to the holders of a reconnaissance permit or prospecting license for obtaining a prospecting license and mining lease respectively over any other person in respect of the mineral explored in a particular area of land.

A number of rules have been promulgated in order to implement the provision of the MMDR Act. Important rules in force under the Act are the Mineral Concession Rules (MCR) 1960, the Mineral Conservation and Development Rules (MCDR) 1988, the Granite Conservation and Development Rules 1999, the Marble Development and Conservation Rules 2002 and the Colliery Control Rules 2004. The Mineral Concession Rules 1960 outline the procedures and conditions for obtaining reconnaissance permit, prospecting license on mining lease. Access to land, both State and private, is available for exploration and mining except in certain areas where the Government reserves through a notification. The Mineral Conservation and Development Rules 1988 lay down the guidelines for ensuring mining on a scientific basis while at the same time conserving the environment. The minor minerals are

separately notified and come under the purview of the State Governments. The State Governments have for this purpose formulated their own Minor Minerals Concession Rules.

The provision of the Mineral Concession Rules (MCR) and the Mineral Conservation and Development Rules (MCDR) are, however, not applicable to coal, atomic minerals and petroleum and gas. In the case of coal mining, the operators are required to comply with the inspection and enforcement of conservation measures of the Coal Controller under the Coal Mines (Conservation and Development) Act 1974 with a view to ensuring scientific mining. The other important legislation relating to coal mining is the Coal Mines (Nationalization) Act, 1973 which nationalized all coal mines (hitherto held in the private sector) and reserved coal mining for the public sector. By an amendment to the Act in 1976, two exceptions to the policy were introduced i.e. (i) captive mining by private companies engaged in the production of iron and steel and (ii) sub-leasing to private parties of isolated small pockets not amendable to economic development and not requiring rail transport. In 1993, the Act was further amended to allow captive coal mining in the private sector for power generation, washing of coal obtained from mine, cement production and the like.

There are two other issues which need attention while discussing the legal framework for the mining industry. One relates to the power to levy taxes on mineral rights and the other concerning the problem of land vis-à-vis mineral development.

The Indian mining industry in subject to various taxes, duties etc. in force from time to time as applicable to industry in general. These are income tax, capital gains tax, excise duty, sales tax and customs duties under the relevant laws of the land. There are also specific levies in respect of mineral rights. The MMRD Act provides for levying reconnaissance permit fee, prospecting fee, royalties and dead rent in respect of the three different forms of concessions, namely reconnaissance, prospecting and mining leases, for minerals (other than minor minerals) payable to the State Governments. The holder of the reconnaissance permit is required to pay a permit fee as is the holder of a prospecting license is to pay a prospecting fee, for each year or part of a year of the period for which the relevant concession is granted or renewed. The lessee is also required to pay surface rent and water cess for the surface area used for mining operations at a rate not exceeding the land revenue.

The holder of a mining lease for minerals other than minor minerals in liable to pay dead rent to the State government at such rates as specified in Schedule III of the Act. This levy is in the nature of a minimum guarantee of income to the lessor, irrespective of the fact whether mining operation was done or not by the lessee. The existing rates of dead rent are based on the area of the lease and the value of minerals. When any mineral is removed or consumed the holder is liable to pay royalty or dead rent whichever is higher. ‘Royalty’ as specified in section 9 of the MMRD Act is neither a tax nor a fee but a payment made by the lessee to the lesser (in case of a mining lease) as a consideration for remaining or consuming the sub-soil property (mineral) by operating the mine with his labour and enterprise. The royalty rates for major minerals are fixed by the Central Government and specified in Schedule II of the MMRD Act. These are also revised by the Central Government from time

to time but cannot be enhanced in respect of any minerals during a period of three years. In case of some of the minerals, the rates prescribed are ad valorem or value-based in nature i.e. royalty is calculated by applying a percentage rate to the gross sale value. There are 40 minerals (out of a total of 51 minerals mentioned in Schedule II) for which ad valorem rates have been prescribed; 9 minerals are subject to unit-based rates i.e. specific royalty is charged on the basis of a unit of quantity such as weight e.g. rupees per tonne; and 2 minerals (asbestos, and coal & lignite) attract different rates for different grades of minerals.

Of the two systems of levying royalty, ad valorem rate is more commonly used all over the world. Also, under the unit-based system where revenue is determined by the quantity extracted, rising prices do not get reflected in the receipts. Therefore, there has been a demand from the mineral-rich states for conversion of the unit-based rates to ad valorem rates in respect of iron ore, coal and other major minerals.

The revenues in respect of major minerals are collected and retained by the State Governments. In case of minor minerals, the State Governments fix the royalty rates and also collect royalty and dead rent.

Thus, although minerals are properties of the state where these are located and the state receive the revenues, they have no control over the determination of the rates of royalty and dead rent, except in respect of minor minerals. However, as revenues from mineral royalties are in the nature of non-tax revenue, mineral-rich states often demand revision or enhancement in the rates of royalty (of various minerals) in order to meet their growing expenditure and fiscal deficits.

Land is another important issue with regard to minerals development, especially in the tribal and forest areas. In general, the right to excavate the minerals from the land of a private owner is based on an agreement between the lessee and the land owner. Unless the land owner gives his consent, no lessee has a right to enter upon his land and carry on mining operations. The Supreme Court of India has, therefore laid down (in Pallava Granite Industries (P) Ltd. V. Government of Andhra Pradesh, AIR 1997, Sc.2098) that with a view to ensuring peaceful operation of the excavation of the mines, insistence on the consent of the landlord is necessary. Also the State administration can acquire private land and then lease it to the operators for mining.

When it comes to mining areas with considerable tribal population, there are additional issues which need to be considered. The Constitution of India, in Article 244 read with Schedule I and Schedule VI, provides for specific protection to tribal rights over their customary resources. The object of these two Schedules is to ensure that tribals remain in possession and enjoyment of lands in the Schedule Areas for their economic empowerment and similar cultural integrity. Most of the geographical area rich in mineral resources fall under Schedule V of the Constitution.

In these areas, the Governor of the State is empowered to make regulation prohibiting and restricting the transfer of land by or among members of the Scheduled Tribes in these areas. Relying on this provision, the Supreme Court of India in its landmark judgment in Samatha case[1] held that any transfer of land to a non-tribal within a tribal area must take into account the empowerment of tribals whose interests the Constitution in general and Schedule V in particular protect. The judgment also ruled that government lands, tribal lands and forest lands in the Scheduled areas cannot be leased out to non-tribals or to private companies for mining and industrial operations. However, the exploitation of minerals which constitute a dormant resource is essential for the economic development of the nation. Therefore, it is necessary to find a sustainable method which will harmonize the competing requirements of protecting tribal interests and the needs of development in the mineral-rich tribal areas of the country.

Another important aspect of the legal framework for mining is that all mining activities have to comply with the environmental and forest conservation legislations in India. The major laws are the Environment (Protection) Act and Rules 1986, the Environment Impact Assessment Notification 1994 and the Forest (Conservation) Act 1990.

The efficiency and effectiveness of a legal arrangement are to a considerable extent determined by the governance-system responsible for monitoring the implementation of the relevant laws. The sectoral governance in mining is characterized by a duality of control and accountability which is a necessary outcome of the legal arrangement which vests the ownership of the minerals in the States and regulation (in public interest) with the Centre. For monitoring the administration of the mining laws, the primary responsibility in the mineral-rich states rests with the State Government agencies. Apart from the Minister and his Department of Mines headed by a Permanent Secretary at the state secretariat, there is usually a technical Directorate of Mines with officials (mining engineers and geologists) and offices in the field with direct responsibility for handling various aspects of mineral administration. Then a Central government agency the Indian bureau of Mines (IBM), a subordinate office of the Ministry of Mines in New Delhi has a significant role in the governance system for the mineral sector, especially in areas such as approval of mining plans and schemes and mine closure plans and monitoring their implementation, administration of the rules for protecting mines-environment and overseeing progression of reconnaissance and prospecting permits. In addition, regulatory measures and institutional arrangements have also been created in two Central legislations, namely the Forest Conservation Act 1980 and the Environment (Protection) Act 1986 for environment protection generally including in mining areas. Besides, another Central Government agency, the Directorate of Mines Safety also regulates the safety-aspects mines under the provisions of the Mines Act 1952. As a result, a multiplicity of State and Central Government agencies are responsible for monitoring different aspects of the implementation of the regulatory system which naturally creates problems of coordination among them.

[1] *Samatha* Vs. *State of A.P. & Ors*, JT 1997 (6) S.C. 449

Increasing cases of illegal mining in almost all the mineral-rich states of the country are a pointer to the fact that all may not be well with the governance-system for the mineral sector. Illegal mining is harmful as it not only leads to loss of public revenue; it also encourages unscientific mining and has other adverse effects which have implications for the ecology, internal security and proper management of the mining sector.

Illegal mining may be defined as mining operations undertaken in violation of the relevant provisions of the laws governing mining in the country, namely MMDR Act 1957, the Forest Conservation Act 1980 and the Environment (Protection) Act 1986. Some of the typical forms in which illegal mining occurs are the following:-

- Mining may take place in an area for which no mining license has been obtained by a party.
- Mining takes place in leaseholds for which surface right has not been granted.
- Mining operations are being carried on without conforming to the approved mining plan/environmental management plan.
- Production of minerals and their dispatch are in quantities in excess of those approved in the mining plan and/or environmental clearance.
- Mineral ores have been dispatched from leasehold areas in an unauthorized manner (for example, mining lease is for iron ore but production and dispatch are for manganese ore and vice versa).
- Mining takes place in forest land for which no forest clearance has been obtained.

The areas vulnerable to illegal mining are the following:-

- Virgin areas often reserved for public sector enterprises and/or private companies who intend to set up processing industries;
- Areas for which intention to grant lease has been communicated but lease not granted for a long time;
- Areas for which lease has been granted but execution is pending for long;
- Areas held under prospecting license but the party's application for mining lease is pending for long;
- Ceased areas where no mining activity has taken place for a long time;
- Surrendered areas lying vacant;
- Areas which have been thrown open for grant of mining lease but applications are pending for long;
- Abnormal delay in the disposal of applications for mining lease, renewal of lease, forest and environmental clearance.

Thus, a combination of procedural delays and administrative inefficiency against the background of rising prices of minerals (since 2004) has led to a sudden spurt in illegal mining. This is further aggravated by a poor law and order situation and ineffective police administration in the mining areas, lack of vigilance and action by the forest department

officials, poor infrastructure and inspection facilities such as non-functioning government weighbridges and inadequate supervision of private weighbridges, as well as absence of adequate authority of the inspecting staff in the field agencies of the State mining department. Absence of coordinated action among the multifarious state and central agencies responsible for regulation of various aspects of mining is also a major factor responsible for this unfortunate situation. Finally, there is political interference and overpowering presence of corruption to which the mining sector is particularly susceptible in view of the huge sums of money involved in the extraction and trading of minerals.

The Central Government and the concerned State Governments as well as the Courts have often expressed concern about illegal mining in the country but the governmental action to prevent and at least control this menace has so far not been adequate or effective.

In 1999, the Central Government amended the Mines and Minerals (Development and Regulation) Act 1957 in order to empower the State Governments to take action against illegal mining by giving them powers to enter and inspects any mine, penalize transportation and storage of illegally mined minerals, and confiscate illegally mined minerals, tools, equipment and vehicles. The State Governments were also authorized to frame Rules under MMDR Act 1957 for curbing illegal mining which some States did.

In 2005, Task Forces were set up at the state and district levels for the prevention of the illegal mining and furnish quarterly reports on illegal mining. These reports showed the large extent to which illegal mining was taking place in all the mineral-rich States.

Since 2009 the Central Government have advised the State Governments to prepare holistic Action Plans to curb illegal mining by incorporating in them modern technological methods such as satellite imagery, integrated monitoring of information, collection and monitoring of data on production, dispatch and prices of minerals from ports, customs and the commerce ministry, bar-coding and use of holograms for transport permits, permits for royalty paid and the like. Special Cells in the Police force for tackling illegal mining and joint teams of officers of various regulating departments of the State Governments were also suggested as also increasing coordination between the State agencies and the Indian Bureau of Mines (IBM). The Task Forces (8) set up by IBM also visit mines in the endemic areas in order to detect the cases of illegal mining and take punitive measures. The Central Government has also appointed a Commission of Inquiry comprising Shri Justice M. B. Shah, a retired judge of the Supreme Court of India in November 2010 in order to enquire into the large scale mining of iron and manganese ore without lawful authority in several States.

In India's governance system, it is not rare for legislations to be passed and executive orders, even court orders, guidelines and advisories issued on important subject of public concerns without a realistic understanding of the possibility of their implementation. This is particularly so in areas, as in the case of illegal mining, where the major responsibility for implementation is with the State Governments, while the Central Government makes the laws and issues orders and guidelines. For, these measures are crafted without addressing the

question of lack of required capacity of the field formations and the problems of inter-departmental coordination that are inevitably faced in the process of implementation. Therefore, the typical reaction is to treat these measures in the usual bureaucratic and routine manner, without much impact in the operational areas. Then, there is also the ever-growing malady of political interference and the nexus between the local politicians and the offenders (mine owners) for mutual benefit at the cost of the public exchequer.

In these circumstances, it is not surprising that there is a steady increase in the cases of illegal mining in most mineral-rich states of the country. The table below gives the year-wise and state-wise details of the cases of illegal mining as reported by the State Governments during the period 2006-07 to 2009-10.

Table 5.1: Number of illegal mining cases detected by State Governments

SNo	State	2006-07	2007-08	2008-09	2009-10		
					Up to Dec 2009	Jan-March 2010*	Total
1	Andhra Pradesh	5385	9216	13478	11591	3943	15534
2	Chhattisgarh	2259	2352	1713	1078	925	2003
3	Goa	313	13	159	9	NA	9
4	Gujarat	7435	6593	5492	5416	722	6138
5	Haryana	504	812	1209	1372	481	1853
6	Himachal Pradesh	478	NA	503	1114	NA	1114
7	Jharkhand	631	82	225	15	NA	15
8	Karnataka	3027	5181	2997	1687	1996	3683
9	Kerala	1595	2593	2695	1324	NA	1324
10	Madhya Pradesh	5050	4181	3895	3868	1407	5275
11	Maharashtra	4919	3868	5828	8270	10368	18638
12	Odisha	284	655	1059	758	NA	758
13	Punjab	218	26	50	73	56	129
14	Rajasthan	2359	2265	2174	4711	482	5193
15	Tamil Nadu	2140	1263	1573	215	109	324
16	Uttarakhand	NA	NA	191	NA	NA	NA
17	West Bengal	80	426	315	80	33	113

Note: NA Not available
Source: Answer to Lok Sabha unstarred question 3962 (20 April 2010)
* Data obtained from Indian Bureau of Mines (IBM), 2011

It is also possible that more cases of illegal mining might have remained undetected by the State Government agencies and are not reflected in these figures.

In recent years, there have been some landmark reports and court judgments detailing prominent cases of illegal mining in different parts of the country. These include the Supreme

Court-appointed CEC (Central Empowered Committee) reports on illegal mining in Odisha and Karnataka (Bellary), the Karnataka Lokayukta Report on illegal mining in Bellary (Karnataka) and various pronouncements of the Supreme Court in some of these cases.

These facts underline the need for a clear framework of effective governance for the mining sector of the mineral-rich States of the country. Any such framework must address both the existing administrative procedures and practices in mining as also the current institutional arrangement for the sector. The approach should be first to analyze the factors that provide the incentives for the operators to indulge in mining operations in violation of the prescribed legal norms. Apart from the miners' greed, there are procedural factors and practices which facilitate illegal mining. Some of these have been mentioned earlier, for example, keeping mining areas vacant for a long time by causing unavoidable delay in the considerations of proposals for leases and/or renewal is an open invitation to illegal mining. Delay in providing forest and environmental clearance has also similar effect. There may be other practices which need to be reformed with a view to streamlining the system.

Draft Mines and Minerals (Development and Regulation) Bill 2011.

However, the emphasis so far has been mostly on creating new institutional structures and providing additional regulatory powers to bureaucrats who come to man these structures. For example, the Draft Mines and Minerals (Development and Regulation) (MMDR) Bill 2011 which, if approved by Parliament, will replace MMDR Act 1957 as the country's main mining law contains a number of provisions seeking to create new institutional mechanisms for addressing the problem of illegal mining. An outline of the provisions of the Draft Bill has been given in Annexure 12. The proposed legislation seeks to create a National Mining Regulatory Authority with powers to investigate and prosecute large scale, organized and inter-state illegal mining (Section 69). Similarly, a new State Mining Regulatory Authority in a mining State will have powers to authorize investigation and prosecution in cases of illegal mining of both major and minor minerals (Section 70), Also, Statutory Coordination-cum-Empowered Committees are proposed both at the Central and State levels to perform various coordinating functions including prevention of illegal mining (Sections 102 and 103). Finally, State Governments have been authorized to set up Special Courts to expedite prosecution of illegal mining (Section 107).

As has been mentioned earlier, these are all measures to create new government institutions and do not address the substantive economic, social and procedural considerations that motivate people to indulge in illegalities. Besides, these new institutional mechanisms will be over and above the existing organizational arrangements and there are no valid reasons to believe that these will be any improvement on the existing structure. In fact, multiplicity of institutions will further add to the confusion through dilution of responsibilities and accountability.

However, the main objective of the new Draft Bill is not so much to address the problem of illegal mining as to bring about a regulatory environment that will be conducive

to private investment including foreign direct investment (FDI) in the Indian mineral sector. There have been questions if this objective could not have been achieved by incorporating a series of amendments (based on the recommendations of the Hoda Committee and the National Mineral Policy 2008) into the MMDR Act 1957 as has been done in the past rather than by bringing a completely new Bill. For, compared to the 1957 Act which has only 33 sections, the Draft Bill has as many as 139 sections each with a number of provisos which make for somewhat clumsy reading. No doubt the proposed law has some useful features but it has also many provisions which are best left to be elaborated in rules framed under the legislation. For example, the Draft Bill has detailed provisions describing the composition and qualifications of the members of various new bodies (e.g. Mining Regulatory Authorities and Tribunals) being created under it and even goes to the extent of enumerating (thereby freezing in law) the membership of the selection committees for selecting the members for these bodies! Many other provisions such as procedures for grant of different categories of mineral concessions which were a part of the rules framed under the 1957 Act have been brought forward into the main legislation (Draft Bill) thereby making it avoidably bulky and cumbersome. Of course there are provisions such as those relating to mining and mine closure plans and transferability of mineral concessions which have rightfully been moved from the rules to the statute.

It is, however, in the area impinging on the main objective of reform i.e. creating a regulatory environment conducive to both domestic and foreign private investment that knowledgeable observers (who were associated with the formulation of the Hoda Committee Report and NMP 2008) have found the draft legislation grossly deficient, even counterproductive. One observer has noted that "more than half the Bill (72 out of 139 sections) delineates an elaborate gamut of regulatory regime, enough to scare away any serious investor." Concerns have been raised about the complex system of licensing and reservations (Sections 4, 13, 19, 20, 21, 22, and 23), auction/bidding for mineral concessions and their transferability, tax regime including contribution to the proposed District Mineral Fund (DMF) and new institutional mechanisms created under the proposed legislation (FIMI 2011).

Broadly, the draft legislation provides for four types of mineral concessions categorized into three tiers: non-exclusive reconnaissance license (RL), high-technology reconnaissance-cum-exploration license (HTREL)/prospecting license (PL) and mining lease (ML). While prospecting license or mining lease would be granted on competitive bidding basis in respect of areas (notified by State Government) where mineralization of specified minerals has been established following reconnaissance (Section 13), State Governments can grant concession for exploration (HTREL and PL) on first-in-time basis for areas where existence of minerals is unknown and the area in question is not notified for bidding (Section 22). Direct mining lease cannot be granted on first-in-time basis (Section 13). This can be granted only to a person holding HTREL or PL for the relevant mining area except where a mining lease is granted through competitive bidding in accordance with the provisions of Section 13(5) (Section 25). Progression from reconnaissance license (RL) to prospecting license (PL) is assured as also from exploration to mining lease if all conditions of license are

met. Transfer of mineral concessions (including data) is permitted for suitable consideration with the rider that the state Government may intervene if the amount of consideration between the transferor and transferee is considered inadequate.

There is a feeling in some responsible quarters that auction is the best method for allocating natural resources by the State, in order to ensure fairness, impartiality and realization of maximum revenue. Even the Supreme Court of India in its judgement in 2G case (Writ Petition (Civil) No. 423/2010 Centre for Public Interest Litigation and others v/s Union of India and others with Writ Petition (Civil) No. 10/2011 Dr. Subramanian Swamy v/s Union of India and others) stipulated that the State was "duty bound to adopt the method of auction" while allocating natural resources, unmindful of the fact that by doing so it was making an unfortunate foray into the executive's policy-making domain. This approach, however, ignores some vital characteristics of mineral resources' exploration and exploitation. In view of the inherent uncertainties associated with the discovery and exploitation of mineral deposits and very low success ratio of discovery becoming a profitable mine, auction or bidding may not be an appropriate method of allocating mineral concessions, especially on the basis of the results of reconnaissance. Also, mineral exploration requires long-term engagement of professional mining companies (prospectors), involving sophisticated technology and large capital. Opening mineral resources to auction may prompt speculative (but unprofessional) bidders to seek to realize maximum profit at the cost of scientific development of mineral deposits. It is for these reasons that globally no major mining nation uses competitive bidding or auction for allocating mineral resources. They all follow first-in-time principle for such allocation. Even the Hoda Committee had recommended the adoption of auction/tender system only for allocating proven ore bodies in the interest of transparency and augmentation of state revenues. Therefore, where as auction and bidding could perhaps be justified for grant of ML in respect of bulk or surface minerals (such as iron ore, bauxite and limestone) whose reserves have been proved by GSI (Geological Survey of India) or other public or private agencies, this method is inappropriate for grant of licenses for prospecting and exploration, especially in respect of base and noble minerals (such as copper, zinc, nickel, gold, silver and diamond) where not much prospecting work has been done in the country and there is the need for foreign expertise, technology and capital. In fact an inability to make a distinction between bulk or surface minerals on the one hand and non-bulk (base and noble) minerals on the other and failure to address their differential problems with the different sets of regulatory provisions is perhaps a major weakness of the Draft Bill.

Again, under the envisaged system of auction or bidding, a number of criteria (in Sections 13(3) and 13(6)) have been enumerated for evaluating the bids for mineral concessions. These criteria include both technical parameters and financial bids. Normally these are considered in a two-step process, technical evaluation followed by the assessment of financial bid. This ensures economic and technical efficiency and fair play. The Draft Bill lumps them together which will make the task of decision-makers difficult as they will have to select from out of a smorgasbord of criteria and attach weights to them in order to select the most suitable bid or proposal.

Also, the provisions regarding transferability of mineral concessions (Sections 17 and 18) come with a number of restrictions and conditions (reminiscent of the provisions of the 1957 Act and Rules) which detract from their utility. The Indian governance system is notorious for its bureaucratic excesses and these formulations will only reinforce this image thereby deterring foreign prospecting companies and explorers from investing their capital, and technical and managerial expertise in the country's mineral sector.

The Draft Bill also contains (in Sections 24, 41 42, 43, 44 and 45) proposals for various levies on the mineral industry: royalty and dead rent, a cess on major minerals by the Central Government, a cess on major and minor minerals by the State Government, and an annual amount equal to royalty in case of major minerals (except coal and lignite) and an amount equal to 26 per cent of profit (called profit sharing percentage) in case of coal and lignite to be paid into the proposed District Mineral Fund. In addition, a mining company will have to make payment of annual compensation to owners of surface and traditional rights of the land over which license has been granted and allot atleast one (non-transferable) share at par for consideration other than cash to each person of the family affected by the company's mining-related operations.

As mentioned earlier in this chapter, like other industries, mining is also subject to direct taxes including mainly income tax and corporate tax and indirect taxes such as customs duties, Cenvat, service tax and State VAT. Apart from mineral levies, the mining industry has to pay for the use of forest land for mining operations through compensatory afforestation charges, net present value of the forest cleared for mining, and charges for development of land and replantation etc. There are also other miscellaneous charges such as environmental consent fees, water cess, labour welfare cess, panchayat and other local body cesses and the like. The mining industry naturally complains that "the Indian mineral sector is already one of the highly taxed globally" and that "no company will invest its shareholders' money in a losing proposition" which is "what exactly MMDR Bill 2011 proposes to do." (FIMI, 2011)

Sometimes, especially during a period when mineral prices are relatively high, there is a public perception of the industry enriching itself with contributing little to public benefit. This could result in imposing additional taxes and levies that can have possible negative implications in the long run in the form of lower levels of future investments in the mineral sector It is therefore essential that public policy determine the optimum level of taxation on mining that will balance the fiscal gains due to the higher levels of levies against the long-terms gains from a sustainable mining industry. Also, the overall system of taxation and levies should be such that it provides an incentive for mining enterprises to invest in sustainable development initiatives for the welfare of mining communities. It is not clear if these issues were factored into decision-making or any analysis was ever made to assess the optimum level of taxation (for mining) when it was decided to double royalty on minerals (other than coal and lignite) for providing for contribution to the proposed District Mineral Fund and suggest other levies on the mining industry.

There is also another aspect of the proposed levies on the mining industry which requires serious examination. The suggested cess on minerals to be levied by the Central and State governments and the contribution to DMF are in effect in the nature of benefit-sharing of mineral resources revenue with the community. These should primarily be spent on community development and welfare. However, the funds, instead of being given to the community directly, will flow into government or government-controlled agencies such as DMF. The possibility of these funds being mainly used for expenditure on bureaucratic structures or on programmes and projects fancied by the bureaucracy cannot be ruled out. In fact the Draft Mining Bill itself provides that the funds realized through cess could be utilized for funding, among other things, official agencies such as the National and State Regulatory Authorities, Tribunals and even the Indian Bureau of Mines (IBM) and the State Directorates of Mining. Since DMF is likely to be dominated by district-level government officials, the possibility of the available funds being misutilized or diverted to non-mining areas cannot be ruled out. It would be more beneficial to mining communities if these funds are left with mining enterprises to be spent on infrastructure and local development work in the relevant mining areas. These expenditures in turn can be monitored by appropriate government agencies and be subject to social auditing. Also, the provision in the Draft Mining Bill for mining companies to allot non-transferrable shares to individuals/families affected by mining is not of much consequence as it would be virtually impossible for such persons/families (most likely to be from indigenous communities) to manage their wealth in the form of shares!

The Draft Bill has a number of provisions touching on various aspects of sustainable development. Sections 46 and 47 which contain provisions relating to the formulation of National and State-level Sustainable Development Frameworks for the mineral sector have been placed, somewhat strangely, under Chapter IX entitled “Power to issue Directions”. The intention seems to be to establish these frameworks through government fiat! Besides the rationale for two different frameworks, one at the national level and the other for the States is not clear. After all the object of the proposed framework is the mining industry, not political or administrative structures in the country. Therefore, the one and only sustainable development framework that may be relevant is the one for the country’s mining industry as a whole. Sections 46 and 47 envisage Government issuing guidelines that will shape mining practices which will comprise these frameworks. These guidelines would cover areas such as scientific and sustainable mining throughout the mining life cycle, minimizing and mitigating the adverse impact of mining operations on environment, biodiversity, air, water, ambient noise, land and quality of life of local communities, creating opportunities for socio-economic development for sustainable livelihood, conservation of mineral resources, minimization of waste generation, promoting restoration and reclamation of mined out land, consultation with stakeholders and transparency in communication through public disclosure of mining operations.

There are also a few other provisions relating to sustainable development. Section 26(3), for instance, provides for attachment to the Mining Plan a CSR (corporate social responsibility) document comprising a scheme of annual expenditure by a mining lessee on

socio-economic development in his mining area. Consultation with local government institutions before notifying an area for mining-related activities and for post-closure land use (Sections 13 and 32 respectively) can also be considered a part of sustainable mining.

Finally, there are provisions concerning benefit-sharing (of mineral revenues) with local population through the District Mineral Fund (DMF) to be constituted by the State Government in each mining district. DMF to be managed by a governing council chaired by the District Magistrate with representatives of miners and government agencies as members, will mainly distribute monetary benefit to identified persons and families affected by mining; it may also undertake other activities such as creation, management and maintenance of local infrastructure in mining areas and "facilitate implementation of the Sustainable Development Frameworks." (Sections 56 and 57)

The formulations in the Draft Bill show that there are no conceptual underpinnings or consistent approach to sustainable development in their provisions. Stray and ineffective measures for sustainability have been provided. The provisions relating to the attachment of a CSR document to the Mining Plan is a compulsory disclosure requirement which is amenable to lax administration. Besides, CSR by its very nature is optional and voluntary and reinforces the donor-recipient model of relationship between a mining company and its local community. There are no provisions covering consultations between the two parties (mining enterprises and local communities) during various phases of the mine life cycle or for mining company to undertake socio-economic development works in its mining project area. The guidelines envisaged in respect of sustainable development framework will be advisory in nature. The proposed law instead should provide for a robust legal framework for ensuring sustainable mineral development and delineate effective measures to enforce these legal provisions.

Conclusion

There is a duality of control over mineral resources in India. This is the consequence of the constitutional arrangements which provide proprietary title of onshore minerals to constituent States while keeping the regulatory powers with the Central Government.

From the initial years after independence (1947) till about 1991, the government policy in India considered minerals as 'basic' or 'strategic' materials and accordingly laws and regulations were designed to strictly regulate their exploration and development which remained mostly with public sector agencies. There was limited role for private companies and foreign investment.

During the period 1991 to 2006, the mining sector was gradually liberalized and was opened for both domestic and foreign investment. This shift signaled a move towards "commoditization" of minerals instead of treating them as "strategically" important as was being done prior to 1990. Although a high-level (Hoda) Committee of the Planning Commission recommended in 2006 for reforming the mining law, the Government has so far

produced a National Mineral Policy in 2008 and has recently (in December 2011) introduced a Draft Mines and Minerals (Development and Regulation) Bill 2011 in Parliament for its consideration.

The Mines Act 1952 and the Mine and Minerals (Development and Regulation) Act 1957 and the Rules framed under these two laws are the basic legislation for the mining sector. The environmental and forest conservation laws also infringe on the sector. A multiplicity of central and state bureaucracies play somewhat ineffective role in administering and managing the sector. This has resulted in illegal mining across a number of states.

The Draft Mines and Minerals (Development and Regulation) Bill 2011 is designed to address the sector's problems including that of sustainable mineral development. There are doubts if the proposed legislation will be able to address the twin problems of increasing investment and bringing about sustainable development in mining effectively.

Chapter 6

ENVIRONMENT POLICY AND LAWS FOR SUSTAINABILITY IN MINING SECTOR

There is a comprehensive architecture of policies, laws and regulations in order to ensure environmental sustainability of mining operations in India. There are environmental policies and legislation generic to all industries including mining; there are also laws and regulations specific to the mining industry. The administrative arrangements for their enforcement tend to be complex because of the division of responsibilities between the central and state governments and also between the functional agencies such as the mining, forest, environment and health bureaucracies (at both the state and federal levels) and the pollution control boards.

The laws and the regulatory instruments, however, work badly, mainly due to lax enforcement. This has resulted in an aggressive non-government organization (NGO) or citizens' movement and an assertive and pro-active judiciary mainly responding to the citizens' complaint against environmental degradation caused by private greed, indifferent governance of environmental regulations and administrative sloth. Sometimes the judiciary assumes the role of policy maker and super administrator, actively monitoring the implementation of the relevant laws.

The Constitution of India has specific provisions for environmental protection and these have been amplified by judicial interpretation from time to time. Article 48A introduced by the Constitution (42nd Amendment) Act 1976 provides as a directive principle of state policy that "The State shall endeavor to protect and improve the environment and safeguard the forests and wild life of the country". Article 51A(g) in a new Chapter entitled "Fundamental Duties" imposes the responsibility on every citizen "to protect and improve the natural environment including forests, lakes, rivers and wild life ……"

The Directive Principles of State Policy of which Article 48A is a part are in the nature of policy prescription though not legally enforceable in a court of law. However, these are being increasingly referred to by the judges as complementary to the fundamental rights. In several environmental cases, such as Virendra Gaur vs. State of Haryana 1995(2) SEC571, 588 and M.C. Mehta vs. Union of India AIR 1988 SC 1037, 1038, the Courts have been guided by the language of Article 48A. In the case, Sachidanand Pandey vs. State of West Bengal (AIR 1987 SC 1109, 1114-15), the Supreme Court held that whenever problems relating to ecology are under its consideration, it is "bound to bear in mind" the provisions of Articles 48A and Article 51A(g) of the Constitution.

In fact, in their new found activist role, the courts have gone a step further and have interpreted the fundamental right of right to life and personal liberty guaranteed under Article 21 of the Constitution to include the right to enjoy unpolluted air and water and a wholesome

environment. “Environmental, ecological, air, water pollution, etc. should be regarded as amounting to violation of Article 21”, declared the Supreme Court of India in its judgment in the case Virendra Gaur vs. State of Haryana in 1995 (1995(2) Sec 577). Similar views have been expressed in the several judgments pronounced by various High Courts of the country.

There are also several policy statements and legislations, both generic and sector specific, relating to environmental protection. In the case of sectoral policies and laws, the concern for environmental protection is incidental to their respective main (sectoral) objectives. In mining for example, the focus of the national mineral policies of 1993 and 1998 is on the development of the country’s mineral resources and promotion of investment, including foreign investment in the mineral sector. For the first time the National Mineral Policy of 1998 mentions about a sustainable development framework for the optimum utilization of the country’s mineral resource while monitoring environmental and social integrity in the mining areas.

The Mines and Minerals (Regulation and Development) Act of 1957 as amended from time to time, naturally deals primarily with reconnaissance, prospecting and development of mines. However in 1986, the Act was amended to introduce provisions in order to provide for greater sensitivity to environmental concerns in the mining operations. These are, however, restrictive or negative in nature, enabling government to take punitive measures against the violators of environmental integrity. Section 4A thus permits government to make “premature termination” of prospecting licenses and mining leases for the preservation of natural environment, prevention of pollution and harm to public health, buildings, monuments and other structures and for conservation of mineral resources and safety in the mines. Sections 13 and 15 empower the central and state governments to frame rules on various matters including rehabilitation of flora and other vegetation destroyed by mining operations. Finally Section 18 puts an obligation on the central government to take all necessary steps “for the conservation and systematic development of minerals” and “for the protection of environment by preventing or controlling any pollution which may be caused by prospecting or mining operations”. To that end it empowers the central government to frame rules on various aspects of this subject.

The Mineral Conservation and Development Rules (MCDR) 1988 framed by the central government in pursuance of these powers prescribe various procedures and practices to be followed by the holders of reconnaissance permits, prospecting licenses and mining leases in order to ensure safe and scientific mining, systematic development of mineral deposits, conservation of minerals and protection of the mines-environment. The areas covered under the rules are the following:-

(i) Scheme of reconnaissance operations;
(ii) Scheme of prospecting indicating the methods proposed for prospecting operations and outlining the steps for protection of environment;

(iii) Mining Plan and five-year scheme of mining providing for practices and procedures to ensure safe and scientific mining, conservation of minerals and protection of environment

(iv) Mine closure plans – both progressive for five-year period and final plans, providing for protective measures including reclamation and rehabilitation work in the mining area;

(v) Submission of various plans and sections by the holders of mineral concessions including an environment plan for the mining lease area and its environs; and

(vi) Specific practices and procedures to be followed by holders of prospecting and mining license for the protection of environment such as removal and utilization of top soil, storage of overburden waste rock etc., reclamation and rehabilitation of lands, precaution against ground vibration, surface subsidence, air and water pollution and noise, restoration of flora through plantations and adherence to various pollution standards prescribed under the appropriate legislations.

The Indian Bureau of Mines (IBM) under the Ministry of Mines, Government of India has the responsibility of monitoring the proper enforcement of the rules. There are two ways that the agency discharges the function. First, the Rules themselves put an obligation on the operators of mines to follow the best practices prescribed for scientific mining and submit various prescribed plans, schemes and reports to the authorized officials of IBM and in some cases, the concerned state governments. IBM scrutinizes these reports and in some cases like the mining plans, schemes of mining and mine closure plans, provides the required approvals and then monitors their implementation.

Second, IBM officials undertake field inspections/studies for the enforcement of the provisions of MCDR 1988. During inspection, IBM officials ensure that various elements of scientific mining are followed in the mines operations and sometimes they also provide guidance to the mines operators and officials in the areas of scientific mining including protection of the mines environment.

As mentioned earlier, the 'environmental' provisions in the mining policies and laws are secondary to their main objective of promoting mineral development. To that extent their role in ensuring environmental integrity in mining operations is somewhat limited. The more important and potentially more effective provisions are contained in the environmental policies and legislations generic to all industries including mining.

Since 1980 the Government of India , especially its Ministry of Environment and Forests (MoEF) has been quite active in formulating policies and laws for meeting India's environmental challenges. It has issued a number of policy statements from time to time covering various aspects of environment including pollution control. The important measures are the following:

(i) The National Forest Policy , 1988;
(ii) The National Conservation Strategy and Policy Statement on Environmental and Development, 1992;
(iii) The Policy Statement for Abatement of Pollution, 1992;
(iv) The National Environment Policy, 2006.

These policy statements together address various aspects of environmental challenges facing the country and emphasize the need for conservation of natural resources and their sustainable development through the integration of environmental concerns in social and economic development activities. The National Forest Policy (1988) emphasizes the need to ensure ecological balance and stability through a strategy of forest conservation and of increasing substantially the forest/tree cover in the country. The Policy Statement on Abatement of Pollution (1992) states the government's commitment to abatement of pollution for preventing further deterioration of environment. The National Environment Policy (2006) addresses a wide range of issues concerning environment and sustainable development and emphasizes the need to ensure intra-generational and inter generational equity and efficiency in environmental resource use.

All these policy statements make specific references to the need for ensuring environmental integrity in mining operations. The National Forest Policy (1988) for example, emphasizes that the diversion of forest land for non forest (including mining) purpose should be minimal and be subject to careful examination from the point of view of social and environmental costs and benefits. Also adequate financial arrangements must be made for compensatory afforestation/regeneration. The Policy Statement on Abatement of Pollution (1992) declares that mining operations should not "ordinarily" be taken up in 'ecologically sensitive areas'. All the documents stipulate that every mining project should have a mining plan, including environmental management and mine closure plans and a time-bound plan for rehabilitation and restoration of mined areas. The need for environmental impact assessment in respect of specific mining operations and environmentally safe disposal of the by-products of mining are emphasized. The policies advocate the need to use economic principles in environmental decision-making and recommend a judicious mix of economic and administrative fiats based regulatory instruments as well as "polluter pays" principle for bringing about environmental compliance.

The policy statements, of course, are not legally binding or enforceable in a court of law. However, they represent a broad political consensus and amplify the government's responsibilities under the directive principles of state policy contained in Part IV of the Constitution of India. To that extent they serve as guiding principles for the state and central governments in their respective areas of operation. Sometimes these can also be used by the courts for interpreting environmental statutes or spelling out the obligations of government agencies under environmental law. However, in the ultimate analysis unless the prescriptions contained in these policy statements are translated in to legislative enactments and are backed by budgetary allocations and administrative support, these are apt to remain as lofty ideals on paper.

Ofcourse India has an elaborate legal framework with a large number of laws relating to environmental protection. Of these, the following four are the main statutes which impact on and regulate mining activity in the country:

(i) The Water (Prevention and Control of Pollution) Act 1974;
(ii) The Air (Prevention and Control of Pollution) Act, 1981;
(iii) The Forest (Conservation) Act, 1980 and
(iv) The Environment (Protection) Act 1986

The Water Pollution Act, 1974 provides for the prevention and control of water pollution and the maintenance or restoration of wholesome quality of water. For this purpose it vests power in the State Pollution Control Boards (SPCB) to lay down and enforce effluent standards for "trade effluents" i.e. any liquid, gaseous or solid substance discharged by industrial establishments including mines and processing plants. The legislation requires a person to take prior consent (permit) from the State Pollution Control Board for the establishment of any mining (or any other) operation in which discharge of effluents into a stream, well or sewer or on to land (section 25) prohibits such discharge beyond the prescribed standards and lays down penalties (fines /imprisonment) for non-compliance. Prior to 1988, enforcement was done only through criminal prosecution in the appropriate court. After an amendment of the law in 1988, the SPCB may close down a defaulting unit or withdraw its supply of power and water by an administrative order. The penalties are also more stringent; and a provision for citizens' initiative to make complaints to the court strengthens the enforcement machinery.

The Air Pollution Act of 1981 similarly seeks to prevent, control and abate air pollution. Its framework is similar to that created by the Water Pollution Act, 1974 and it utilizes the institutional mechanisms of the Central and State Pollution Control Boards for administration of its provision. Under this Act, all industries (including mines) operating with in designated air pollution control areas must obtain permits (consent) from SPCBs. The state boards lay down the standards of emission of air pollutants in to the atmosphere from industries (including mines) and vehicles after consulting the central board and noting its ambient air quality standards. The Act empowers the authorities (SPCBs) to enforce the provisions of the Act including measures to close down a defaulting unit and /or stop its supply of electricity and water. A board may apply to a court to restrain emissions that exceed the prescribed standards. There are also provisions for a citizens' initiative and for prosecution and penalties for non-compliance.

All polluting facilities are legally required to obtain from their respective SPCB consent (permit) to establish (CTE) and then consent to operate (CTO). Also quarterly reports on water and air pollution are obtained from specified industries (including mining) and registers are maintained in SPCBs showing pollution with reference to standards. In spite of these legal provisions, there is a laxity in compliance mainly due to the lack of resources and capacity in the regulatory agencies to monitor compliance. It is also necessary for citizens to be proactive in accessing the available information in order to ensure effective compliance.

The Forest (Conservation) Act of 1980 requires the approval of the Central Government before a State 'dereserves' a reserved forest, uses forest land for new forest (including mining) purposes, assigns forest land to a private person or corporation or clears forest land for the purpose of reforestation. An advisory committee known as the Forest Advisory Committee constituted under the Act – advises the central government on these approvals. Contravention of the Act attracts up to 15 days in jail. The Forest (Conservation) Rules 2003 framed under the Act prescribe, among the things, the composition of the advisory committee and the factors it should take into consideration while formulating its recommendation to the Central Government on various proposals received for 'forest clearance'.

In cases relating to proposals for de-reservation or diversion of forest land for non-forest purposes, the most important condition stipulated by the Central Government is that of compensatory afforestation. The proponent of a project is required to submit a scheme for compensatory afforestation over an equivalent area of non-forest land, as far as possible, in the proximity of reserved or protected forest. However, no compensatory afforestation is required in respect of the proposals involving underground mining in forest land below 3 metres and in cases of renewal of mining leases unless new forest land is to be "freshly broken up".

After the Panchayats (Extension to Scheduled Areas) Act 1996 (PESA) and the Forest Rights Act 2006 (FRA) were passed in the Parliament and became the laws of the land, their compliance has also become a mandatory requirement for forest clearance.

Over the years, the Courts interpreted various provision of the Forest (Conservation) Act 1980 in order to amplify its scope, with a view to preventing destruction of forest cover and protecting the environment. In the Godavarman Case (T.N. Godavarman Thirumulpad vs. Union of India, AIR 1997 SC 1228), the Supreme Court laid down that since the Forest (Conservation) Act 1980 was enacted with a view to checking further deforestation which ultimately results in ecological imbalance, its provisions for forest conservation and allied matters "must apply to all forests irrespective of the nature of ownership and classification".

The words "forest land" accruing in Section 2 of the Act will not only include a "forest"' as per the latter term's dictionary meaning but also any area recorded as forest in government records irrespective of their ownership and classification. In this context, it was also laid down that prior approval of the Central Government is required for any non-forest activity (including mining) within the area of any forest. Such 'prior approval ' of the Central Government is also mandatory in respect of renewal of pre-existing leases, as was laid down by the Supreme Court in the case Ambica Quarry Works vs. State of Gujarat (AIR 1987, SC1037).

There have also been initiatives by the Court to lay down, for the executive agencies, the criteria that should be followed in the exercise of their discretionary powers under the Forest (Conservation) Act 1980. In the Kudremukh mining case, for example, the Supreme

Court opined that the principles of sustainable development and the precautionary principles (which govern the law of environment) should be followed in making decisions in these cases. Similar guidelines to the State and Central Government agencies were also provided by the Court in Samatha case[1] when it said that it was their "duty to prevent mining operations affecting the forest" and "to ensure that the industry or enterprise does not denude the forest to become a menace to human (existence) nor a source to destroy flora and fauna and bio-diversity."

The legal position, however, is that the Forest (Conservation) Act 1980 only prohibits mining or any other non-forest activity on forest lands that do not have the (prior) approval of the Central Government. The Supreme Court has clarified that it was not against mining per se but mining which is in violation of the provisions of the Forest (Conservation) Act 1980 and also mining in the National Parks and Sanctuaries.

However, this arrangement which leaves it to the sole discretion of the Central Government to provide 'forest clearance' in respect of non-forest activities has its demerits since it tends to concentrate this power in a Central ministry. Although there is an expert advisory committee to examine these cases, their recommendations are advisory in nature and the Minister is not always bound by their advice. The final decision is with the Minister for Forests and Environment who sometimes may be swayed by political consideration in the context of India's multi-party polity where different political parties are in power in the States and at the Centre. Besides, in the Indian society, given its continuing feudal character and ego-centric government ministers and officials, there is as yet no tradition of robust professionalism or independent decision-making. In these circumstances only a vigilant public opinion and aggressive press can provide the needed antidote against political and personal bias in environmental decision-making.

The Environment Protection Act of 1986 (EPA) and the Environment (Protection) Rules 1986 framed under the Act provide an overarching framework for environmental protection in the country. EPA has a very broad scope for providing for the protection and improvement of environment and prevention of hazards to human beings, other living creatures, plants and property. Section 3 of the Act vests with the Central Government power "to take all such measures as it deems necessary or expedient for the purpose of protecting and improving the quality of environment and preventing, controlling and abating environmental pollution". Specifically the Act empowers the Central Government to lay down standards of quality of the environment and standards of emission or discharge of environmental pollutants. Section 7 of the Act prohibits the discharge or emission of environmental pollutants in excess of the prescribed standards. In order to implement this mandate, the standards have been laid down in the Environment (Protection) Rules 1986, as Schedules form I to VII. While Schedule I lays down the industry-specific standards for a effluent discharge and emissions in respect of specified industries (89). Schedule VI specifies the general standards for discharge of environmental pollutants for all other industries. While Schedule IV indicates the standards

[1] *Samatha* Vs. *State of A.P. & Ors*, JT 1997 (6) S.C. 449

of emission pollution norms for motor vehicles, schedule III and VII prescribe national ambient air quality standards in respect of air pollutants and noise. The pollution control boards have been empowered to lay down strict standards than these, where necessary.

Under Section 3 (2) (V) of EPA, the government is empowered to restrict industrial locations and impose conditions. Rule 5 of EPR lays down the factors such as standards of quality of environment in the area. Its biological diversity, topographic and climatic conditions and environmentally compatible lands use, to be taken into consideration while prohibiting or restricting location of an industrial activity (including mines) in any area.

Section 5 empowers the Central Government to issue "directions in writing to any person, officer or any authority" and this power includes directions to close, prohibit or regulate "any industry, operation or process" and also to stop or regulate the supply of "electricity, water or any other service". Since Section 23 of the Act empowers the Centre to delegate its powers and functions (with a few exceptions) to any officer, State Government or any other authority, these powers to give directions can also be exercise by its delegates for achieving the objects of the Act.

EPA under Section 3(3) makes provision for the Central Government to constitute one or more authorities to implement the Act. This would enable the Central Government to set up an autonomous and professional agency along the lines of the US Environment Protection Agency to oversee the implementation of EPA and its rules. This has not happened so far and the Ministry of Environment and Forests (MoEF) continues to exercise all these powers.

The Act provides for prosecution in the event of contravention of its provisions and requirements and for strict penalties of a prison term up to 5 years or fine up to Rs.1 lakh or both. There is also a provision of a citizens' initiative in filing complaints against violation but the conditions put on the exercise of this initiative makes if somewhat ineffective.

Finally, there is a broad rule making power conferred in the Central Government under Section 6 and 25. The Central Government has used this power to issue a large member of rules and regulations covering areas like pollution control, handling of hazardous substances, protection of the coast and ecologically fragile areas and environment impact assessment. In response to specific environmental threats, industrial and mining activity has been stopped through government notifications in some ecologically sensitive areas such as the Doon Valley in Uttarakhand (Feb 1989) where the area was harmed by extensive limestone quarrying and in the Aravalli range in Rajasthan and Haryana (May 1992) where limestone quarrying threatened the flora and fauna.

The Coastal Zone Regulations issued in Feb 1991 strictly control development activity (including industrial activity) within a strip of 520 metres from the sea shore in the coastal areas.

However, from the point of view of mining (and many other industries), the most important environmental requirement is a comprehensive statutory impact assessment programme (EIA) which was started in 1994. Under the powers conferred by Section 3 (1) (V) and (2) of EPA read with Rule 5 (3) of EPR, the Central Government issued a notification on 27th January, 1994 providing for mandatory EIA. This was subsequently replaced by a fresh notification on the 14th of September, 2006 (further amended in 2009) which now governs the EIA procedures for mining and other specified industries.

EIA has been broadly defined as "the process of identifying, predicting, evaluating and mitigating the biophysical, social and other relevant effects of development proposals prior to major decisions being taken and commitments made" (IAIA, 1999). Although EIA can be applied to legislative proposals, policies and programmes, in India it is exclusively applied to individual development projects in various sectors including mining. To that extent it boils down to a technique or process by which information about environment effects of a project is collected mostly by the project proponent and also to some extent from other agencies and sources and taken into consideration by the relevant authorities in making decisions on whether the project should be allowed to proceed or not.

The 2006 Notification divides the projects into categories always having significant effects on the environment and for which EIA will be required in all cases (category A projects) and those which either will not require an EIA (category B2 projects) or will require in some circumstances (B1 projects). Also, a category 'B' project located within 10 km from the boundary of a protected area notified order the Wild Life (Protection) Act 1972, notified critically polluted and eco-sensitive areas and inter-state or international boundaries are treated as Category 'A' projects. In "mining for minerals", for example, more than 50 hectares of mining lease area in respect of non-coal mine lease and 150 hectares of lease area in respect of coal mine lease are included in Category 'A', along with offshore and onshore, oil and gas exploration and development. Category 'B' projects cover mining lease area between 5-150 hectares in respect of coal and 5-50 hectares in respect of other minerals. Mineral prospecting, however, is excluded from prior environment clearance.

While Category 'A' projects are assessed by a Central Environment Assessment Committee (EAC) whose recommendations are submitted to the Central Government (Minister for Environment and Forests) for final decision, in the case of Category 'B' projects (both B1 and B2) the required assessments are made by a State-level Expert Appraisal Committee (SEAC) and decisions taken by a State-level Environment Impact Assessment Authority (SEIAA). Both SEAC and SEIAA are constituted by the Central Government on the recommendations of the respective State Governments. It is interesting to note that neither the State nor the local government agencies have any role in final decision-making (both with respect to the constitution of the appraisal committees or giving environmental clearance) although the environmental effects of the project are in fact felt in the areas under their immediate jurisdiction. The environment assessment committees are, however, multi-disciplinary bodies staffed by technical and professional persons with considerable expertise and experience in environmental assessment methods and in the relevant projects under

consideration. A National Environment Appellate Authority (constituted under an Act of Parliament), headed by a retired justice of the Supreme Court or Chief Justice of a High Court and comprising subject matters experts hears appeals filed by persons aggrieved by an order granting environmental clearance where industrial activity is restricted under Sections 3(1) and 3(2)(v) of the Environment (Protection) Act. However, the Authority has no jurisdiction to directly hear appeals by project authorities who are denied environmental clearance. Thus, the entire environmental clearance procedure is somewhat reminiscent of the industrial licensing approval system of the earlier license-permit raj!

However, following international practice the 2006 Notification lays down a number of substantive steps for the EIA process with the avowed purpose of anticipating, measuring and assessing the bio-physical and socio-economic changes, both positive and negative, that may result from a proposed project. The emphasis, compared to many other mechanisms of environmental protection, is (or should be) on prevention and the primary purpose is supposed to be to anticipate and avoid or mitigate significant adverse environmental (including socio-economic) consequences of development projects and promote development that is sustainable and optional in the use of resources.

The following stages of the EIA process have been laid down in the 2006 Notification:

Screening:- to determine whether or not a proposal should be subject to EIA or not (only Category B projects are subjected to screening by SEAC which identifies Category B1 and B2 projects)

Scoping:- to identify the issues and impacts that are likely to be significant and to establish the terms of reference (TORs) for the preparation of an Environment Impact Assessment (EIA) Report in respect of Category A and Category B1 projects

Public Consultation:- to ascertain views of the local affected population of the project-area through public consultation in meetings and of others through web-based responses

Appraisal:- to examine in detail the EIA Report, and the outcome of public consultations and determine whether the report meets the terms of reference, especially with respect of clear and objective description of the impacts of the proposal, the proposed environment management plan outlining measures for mitigation, the significance of the effects and the concerns of the local communities affected by the proposal; and to make, on the basis of the appraisal and with supporting information and reasoning, clear and categorical recommendations to the decision-making (regulatory) authority to approve (i.e. give prior environmental clearance) with stipulated terms and conditions or reject the proposal

Decision-making:- to approve or reject the proposal and in case of an approved proposal, lay down the terms and conditions of its implementation (The Central Government (MoEF) takes decisions in respect of Category A projects and SEIAA for Category B Projects)

The 2006 Notification has also provisions for post-project monitoring. The project proponent is required to submit (to the regulatory authorities) half-yearly reports in respect of the stipulated terms and conditions for implementation. These are treated as public documents. Also the regional office of the Ministry of Environment and Forests (MoEF) of the Central Government monitors their implementation.

Of the various stages of the EIA process described above, the following three are relatively more important: scoping, public consultation and appraisal. The quality of the activities comprising these three steps determines the integrity and effectiveness of the process.

Scoping identifies at an early stage, from all of a project's possible impacts, those that are most crucial and significant. The comprehensiveness of the terms of reference (TORs) given to the project proponent has a great bearing on the final outcome of the EIA process.

The main activities undertaken (by the project proponent) for operationalizing the TORs are the following:- description of the project action and alternatives, environment baseline data collections, identification of the key impacts (environmental, social and related effects) and of the magnitude and other dimensions of identified change in the environment, evaluation and assessment of the predicted impacts with a view to identifying those with major adverse effects and description of the mitigation measures needed to reduce, remedy or compensate for any significant adverse impacts. The environmental impact assessment would cover a number of areas such as land use, soil and geology, hydrology and water quality, infrastructure including roads and transport, impact on the social and economic life of the local communities and their interrelationships.

Public consultation through direct interaction with the affected groups in the area of the location of the project and through responses from the other interested citizens and citizen-groups is a vital step in view of the emerging concerns and opposition to development projects in many parts of the country. However, the process should be genuine, neither stage managed nor unduly politicized by the local (partisan) politicians.

The EIA Report that is proposed as a result of these exercises must document clearly and impartially the results of the studies, in particular the impacts of the proposal, the concerns of the affected population and the proposed mitigation measures and a time-frame for their implementation in the form of an environment management plan.

The Appraisal process, as has been stated earlier, should determine whether the report meets the given terms of reference, provides a satisfactory assessment of the proposal and contains comprehensive information on all aspects of the project. A rigorous analysis of the quality of the EIA Report by the appraisal committee(s) has a crucial contribution to decision-making. The review should, however, focus on significant and relevant environmental issues and key effects and not degenerate into a wide-ranging bureaucratic

exercise seeking compliance to a number of other laws as normally happens in government committees considering project proposals for grant or denial of license or permit for industrial and mining projects.

In fact, the EIA process is not merely about issuing or denying an environmental clearance permit for the start of a project. If undertaken with due intellectual honesty, objectivity and thoroughness, EIA can be an effective decision-making tool for the regulatory agency, a project management tool for the developer and a basis for negotiation between the project proponent, government agencies and the affected communities in order to bring about a project outcome that balances development needs with environmental integrity.

Conclusion

India has a vast array of policies, laws, regulations and procedures, often modeled on international best practices, for ensuring sustainability in mining and other development action. The Mines and Minerals (Regulation and Development) (MMRD) Act of 1957 and the Rules framed under it have provisions to ensure environmental integrity in mining operations. However, relatively more effective provisions are contained in the environmental policies and laws which apply to all industries including mining. The most important environmental requirement is a comprehensive statutory environmental impact assessment (EIA) programme which was started in 1994 and is being continued with refinements since that date. The air and water pollution control, administered through State Pollution Control Boards (SPCB), is another important area for effecting environmental mitigation in mining. The legislation relating to forest conservation which requires the Central Government's approval for diverting forest land for mining is also of considerable significance for environmental integrity in the mining areas of the country.

All these legislations and their procedures have led to the creation of elaborate administrative arrangements for their enforcement. These are State and Central functional agencies such as mining, forest, environment and health bureaucracies at both levels of government as well as State Pollution Control Boards whose mandate comes from air and water pollution laws. The laws and regulatory instruments, however, work badly, mainly due to lax enforcement and inadequate coordination among a multiplicity of functionaries. This has resulted in an aggressive citizens' movement, and pro-active judiciary, which sometimes assumes the role of policy maker and super administrator.

Section III
EXPERIENCE IN SUSTAINAIBILITY PRACTICES IN INDIAN MINERALS SECTOR:
A Few Case Studies

Chapter 7

ODISHA
Case Study: Iron Ore Mining in Keonjhar[1]

Odisha is one of the leading mining states of India, both in terms of mineral resources and production. The State accounts for 95 per cent of chromite, 92 per cent of nickel, 55 per cent of bauxite and 33 per cent of iron ore (hematite) resources of the country. It is also rich in other minerals like coal, dolomite, fire clay, manganese, graphite, and lime stone, apart from having a host of minor minerals.

Table 7.1: Mineral Resources of Odisha

(In million tonnes)

Mineral	Odisha (2)	India (3)	Percentage share in India (2/3)
Chromite	202.96	213.06	95.25
Nickel	174.48	188.71	92.46
Bauxite	1808.27	3289.81	54.96
Manganese Ore	152.96	378.57	40.40
Iron Ore (Hematite)	4760.63	14630.39	32.54
Fire Clay	175.48	704.76	24.89
Coal	61999.26	253301.66	24.48
Dolomite	836.80	7533.11	11.10

Source: IBM. 2011. *Indian Minerals Yearbook 2009*, Indian Bureau of Mines (IBM), Nagpur, January.

In terms of the total value of mineral production, Odisha ranked third among all the States in 2008-09, accounting for 13.06% of the value of country's mineral production (excluding atomic minerals) (IBM, 2011). In terms of value, iron ore contributes significantly to Odisha's mineral production, followed by chromite (see table 7.2).

Within the State's economy, the mineral sector occupies a prominent place. "Mining and Quarrying" contributed 8.55% to the Net State Domestic Product (NSDP) at factor cost and current prices during 2009-10 (Base: 1999-2000). The equivalent figure for the country is 2.5% (RBI, 2010). In fact, over the past ten years, the sector's contribution to the net state domestic product at factor cost (at current prices) has grown steadily (see figure 7.1).

[1] Data (both qualitative and quantitative) collected through questionnaires and personal discussions with government and mining company officials, non-government organizations, civil society and local community groups, during visits to Odisha, specifically to various iron ore, manganese, bauxite and chromite mines (Annexure 13) in the mining regions of the state.

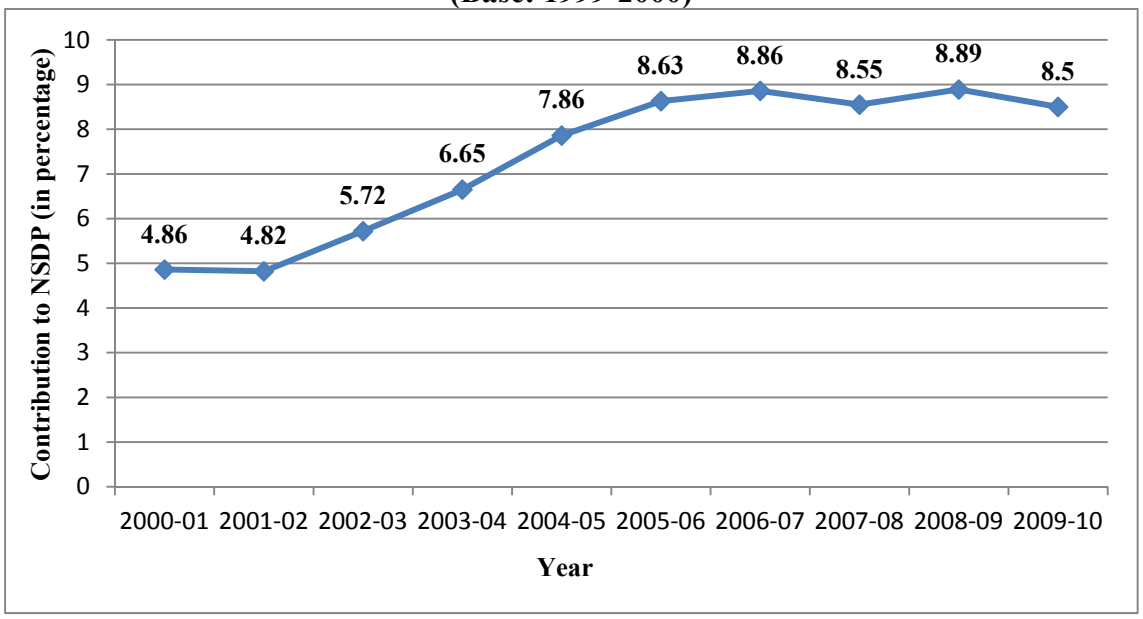
Table 7.2: Mineral Production in Odisha

(In tonnes, in '000 Rupees, unless otherwise specified)

Mineral	2006-07		2007-08		2008-09 (provisional)	
	Quantity	Value	Quantity	Value	Quantity	Value
All Minerals (excluding atomic minerals)		100652131		145079632		162334288
Bauxite	4673886	1292562	4685998	1486174	4734417	1591793
Iron Ore (in '000 tonnes)	64178	48069518	69883	75676652	74130	92599498
Manganese Ore	686783	1398965	667780	2153715	905907	3262668
Chromite	5287836	14458302	4863359	21350794	3976382	22137308
Minor Minerals		856767		856767		856767

Source: IBM. 2011. *Indian Minerals Yearbook 2009*, Indian Bureau of Mines (IBM), Nagpur, January.

Figure 7.1: Contribution of mining and quarrying to net state domestic product (Base: 1999-2000)



Source: Handbook of Statistics on Indian Economy (2009-10), Reserve Bank of India, 15 Sept 2010

Its increasing contribution is thus an important factor in the growth of Odisha's economy. In view of the growing global and national demand for metals and minerals, the sector seems poised for higher growth, making Odisha a favorite destination for investors in mineral and mineral based industrial projects.

Apart from minerals, Odisha is also rich in forests, marine and water resources. It has a relatively large tribal population (23% as against the all India average of 8.20%), mostly concentrated in the mineral-rich north western (Keonjhar, Sundargarh and Mayurbhanj) and

south-western (Koraput, Kalahandi, Bolangir and Phulbani) districts of the State. About 30% of the State's area is under forest cover, which provides for the livelihood of the tribal population. From the point of view of sustainable development what is critical is that Odisha's large mineral deposits are located in its forest areas which are rich in biodiversity, contain the catchments of its major rivers and also provide the habitats for its poor and marginalized tribal population.

Keonjhar district which occupies an important place in the mineral resources map of India and produces the maximum quantity of iron ore in the country (54.9 million tonnes or 27% of the country's production during 2007-08) mirrors this criticality to a considerable extent (Indian Mineral Year Book, 2009). The district has abundant resources of high grade iron ore; besides manganese and chromite ore are also available along with other minerals like limestone, dolomite, nickel, quartz and vanadium.

Table 7.3: Total mineral resources of Keonjhar district

(In million tonnes)

Name of Ore	Amount of resources
Iron ore	2600
Manganese	28.470
Chromite	24.40
Bauxite	10.00
Dolomite	10.00
Nickel	7.90
Quartz	14.10
Vanadium	1.20

Source: "Impact of mining in the scheduled area of Orissa", Vasundhara, Bhubaneswar (2008)

Officially, it has around 119 mining leases (as in Dec 2005) and 31,256 hectares under mining although illegal mining is quite widespread (Murthy and Rao, 2006). For 2010, the equivalent figures were 108 and 23,753 hectares. The district has 37% of its geographical area under forest, home to the catchment area of major rivers and small springs/streams feeding these rivers (Government of Orissa, 2010). Nearly 45% of the district's population – many of them living in these forests – belongs to the scheduled tribes and another 12 percent to belong to the scheduled castes (Human Development Report 2004).

Iron ore mining is the main mineral production activity in the district which has proved iron ore resources of more than 1000 million tones. The Singhbhum – Keonjhar – Bonai – mining belt passing through Keonjhar and the Joda – Barbil region of the district is the main hub of iron ore (and manganese) production. Chromite, a strategic mineral, is also produced in another part (eastern) of the district (Anandpur Block). The production of iron

ore, manganese and chromite were respectively 78%, 69% and 4% of the Odisha's mineral production during 2008-09 (Indian Mineral Year Book, 2009).

Empirical studies carried out by some professional agencies in Keonjhar have shown that extensive mining in the Joda – Barbil area of the district had both positive and negative effects. The survey results cited by the World Bank in its report (World Bank, 2007), for example, indicate that mining brought benefits to nearby communities, mainly in the form of better access to roads and greater stimulus to economic activity. The people nearer to mines had higher wage incomes and purchased more consumer goods, although those less exposed to mining activities seemed to have fared better on several indicators, including education levels, access to clean water, reported illness, production asset and total cash incomes. The findings thus highlight the importance of sharing the benefits of mineral development with the local communities and mitigating the negative effects of mining.

Another research study (Vasundhara, 2008) highlights the considerable negative effects of mining (in Joda – Barbil area) on the natural environment and the local communities around the mines.

The land use pattern surrounding the mine area has changed rapidly, involving loss of forest cover and degradation of agricultural land and consequent sharp increase in waste land.

Table 7.4: Changes in land use in the Joda Block (Keonjhar)

(In hectares)

Land use	Area in 1989	Area in 2004
Agriculture	22128.61	21520.57
Forest	36191.82	24501.17
Waste land	8294.82	18540.86
Mining	1646.41	2807.11

Source: "Impact of mining in scheduled area of Orissa – A case study from Keonjhar", Vasundhara, Bhubneswar (2008)

Apart from inadequate and unplanned efforts at land reclamation and afforestation in the mining areas, huge overburden from the mines and their poor management is a major source of landscape change. The purpose of compensatory afforestation has not been achieved as the condition of the re-afforested land is in a shattered condition; either no plants exist on the site or a few number of species like eucalyptus or acacia (not indigenous to the region) have been planted on these lands. Also, soil quality of agricultural land has been affected adversely due to the deposit of iron ore dust generated from the nearby mines or during transport, mines run-off generated during the rainy season and deposit of overburden on agricultural land from the nearby mines.

Mining and consequent deforestation and heavy vehicular traffic carrying mineral ores have also destroyed elephant habitats and corridors, leading to increased human-animal conflict and reduction in the elephant population in Keonjhar.

The Orissa State Pollution Control Board (SPCB) in its "State of environment report, Orissa" (Orissa State Pollution Control Board, 2006) has classified Joda – Barbil region of Keonjhar district as a highly polluted zone (Zone 1). During the rainy season, the water in rivers turns red with heavy concentration of particles of iron oxide and the total suspended solids often go up to 1000mg/litre. Overflow of mine seepage and effluents from beneficiation plants normally find their way to streams and pollute streams passing through the mines areas.

Air pollution is also a major problem in the mines area, with concentration of suspended particulate matter (SPM) in ambient air much above the permissible limit in many places, particularly at crusher loading and transfer points. One of the biggest reasons for fugitive dust generation is the poor condition of roads in these areas and movement of large number of trucks carrying mineral ores on these roads. Sometimes the pollution level on the roads is much higher than in the mines where sprinkling of water suppresses dust generated due to mining operations.

Infrastructure, especially roads, is in a very bad condition in Keonjhar and is totally inadequate to handle the heavy vehicular traffic generated for the transport of mineral ores from a large number of mines. Apart from the district and panchayat roads in the mining area which are in pathetic conditions, the National Highway 215 passing through the region is totally inadequate to handle the vehicular traffic comprising trucks carrying mineral ores out of Joda – Barbil to their destinations. The highway has only two lanes of which one is blocked by parking of heavy vehicles during the day as these are allowed to ply only during night time. This often causes road block and jams and accidents. The situation further deteriorates during night when there is heavy vehicular traffic causing great inconvenience to the local communities who continue to face frequent traffic jams during both day and night. With virtual absence of traffic and local police to manage difficult situations on the roads, the local musclemen are often seen taking law into their hands to deal with the situation (and in the process perhaps make some fast buck!).

Mining activity also has adverse effect on the health of the local population. In buffer villages, there is high incidence of bronchial diseases and the number of respiratory tract infection patients is on the increase. HIV Aids is also a growing problem in the area. All these naturally have a detrimental effect on the local communities with high exposure to mining. Firstly, large scale and indiscriminate mining in the Joda – Barbil area is threatening to disrupt the traditional livelihood and social fabric of the local communities comprising mostly Adivasis (members of the scheduled tribes). These communities used to depend on agriculture, forest produce and other traditional occupation such as fishery and handicrafts for their livelihood. Degradation of land and soil quality as well as loss of forest has affected their occupation adversely, resulting in loss of total income. Due to the absence of technical skills, the eligible members of these communities can be employed only as unskilled workers in the mines. With increasing mechanization, the scope for such employment is declining. The opportunities for jobs in transport and other ancillary occupations are also limited and

sometimes these can have damaging effect on their traditional life style. Displacement due to mining projects and exposures to urban and industrial activities is also disturbing the age old social structure creating tensions within these communities and in their interface with the outside world. This is aggravated by air and water pollution in their localities, shattered infrastructure, health problems and chronic poverty among the people. In Keonjhar, in a classic case of the so-called "resource curse", nearly 62 percent of the population live below the poverty line and score poorly on various human development indicators, especially in the fields of education and health. It is obvious that in the absence of proper benefit-sharing mechanisms, the gains from the mineral sector are being disproportionately appropriated by a small group of people (mine owners). In such a situation, it is not surprising that the "social license to mining" is under severe strain. It is, therefore, of critical importance that the benefits of mineral development are shared with the local communities and the negative effects of mining on environment are mitigated to the maximum extent possible. This is central to the issue of sustainable development in the mineral sector.

How is the mining industry in Keonjhar (Joda – Barbil region) responding to this challenge? What measures the relevant public agencies are taking in order to ensure mineral development that harmonizes with environmental integrity and socio-economic development of the local communities with high exposure to mining?

Keonjhar is dominated by small-sized mines. In 2010, there were 108 mining leases for iron, manganese and chrome ore in the district; only 6 leases were for chrome ore and the rest for iron/iron-manganese ore. These leases covered an area of 23753.45 hectares of land including 17134 hectares of forest land. Eighty three of these mines were operational in August 2010. The average land size of the mining leases was 275 hectares with more than 50 percent having size of less than 100 hectares (Table 7.5). In fact, only 18 mines were of land sizes of more than 500 hectares with only 7 mines having more than 1000 hectares of land each. It is obvious that a large number of small-sized leases have been granted in Keonjhar where the landscape is scarred by extensive mining by these small operators (Additionally, extraction of minor minerals taking place all over the district also affects the environment adversely).

Table 7.5: Distribution of mining leases (iron ore, manganese ore and chrome ore) in Keonjhar district by land sizes in 2010

Size	Number
500 hectares or less (of which less than 100 hectares)	90 (55)
More than 500 hectares (of which more than 1000 hectares)	18 (7)
Total	108

Source: From the data obtained from the Directorate of Mines, Government of Orissa, Bhubaneswar (August 2010)

Almost all the mines are open cast mines which is the dominant method of mining for ferrous minerals in India. Small and medium sized means mostly adopt manual or at best semi-mechanized-cum-manual method of operation. The manual mining is generally confined to float or reef ores. The float ores are dug up with picks, crossbars and spades and the material is then manually screened and staked. Jack hammer drills may also be used for blasting and the blasted ore is manually loaded to trucks for dispatch. Semi-mechanized-cum-manual methods comprise blasting with explosives, excavation by earth-moving equipment and ripper dozers and manual dressing and sorting.

Only those mines which have large land area and can produce around 1 million of iron ore/metric tonnes (or more) per annum have fully mechanized operations and are in a position to upgrade their technology from time to time. In Keonjhar, the few large mines operated by the public sector companies like the Steel Authority of India (Bolani) and the Orissa Mining Corporation (OMC) and the leading private sector companies like Tata Steel (Joda and Nuamundi in nearby Jharkhand) and Essel Mining are adopting fully mechanized methods of production. Even some of the larger companies (like KJS Ahluwalia, OMC and Rungta Mines) have a few medium sized mines (iron ore and manganese) where semi-mechanized-cum-manual methods are used.

Sustainability Performance of Mines

The sustainability performance of a few large, medium and small mines was studied with the conclusion as given below:-

A. <u>Scientific Mining</u>

Scientific mining comprises mining methods and practices originating from a systematic approach to mine development and operation. It involves adoption and continuous development of technology reflected in the advances in equipment and management practices. Scientific mining is the first step for ensuring environmental sustainability in mining; it is also essential for the conservation of a non-renewable resource and its optimum utilization. The Mineral Conservation and Development Rules (MCDR) 1988 lay down some parameters including the requirements of a proper mining plan for each mine, operational mining schemes and a mine closure plan when the resources are fully exhausted.

The large iron ore mines in Keonjhar that are fully mechanized (like Tata Steel's Joda and Khand Bond mines and Noamundi in the adjacent Singhbhum district) mostly adopt such a systematic approach, going beyond the legal requirements. The main elements of scientific mining and the differential behaviour of different categories of mining enterprises are enumerated below:

Box 7.1: Pictures Showing Scientific Mining

Box 7.2: Pictures Showing Unscientific Mining

(i) Mine Planning

This involves a systematic survey of the mining lease area in order to evaluate the deposits and their grades for mine design, modeling of ore bodies, and progressive breaking of areas. Larger mines use computer-aided mine planning and scheduling software for the purpose. All environmental considerations are integrated into planning for each stage of a mining project.

The small and medium-size mines, on the other hand usually do not have the technical capacity and resources to undertake such elaborate mine planning exercise. They generally confine their efforts to preparing mining plans and schemes as required under MCDR 1988.

(ii) Mine development and operations

In the case of fully mechanized mines, the entire operations are technology-oriented with optimal utilization of critical heavy equipment and the use of a global positioning system (GPS). Innovative techniques are used with emphasis on continuous up-gradation of technologies in areas such as mining equipment and methods, blasting systems, transportation equipment and systems mineral conservation at the mine level and beneficiation technologies. In the case of Tata Steel's mines, for instance, some recent examples include the use of hydraulic operated platform and scaffolding for working at height, higher capacity dumpers (100 metric tonnes from earlier 50 metric tonnes), GPS-based truck transportation system, use of beneficiation technologies, such as jigging and hydrocyclone and use of chemicals for dust suppression and zero discharge slime dams. Robust environmental management and monitoring at the mine level ensures maintenance of right benches (12 metre/9 metre width) of the required quality with wide internal roads and effective methods of dust suppression.

The small and medium-size mines (which adopt manual/semi-mechanized mining methods) mostly stick to traditional equipment and techniques for mining and transportation of ores. Dry crushing of ROM (run of the mines) is done in crushers and sized ores and fine ore transported in trucks as final products. The objective in most cases is to recover the saleable (lumpy) ore with minimum cost without so much concern for mines-environment. Sometimes it is seen that instead of a planned and progressive breaking of ground, the areas (in mines) with higher quality ores are first taken up for mining which low-quality material is disposed of at the site. In fact, small and medium-scale mining involving low capital investment means that relatively simple methods are used to "cherry pick" the most easily extractable and valuable mineral-component, leaving a high level of residual mineral in the associated wastes which do not undergo further processing.

(iii)Mineral waste management

The management of solid waste produced during mining presents an environmental and economic challenge. Most of the larger mines adopt planned and systematic approaches in handling the massive amount of loose earth and rocks removed from the working benches. Normally overburdens and sub-grade ores/rejects below the thrust-hold (45% iron content) are staked separately, at designated waste dumps and are managed in such a way (through provision of garland drains, check dams, terracing of slopes and plantation) that erosion from these do not pose any pollution problem in the natural waterways. These are subsequently used for backfilling, excavated mines inactive or 'dead' dumps are put under afforestation in order to control the flow of silt that can damage agricultural fields and water streams located near the mines.

As mandated by MCDR, the smaller-sized mines adopt measures for storage of overburden in waste dumps, with garland drains and retailing walls around the dumps. Steps are also taken to stabilize these dumps through terracing of the slopes and plantation. But in case of many of these mines inadequacy of available land in their lease area for waste dump presents a problem and the mines-environment sometimes presents a chaotic picture with mineral ores and waste materials stored very close to each other.

A major area of concern in the case of these (smaller) mines is the storage and utilization of top soil removed during the mining operation. This is required to be stored separately and utilized for restoration or rehabilitation of land not required for mining operations. Due to in sufficient land area and in the absence of careful management behaviour, top soil can get mixed with the waste material or its quality destroyed making it unsuitable for use at the appropriate time.

(iv)Tailings management

Tailings from beneficiation plants are discharged into tailing ponds in order to avoid contamination of the surface run off and to restrict discharge into the river and draining system. Embankments/dams for the management of tailings are constructed to avoid seepage, sliding and erosion. Larger mines having beneficiation plants normally provide for this facility. In the case of Tata Steel's mines in Nuamundi, for example, chemicals are used at slime dam for clear water recovery and a zero discharge slime dam and water recirculation system is maintained. Small and medium-sized mines usually do dry crushing, without the need for tailings management.

(v) Mine closure plans

Mine closure plans at an early (feasibility) stage of a mining project is required in order to facilitate successful rehabilitation of a mined out area in terms of habitat reconstruction, soil development and ecosystem restoration in a systematic manner. This ensures that through the application of best practices and the implementation of a phased programme of reclamation and closure even during the operation of the mine, environmental liabilities would be managed at an acceptable cost-level. MCDR 1988 also provide for a mine closure plan along with the mining plan.

All mines, large and small have mine closure plans approved by IBM as a part of the statutory requirement. However most of them look at it only when the mineral resources are about to be exhausted and the mine is approaching closure. Regular review and phased implementation of the closure plan is rare in respect of most mines. Some mines claim that they review these plans every five years; the larger mines seem to review annually. Fresh closure plans are prepared at the time of renewal of mine leases, along with new mining plans.

Although there is no evidence of phased implementation of closure plans, some of the mines have taken steps to backfill small portions of their mined out areas. In most cases, however, the tendency is to wait till the exhaustion of all the mineral resources in a mining block. In some larger mines there is a conscious attempt at concurrent reclamation and mined out areas have been backfilled.

The people most affected by a mine closure are those who live near a mining project and need to be consulted at various stages of closure. There is no evidence that local communities are ever consulted by any of the mines, either at the stage of the preparation of a mine closure plan or its subsequent revision and implementation (if any).

Apart from these substantive mining practices which affect the quality of the mines-environment, there are also a set of environment protection measures that a mining enterprise must take in order to mitigate the negative effects of mining on the environment.

B. Environmental Protection and Biodiversity

The major environmental management practices being followed by the iron ore mines in Keonjhar are described below:

(i) **Air quality management**

The major air pollution in mines is caused due to the particulate matter of various sizes and chemical constituents or dusts. Thus dust management at various stages of mining operations is the most important challenge. The major sources of dust are haul roads, drilling and blasting, crushing and screaming operations, material handling and waste rock dumps. The main measures observed for dust suppression and management are the following:-

- Regular water sprinkling (at intervals) on haul roads, other roads and working areas as well as active overburden dumps. In Tata Steel's mines chemical mixed water spray on haul roads have been found effective.
- Wet drilling and site mixed emulsion for drilling with less noise, vibration and dust in larger mines.
- Dust extractors in the crushing and screening plants, water spraying and dry fog system at the crushing plant.
- Use of covered dumpers and trucks for transportation of ore.
- Rehabilitation of waste dumps through vegetation.
- Creation of green belts around the mining areas (particularly loading sites), avenue plantation and afforestation of dumps through various measures including in-house nurseries.

Box 7.3: Rehabilitation of waste dumps through vegetation

Box 7.4: Pictures Showing In-house nursery

Clearly the level of effort and expense that is applied depends on the resource of the mining company and the commitment of its executives to environmental good practices. The larger mining companies naturally adopt a more proactive approach. For example, in Tata Steel's mines along with the usual tree plantation measures, the company develops parks and gardens, fountains, butterfly and medicinal plants, parks, etc. in the mining areas in order to protect environment and improve aesthetic beauty.

In the case of smaller firms, the objective is to comply with the prescribed legal requirements for ambient air quality in their mining areas. According to the Orissa State Pollution Control Board (OPCB) the monitored and reported air quality of the different mining enterprises in Keonjhar shows general compliance to these requirements. In fact, it was mentioned that while the ambient air quality in the mines was within the prescribed limits, it is often not so in the areas outside the mines, especially on the highways used for transporting the cumulative production of the iron ore and manganese mines of the Joda – Barbil region.

(ii) **Water pollution and waste water management**

In Keonjhar, the iron ore mining operations do not intersect with the area's water table. However, water pollution is caused due to higher loads of suspended solids through ore-washing at the screening plant, slimes generation in the stockpiles or dumps and erosion over degraded lands. The main consideration is how to limit the extent of the flow of slimes into the natural streams in the area and prevent environmental damage. The measures usually taken by the mines in Keonjhar are the following:-

- Construction of check dams to harvest rainwater and arrest surface runoffs;
- Provision of garland drains around major waste dumps;
- Provision of settling ponds at suitable locations and channeling flow of water running down the hill or dumps to settling ponds.
- Construction of tailings dams or ponds for left over residue from beneficiation plants.

Another issue is that of waste water management. The larger mines (like Tata Steel's mines) maintain a closed water circuit system under which waste water is recovered, recycled and reused. Tailings from beneficiation plant in Tata Steel's Nuamundi mines, for example, is treated by chemicals to separate the solids and from the tailings pond, clear water (nearly 85%) taken out for reuse in the beneficiation plant. The main benefit of the closed water circuit is that it results in the reduction of costs for the mining company, while avoiding damage to the area by reducing suspended solids in the treated water.

(iii)**Rehabilitation of degraded land**

Degraded land can be reclaimed for various final uses like agriculture, housing, plantation etc. In Keonjhar, abandoned mined areas, slime dams and overburden dumps and such other degraded lands are either left as such or covered with afforestation. Larger companies may give some thought to wider biodiversity concerns such as distribution of flora and fauna, identification of native species of plants and their regeneration potential and prepare comprehensive ecological studies. These studies are kept in mind while planning afforestation programmes which may include setting up of botanical, rare plants and butterfly parks and the like. Smaller enterprises just do plantation with fast-growing species (like acacia) which can survive in the degraded lands of their lease-areas. This enables them to comply with the environmental regulations and acquire a "green" image.

Box 7.5: Afforestation

C. Stakeholder engagement

The local communities living in a mine's area are directly affected by its operations. They, therefore, have a right to be consulted on the mining enterprises' plans and programmes that affect their land, environment and socio-economic life. Besides, in Keonjhar, most of the local communities belong to the marginalized groups – scheduled tribes and scheduled castes – and deserve special attention.

It emerges that all the mining enterprises (large and small) do not consult the local communities on what they call "technical" matters concerning mining operations. These include all aspects of mine development, operations and even closure. The only interaction they have with these communities is during public consultation organized under the environment clearance process. Typically this is done before a mine starts its operations and the main concerns expressed by the members of the local communities in their meetings relate to a few local development works such as construction of school buildings, tanks, tube wells, village roads and the like.

D. Local Community Development

Community development needs to be one of the central concerns of the mining industry since wealth removed from the community in the form of minerals may not necessarily be returned to the community in any other form. On this score, the performance of the mining companies in Keonjhar is quite patchy and indifferent. Firstly, no mining project, large or small, prepares a social impact assessment survey as there is no mandatory requirement to that effect. This prevents the enterprise from taking a holistic view of the socio-economic situation in the area of its operation which in Keonjhar is dominated by tribals and other marginalized groups.

Secondly, there is no formal institutional management to interact with local communities and assess or respond to their requirements. Local development projects are selected and taken up on ad hoc basis, either in response to the requirements indicated by the villages during public consultations under the environment clearance process or strong requests made from time to time. Sometimes the representatives of the local Gram Panchayats and Panchayat Samiti are consulted. The typical projects that are taken up in a piecemeal manner are the following:-

- Construction and maintenance of primary school buildings;
- Payment of salary of a few school teachers;
- Construction of wells, tube wells, village tanks and temples;
- Maintenance of some village roads, frequently used by the mining company for its business;
- Free medical camps and distribution of medicines;

Box 7.6: Medical Camps

Taking up community development work entails costs and most mining companies, especially small and medium-sized ones are not enthusiastic. There is also no legal requirement for this to incur this expenditure. They sometimes seem to undertake these works either under official or community pressure for maintaining congenial conditions for their business operations.

In case of some of the larger companies (like Tata Steel and the large public sector mining companies), the approach may be somewhat different. Even then the State's public sector mining company, the Orissa Mining Corporation (OMC) has no corporate strategy or policy on community development and takes up local development works in a piecemeal manner, in response to local demands.

However, larger companies (like Tata Steel in its Joda (Keonjhar) and the adjacent Nuamundi (Singhbhum) mines), have a relatively more organized development programmes for the local communities. For example, Tata Steel's TSRDS (Tata Steel Rural Development Society) operates in about 30 villages around Joda and 42 villages around Nuamundi

promoting local development works. A Tribal Cultural Society works among the marginalized scheduled tribes and caste communities. The broad areas of intervention are land and water management, vocational training and creation of rural enterprises through self help groups (SHGs). The development projects are undertaken in the following categories:-

(i) Land and water management

- Integrated watershed development
- Wasteland development
- Lift irrigation projects
- Agricultural improvement projects

(ii) Technical training and skills development of the local people

- Motor winding and mechanical training
- Electrician
- Welding and gas cutting
- Repair and maintenance of tubewells and borewells

(iii)Community education services

- Provision of infrastructure like school buildings, furniture, library books etc.
- Financial aid to schools
- Provision of computers and associated training
- Running of camp schools for drop out boys and girls
- Scholarships to students

(iv)Community health and medical services

- Mobile medical facilities with doctors and para-medical staff
- Regular health camps
- Family planning and eye care camps, cleft lips camps etc.
- Malaria prevention programme
- AIDs awareness programme

(v) Development of physical infrastructure in the mining area

- Construction of roads and culverts
- Deepening of ponds, construction of canals and checkdams for rainwater harvesting
- Electrification of villages

- Deep bore well, tube well and open well
- Construction of Community Centres

(vi) Rural enterprise through Self Help Groups (SHGs)

- Women's SHGs through small savings and micro enterprise route
- Vegetable cultivation, poultry farming etc.

These are basically activities designed to help create income-generating opportunities which supplement the direct and indirect employment that mines create in their areas of operation.

Thus, unlike the smaller sized mines, which lack in motivation, capacity and resources, the larger mining companies engage in visible community development work.

Apart from the determining influence of the moral and ethical vision of their founders, the desire to present the company as a caring concern for community acceptability does play an important role in shaping their efforts. But whether the extent of community development work undertaken and the annual financial resources allocated for the purpose are in commensurate with the benefits derived from the exploitation of the community's natural resources is difficult to say.

E. <u>Transparency and accountability</u>

Finally, transparency and accountability are essential for a more equitable distribution of resource-derived profit and to rein in corruption which is endemic in the mining industry. On this count, the record of the mining companies is not satisfactory. There is no tradition of sharing information (on the part of the mining enterprises) with the local communities; the only interaction that mining companies have with the people is during public hearing under the environmental clearance process for new mines and expansions. The situation is further complicated by the fact that in Keonjhar, most local communities are poor, lack in education, and belong to the most marginalized scheduled tribes and castes.

Thus, the picture that emerges is a mixed one. In view of the difference in mining practices (including ore processing and handling of products) and in their approach to environmental management, the nature and extent of degradation caused to the environment by the large, fully mechanized mines on the one hand and the smaller, semi-mechanized/manually operated mines differ widely. The latter are more concerned with extracting high-value product while keeping the cost low by complying with the minimum legal requirements. Their executives also do not exhibit much of sensitivity to environmental and social issues.

In the case of larger, mining firms, apart from adopting technology-oriented mining operations, the executives often take a more proactive approach to environmental protection. This could be due to the vision of their founders, a positive corporate culture or a desire to present a "green image" for community accountability. Many of them use ISO 14000 standards and their senior executives display greater awareness of and commitment to environmental and social issues. Of course even among large enterprises, there are variations in environmental behaviour with some firms being more proactive than the others.

So far as stakeholder engagement is concerned, the management behaviour of both the large and small firms hardly differs. The local communities comprising mainly of members of the scheduled castes and tribes (uneducated, poor and marginalized in the society) are never taken as stakeholders in the activities of the mining companies. Also a more systematic and formalized arrangement for bringing about socio-economic development of the people residing around the mines is necessary to compensate them for taking way their habitat's natural resources.

In Keonjhar (Joda – Barbil region), it appears that the air and water quality deterioration and other environmental problems are the cumulative effect of a large number of mines operating beyond the region's carrying capacity, even though individual mines could be conforming to the prescribed standards. In particular, the indiscriminate mining by a large number of small and medium-sized concerns where the mining and environmental practices may not conform to the best possible standards is contributing to environmental deterioration.

Then, there is also the prevalence of the so-called "illegal mining" in the area, fuelled by increase in the iron ore prices since 2004. Odisha's illegal mining scam that came to light in 2009 is mainly relates to iron ore mining in Keonjhar. The Central Empowered Committee (CEC) of the Supreme Court of India which enquired into the allegation has the following to say in its interim report (CEC, 2010) submitted to the Court in April 2010:-

> *"Mining activities were going on in a large number of mines in Orissa without the requisite approvals under the Forest Conservation Act 1980, environmental clearances and the Air and Water Acts. The mining activities also exceeded the production limit as approved under the mining plans".*

A major factor that facilitated illegal mining is the system of so called "deemed extension" of mining leases under Rule 24A(6) of the Mineral Concession Rules 1960. Applications of mining lease holders for renewal of leases are kept pending for long periods, in some cases even beyond a period of 20 years, after the expiry of the original lease. During this period of pendency mine owners are allowed to carry on mining operations (as 'deemed leases') even without the required forest and environmental clearances. Collusion of mining and forest bureaucracies and corruption often play a critical role. This is the finding of both CEC and the Justice M.B. Shah Commission of Inquiry for Illegal Mining of Iron Ore and Manganese appointed by the Government of India. (Justice M.B, Shah, 2011).

Apart from the recognized mine owners, both large and small, indulging in illegal mining, there are also instances of villagers in the mining areas, encouraged by local mafia groups, taking to crude surface mining with simple implements like picks and shovels in total disregard of the law and environment. Prevalence of wide-spread corruption among the concerned official agencies and political establishment only aggravates the problems. Illegal mining in all its forms is a great environmental hazard for it results in production beyond the prescribed capacities and violates all the norms and standards laid down for maintaining environmental integrity in the mining areas.

Regulatory Arrangements

This brings us to the question of effectiveness of the available regulatory regime for mines development and environmental protection. Environmental protection in India is of the "command and control" variety, without much emphasis on economic incentive or market stimuli. Of late civil society and non-government organization (NGO) pressure and people's opposition to large projects (like Vedanta Aluminium and POSCO and Kalinganagar steel projects in Odisha) on environmental and livelihood considerations are having some impact on corporate environmental behaviour. But it is doubtful if the elaborate governance system comprising multiple institutions, legislations and procedures has been effective in bringing about a satisfactory environmental outcome in Keonjhar and other mining areas.

The two agencies which are directly concerned with administration of the mineral sector are the State Directorate of Mines (along with its field formations) and the Regional office of the Indian Bureau of Mines (IBM) at Bhubaneswar, which is a central government agency under the Union Ministry of Mines. Broadly, the State Government agency handles issues concerning grant, revision and termination of mining concessions, survey in demarcation of mining leases, revenue/royalty collection, production and transport of mined areas, illegal mining, etc. Most of these matters are covered under the Mineral Concession Rules (MCR) 1960 under MMDR (Mineral Conservation and Development) Act 1957. IBM, on the other hand, primarily deals with matters covered under the MMDR Rules 1988 such as approval of mining plans and schemes, monitoring their implementation, mine closure plans, environmental protection in mines and other issues concerning scientific mining. There is evidence to suggest that this artificial separation of responsibilities pertaining to mineral administration creates problems of coordination and blame games among the state and central government agencies. The administrative arrangements provided for coordination such as the regional coordination committees, the State Geological Programming Board and the State Coordination-cum-Empowered Committee are not effective in bringing about the desired coordination and coherence.

This situation is best illustrated by the differences between the Odisha State Government and the Central Government (Union Ministry of Mines) on the issue of prevention of illegal mining in the state. Since the mining plan approved by IBM for a mineral project specifies the quantity of ore that can be extracted in a year, significant

overproduction can amount to illegal mining. Therefore, in September-October 2011, the State Government complained to the Central Government (Union Ministry of Mines) about the violation of the annual production limits in various (iron ore) mines (274) in the state and the inadequacy of the action taken by IBM to prevent illegal mining.

The position of IBM is that checking illegal mining is a state responsibility as it is covered under the Odisha Minerals (Prevention of theft, smuggling and illegal mining and regulation of possession, storage, trading and transportation) Rules 2007 framed by the State Government under Section 23C of MMDR Act 1957. In view of this general position, the Central Government (Union Ministry of Mines), in its detailed response to the State Government, sent in December 2011, threw the ball back to the latter's court. Their argument had two somewhat contradictory strands. Firstly, it was contended that the State Directorate of Mines had legal powers and responsibilities to undertake site inspection of mines in order to determine the quality and quantity of minerals excavated for assessing royalty payable on the minerals. They have the powers to examine the production records and accounts of miners and exclusive powers to issue transit permits only after which these can be moved out of the mines. It is the State Government's responsibility to correlate production and dispatch of minerals with the production figures indicated in the mining plans and schemes (endorsed to them for this purpose by IBM) in order to check illegal mining including transportation.

At the same time, the Central Government's letter contended that the Mining Plan was a dynamic document and while 20% deviation from the annual production limit indicated in the Plan was permissible, it could also be modified from time to time (under Rule 10 of MCDR) in the interest of flexibility and scientific mining. On the basis of this formulation, and after regularization through review (by IBM), only 15 out of 278 instances (spread over a 10 year period) identified by the State Government were shown (by IBM) to be the cases of violations on the ground of overproduction.[2] The responsibility for the failure to detect such overproduction of minerals (and restrict their transportation) was of course laid on the state machinery for its failure to correlate with production figures indicated in the approved mining plan.

Similar overlapping is also seen in environmental governance relating to the mineral sector. MMDR has as many as 11 rules (Chapter 5) concerning environment and IBM requires an "Environment Plan" along with mining and mine closure plans in respect of a mining project. At the same time, an Environment Management Plan (EMP) for a mining project is prepared as part of the Environment Impact Assessment (EIA) process under the Environment Protection Act 1984 and its implementation is supposed to be monitored by the Regional office of MoEF at Bhubaneswar. IBM is also required to monitor environmental protection measures in mines including air and water pollution whereas the Air and Water Acts give this responsibility to the State Pollution Control Board (SPCB). SPCB itself has an elaborate system of granting consent to establish (CTE) and consent to operate (CTO) and

[2] Ministry of Mines, D. O. No. 16/185/2010-MVI, dated 12th December, 2010, Ministry of Mines, Government of India

monitor their implementation. (It is another matter that CTE is mostly granted on the satisfaction that a mining project has obtained all other clearances including mining lease and forest clearance) Added to all this is the monitoring of the violations of the Forest Conservation Act (FCA) 1980 which is the responsibility of both State and Central forest bureaucracies. The officials of the State Directorate of Mines are, however, required to bring the cases of violations of environmental and forest laws to the attention of the relevant central and state government officials.

While officials of both the State and Central Government agencies have a number of responsibilities and considerable legal powers, they are understaffed and do not have adequate manpower to monitor the activities of even large mines, let alone small and medium-sized mines and illegal operations. There is also an unwillingness to take tough measures to bring the violations to justice. The Keonjhar district, for example, has two mining circles (out of the state's total of 14), one headed by a Deputy Director of Mines (Joda) and the other by a mining officer (at Keonjhar). They have inadequate technical staff (mining officers and inspectors) and are not able to monitor the activities of the mines in their respective areas effectively. Similar is the case of the Regional Office of IBM at Bhubaneswar which has 3 to 4 officials. Thus, the administrative capacity available is very limited and this affects the governance in the mineral sector adversely. Then there is the problem of coordination at the field or district level. Field officials of mining, revenue, forest and police departments need to coordinate and sometimes take joint action in order to prevent violations arising out of illegal mining and transportation of mineral ores. This often becomes difficult due to inherent departmentalization and with the chief official of the district, the District Collector busy with multifarious administrative issues. Following allegations of large-scale illegal mining in Keonjhar, the State Government has set up state-level and district-level task forces in order to bring about coordination among the concerned officials. These are, however, ad hoc measures and the urgency and effectiveness of such bodies normally diminish with the passage of time. It is, therefore, essential to introduce appropriate institutional reforms in order to strengthen the regulatory arrangements in the field, apart from introducing suitable economic incentives for promoting good behaviour on the part of mining enterprises.

The focus of field-level mineral administration is almost exclusively on regulatory matters; there is no involvement or concern for developmental issues such as promoting consultations with local communities or local development projects. Following the judgement of the Supreme Court in the Samatha case[3] which among other things laid down that atleast 20% of the profits (of mining enterprises) should be set apart for development needs (of the mining area), the Government of Odisha through a notification dated 15.01.2004 provided that (i) in order to protect the interests of tribal land losers, the mining projects should "earmark upto 5% of their equity towards preferential equity shares of the company for the displaced tribal persons based on the value of their acquired land for the project" and (ii) "5% of the net annual profits (of the mining project) should be spent for the development of

[3] *Samatha* Vs. *State of A.P. & Ors*, JT 1997 (6) S.C. 449

health, education, communications, irrigation and agriculture of the said scheduled area within a radius of 50kms" (presumably from the mining project).

The formulation was vague and riddled with various conceptual flaws. For example, among the mining enterprises of Keonjhar district, most are either proprietorships or private limited companies. The question of issuing preferential shares does not arise. Besides, what does a tribal person do with a preferential share and how will he manage his so-called wealth in the form of a preferential share?

Secondly, by extending the area over which the peripheral development fund could be spent to a radius of 50 kms, the notification ensured that the funds could be spent on projects which would not necessarily benefit the people in the local area affected by the relevant mining project.

In fact, this is what seems to have happened in Keonjhar district where following the notification; a sum of nearly Rs. 150 crores was collected from the mining enterprises. The funds seem to have been spent on development works in the district's urban areas (like the water supply system at Joda), even on improving the government circuit houses and offices! Finally, the notification was set aside by the Odisha High Court on the grounds that it was issued without any legal or constitutional authority.

Another instance of the distorting effects of bureaucratic involvement in local area development of mining companies is seen in the experience of National Aluminum Company (NALCO) in its bauxite mining project at Damanjodi in Odisha's Koraput district. As a matter of policy, NALCO has been allocating 0.5% of its net profit every year on periphery development since 1998-99, which was doubled to 1% since 2002-03. Forty percent of this amount is spent in the Damanjodi bauxite mining area. As per the guidelines of the Odisha Governemnt, a Rehabilitation & Periphery Development Advisory Committee (RPDAC) is to decide all policy and project matters relating to periphery development of industrial and mining projects. The Committee comprises MLAs, MPs, representatives of the Panchayat Raj institutions and NGOs of the area, with Collector of the district as its member and Divisional Commissioner as its chairman. The guidelines also provided that the entire district (Koraput) would comprise the periphery or local area of a mining project.

NALCO's experience was that although it provided substantial funds through this mechanism, the development activities suffered from the following shortcomings: no objective assessment of community needs, no involvement of primary stakeholders, expenditure spread much beyond periphery area, inordinate delays in implementation of projects and lack of accountability and sustainability (NALCO, 2011). The practice of placing funds at the disposal of local government authorities for development works resulted in public criticism on the alleged grounds of misutilization and diversion of funds, non-completion of projects, poor quality of work, etc. Extending the local area into the entire district beyond the project area of NALCO's mines also detracted from its effectiveness.

To overcome these shortcomings, NALCO set up a foundation (NALCO Foundation) for undertaking development works in the villages located within 15km radius of Nalco mines in Damanjodi. They also adopted a project-based accountability approach by ensuring participation of the primary stakeholders at grass-root level in the decision-making processes relating to identification, formulation and implementation of projects. They also decided to allocate an additional 1% of NALCO's total net profit every year to fund the schemes and programmes to be undertaken by the NALCO Foundation, making the CSR budget of the company to be 2% of the net profit.

There are two other aspects of mineral administration which require some comments. First, the issue of 'forest clearance' for mining projects under the Forest Conservation Act (FCA) 1980. It has been said that in practice the law is being construed "not so much as a tool for preserving forests, as one for deriving compensation for the diversion of forests" (Bhushan and Hazra, 2008). This compensation comes in the form of funds for compensatory afforestation and as an amount for the net present value (NPV) of the forest to be lost. Due to myriad administrative and procedural resources, there is avoidable delay in making available these funds to the local administration for creating alternate assets in proportion to the loss to the natural environment due to a mining project. Besides, there are no criteria for the distribution of NPV-amount which would ensure that the amount is spent in the area where trees have been felled.

Finally, there are two specific aspects of the EIA (environmental impact assessment) process under EIA Notification of 2006, which require some comments. Firstly, private consultants prepare EIA report for project proponents who pay them for the service. These often do not present an objective analysis of the possible environmental impacts of a project and the report ends up as a document in support of the project proposal. Secondly, the public hearing process in the field also suffers from many drawbacks, especially in a backward area like Keonjhar where most residents of the villages affected by mining projects are illiterate, and belong to the marginalized scheduled tribes and castes. Very often the proceedings are stage managed, either by the project proponents or opponents to the project or both. Sometimes local politicians and goons can create disturbance in the meetings with a view to blackmailing project proponents for irregular payments. Inter-company rivalries may also get reflected in these meetings. In the mining areas of Keonjhar, public hearings have sometimes been postponed or abandoned due to public disturbance and threat to law and order.

Conclusion

The picture that emerges from the analysis of the situation in Keonjhar is a mixed one. While larger mining enterprises have some concern for scientific mining, environmental protection and limited social development (through CSR activities), smaller enterprises are focused on the maximum extraction of mineral resources from their lease areas. There is also considerable illegal mining. In Keonjhar, mining is being carried on without any concern for the environment's "carrying capacity" and infrastructural limitations. Engagement with local population and socio-economic development in the mining project area are neglected issues

both by the mining industry and the government agencies which mostly focus on regulatory matters. Multiple central and state agencies create problems of coordination and are ineffective in ensuring sustainable mineral development.

Chapter 8

GOA
Case study: Iron Ore Mining [1]

Goa, one of the smallest states of India on the country's western coast, on the Arabian Sea, is famous for its golden beaches and undulating green landscape that attracts millions of tourists from all over the world every year. It consists of a chain of imposing hills, valleys and ravines, constituting the Western Ghats on the east, the coastal plains in the west and intermediate undulating tracts and planes in between.

It is also an important iron ore producing state in the country and accounts for nearly sixty percent of India's iron ore exports. Goa is endowed with a number of mineral resources. Iron ore, manganese and bauxite are the major minerals of economic importance (see Table 8.1) in addition to other minerals (including minor minerals) like limestone, clay, basalt, laterite, river sand, murrum etc.

Table 8.1: Mineral resources and remaining reserves in Goa (as on 1st April 2005)

(In '000 tonnes)

Mineral	Goa (2)	India (3)	Percentage share in India (2/3)
Manganese	19057	378569	5.0
Iron ore (Hematite)	712, 948	14630387	4.87
Iron Ore (Magnetite)	214169	10619481	2.02
Bauxite	50355	3289817	1.5

Source: IBM. 2011. *Indian Minerals Yearbook 2009*, Indian Bureau of Mines (IBM), Nagpur, January.

Nearly 99 percent of the total value of mineral production in Goa is contributed by iron ore (see Table 8.2).

Iron ore production which ranged between 12 to15 million tonnes per annum during 1992 to 2001 increased considerably during the first decade of the 21st century due to the spurt in the world demand and prices of the mineral (see Table 8.3).

[1] Data (both qualitative and quantitative) collected through questionnaires and personal discussions with government and mining company officials, non-government organizations, civil society and local community groups, during visits to Goa, specifically to various iron ore mines (Annexure 13) in the mining regions of the state.

Table 8.2: Mineral Production in Goa

(In tonnes, in '000 Rupees, unless otherwise specified)

Mineral	2006-07		2007-08		2008-09 (provisional)	
	Quantity	Value	Quantity	Value	Quantity	Value
All Minerals (excluding atomic minerals)		19508109		31946859		38973677
Bauxite	111097	8332	129259	9694	514996	31097
Iron Ore (in '000 tonnes)	28723	19438965	30526	31879422	32969	38884815
Manganese Ore	3460	3562	580	493	680	515
Minor Minerals		57250		57250		57250

Source: IBM. 2011. *Indian Minerals Yearbook 2009*, Indian Bureau of Mines (IBM), Nagpur, January.

Table 8.3: Production of Iron Ore in Goa

Calendar Year	Iron Ore including black (in million tonnes)
2001	15,737,701
2002	17,371,039
2003	23,727,937
2005	25,440,925
2007	31,327,805
2008	32,720,536
2009	41,038,392

Source: "Goan Mineral Ore Exports – Selected Statistics", Goa Mineral Ore Exporters' Association, Goa, 2010

Iron ore mining is, therefore, currently the major extractive industry in Goa with mines along the Western Ghats in the east where a mining belt stretches 65 kms from south-west to the north-west covering about 700 square kms (Central Pollution Control Board, 2008). Unlike in other mineral-rich states like Odisha and Jharkhand, all the mines in Goa are concentrated in a small area comprising four talukas of the state, namely Bicholim, Sattari, Sanguem and Quepem.

The entire mineral belt of Goa has been leased to private mine operators. In 2011, there were 336 mining leases (concessions) in the state, over an area of nearly 24,168 hectares comprising 8 to 9% of the Goa's geographical area (3,70,200 hectares) (Directorate of Mines, 2011). However, at any point of time, there are about 100 mining leases under active mining operations, covering not more than 2.5% of the geographical area, apart from roads, plants, stock piles and barge loading areas (Kalavampara, 2009).

Another distinguishing feature of Goa mining is that the area of individual mining concessions is limited to a maximum area of 100 hectares; in fact out of the total number of leases, as many as 73 mining leases had each an area of less than 50 hectares (TERI, 1998). Small size of the mining lease hinders proper development of mines infrastructure, in particular, the arrangements for proper stockpiling of mineral ores and waste materials.

Also, Goa's iron ore is of relatively low grade with iron (Fe) content that ranges from 50 to 62 percent (Venkatesan, 2010). Being more friable, Goa ore generates a higher quantum of fines. These qualities make it unsuitable for the country's steel plants which use high grade (Fe content of 65% or more) hematite ore, which is available in abundance in the states of Odisha, Jharkhand, Chattisgarh and Karnataka.

Goa's iron ore industry is, therefore, totally export-dependent and all the iron ore produced in the state is exported to China, Japan, South Korea, Taiwan and the European Union. There is also a huge international demand for Goan ore as it is often used as a product blend to make up for the optional silica and aluminum content with ore from other parts of the world. Of course, the ore being of low grade has to go through an elaborate process of dry and wet screening (including beneficiation) in order to meet the requirements of the buyers which are often for sinter grade ore fines of size less than 10mm (-10mm) with iron content of more than 62%.

There are a few difficult conditions under which Goa iron ore mines operate that have impact on environment and local communities. Mining in several places are carried out below water level requiring dewatering of pits for operations to continue. This increases working depth necessitating transport problems within the mine. Besides, unlike in Odisha or Jharkhand where iron ore mines ore located in remote forest areas, most Goan mines ore are located in the vicinity of inhabited villages. Dewatering has adverse effect on the water table of these surrounding villages. Drilling and blasting are also restricted due to the presence of the populated areas and due to limited lateritic overburden.

Goan iron ore has a relatively high overburden to ore ratio (of an average of about 2.5 to 3:1) and thus generates a large quantity of waste material.[2] Since the size of mining leases is small, mining companies often acquire land outside their lease area to dump waste material. Lands being in short supply, waste dumps are typically steep with slopes greater than 30 degree and height of 30-50 metres. Many waste dumps are situated in the upper part of the valley regions and during the rainy season run off from dumps settle down on agricultural fields and in water bodies.

However, Goa has a logistic advantage of using inland road and river transportation to move iron ore to its ports for exports. The transportation from the mines to jetties, at an average distance of about 10-15 kms, is by trucks and from the jetties to the ports on barges through the inland waterways of Goa. These work out as more efficient and competitive compared to transportation through railway wagons.

[2] From discussion during field visits

Not only are the mines and barge loading jetties near human habitats, the roads which are used to carry mined ores by trucks to the jetties also pass through the inhabited villages. Congestion in road network due to limited width of the roads and resultant dust pollution arising from ore-transport pose a major problem for the iron ore industry and local communities.

Mining operations are carried out by open cast method forming systematic benches and the pits are laterally extended in stages in all directions with increasing depth. In general, bench heights and width are maintained at 7 metres and 15 metres respectively. The mining operations involve systematic removal of laterite overburden, mining of lumpy ore zone followed by powdery ore zone, in that order. Soft laterite is removed mostly by ripping and dozing. Drilling and blasting is done only in hard laterite and lumpy ore zone, if absolutely necessary. Iron ore mining in Goa is fully mechanized, comprising a variety of heavy earth-carrying and transport equipment (shovel and dumper). Most large mines have also beneficiation plants comprising crushers, classifiers, hydrocyclones, log washers and magnetic separators.

Iron ore mining has had a positive and significant impact on the economic development of Goa. There have, however, been several adverse effects on environment and local communities living in the vicinity of the mining areas that have attracted considerable attention from several quarters. Goa has fragile ecosystems and mining operations in the Western Ghats have had impacts on forests, agricultural land and water bodies including the two main rivers (Mandovi and Zuari). Some of these problems are due to the unique features of mining in Goa and a few others as the result of inappropriate mining practices and poor environmental management.

Besides, unlike in Odisha or Jharkhand where local communities near the mining areas are illiterate and backward, the population in Goa is educated, has a higher degree of awareness and is not willing to accept environmental degradation in their habitats. There are also active and articulate civil society and environmental groups who are vigilant about environment and carry on campaign, through public agitation and court cases, against what they consider as unacceptable practices of mining companies that have an adverse impact on environment and local communities.

There are a number of studies and reports prepared by reputed organizations such as The Energy and Resource Institute (TERI), the Centre for Science and Environment (CSE), the Central Pollution Central Board (CPCB) and the National Environment and Engineering Research Institute (NEERI) which document the negative environmental consequences of mining in Goa. The major problems identified are deforestation, land degradation, air and water pollution.

Deforestation

According to the Government of Goa (Forest Department), the total surface area of the state is 3,70,200 hectares out of which 1,42,400 hectares are classified as government forests and 20,000 hectares under private forests. Almost 70 percent of the total forest area in the state is located in the four mining talukas of Sanguem, Satari, Bicholim and Quepen. Most of the mining areas in Goa are located on laterite thorn forests which consist of irregular open scrub of stunted trees of deciduous habitat and thorny trees, with thin undergrowth (Central Pollution Control Board, 2008). Of course, there are also other important species like shisham, bamboos, teak and canes in these forests. Mining has resulted in the diversion of forest land and loss of vegetation cover in the mining areas. The total forest area affected by mining during 1988-1997 had been estimated at about 2,500 hectares and it was projected that about 100 hectares more of forest area would be affected by mining during the following decade. The diversion is of course regulated by the provisions and requirements of the Forest Conservation Act, 1980.

Land Degradation

Land degradation in the mining areas has been caused by mining operations, due to land utilized for storing waste dumps and due to siltation of agricultural land from the surface run offs from the waste dumps. Mining pits change the landscape, apart from removing top soil and overburden, so do the waste dumps which are located on flat land or hill slopes. Most of these waste dumps are outside the mining lease areas due to the small size of leases and step terraced up to 50 meters high with steep slopes. Surface run offs from these dumps affect agricultural land in the surrounding villages as also water bodies through siltation. According to Venkatesan (2010), around 250 hectares of agricultural land located close to the mines have already been affected during the 1980s.

Similarly, NEERI (2009) had stated that the topography of Sirigaon village (Bicholim Taluka) in North Goa had been altered significantly due to the open cast mining activity and large depressions have been created in the form of mine pits in place of "topographic heights" existing earlier. On the basis of soil analysis results, the report also concluded that "the silt deposition from mining overburdens has degraded the soil fertility in the agricultural fields of the Sirigaon village". The mining companies in Goa are no doubt taking various measures for waste dumps rehabilitation as part of their mining activity. From a study of satellite imagery (1997) and aerial photographs (1988), it was estimated that nearly 300 hectares of waste dump have partially or fully been vegetated through afforestation measures. Even then there is a back log of a large extent of dump area for rehabilitation (Central Pollution Control Board, 2008).

Air Pollution

Air pollution is mainly caused by dust emissions from mines, particularly at the time of loading and unloading of material and subsequent transport from mines to river barges.

The major air pollutants are (i) dust or particulate matter of various sizes and (ii) gases such as sulphur dioxide, oxides of nitrogen, carbon monoxide etc. from vehicular exhaust. Dust is the single largest pollutant from iron ore mining and associated operations.

Major mining companies monitor and record ambient air quality data in their respective mining areas. Analyzing the data for the 1995-96, TERI (1998) had concluded that the SPM concentration levels in almost all operating mines exceeded the air quality standards prescribed (for industrial areas) by the Central Pollution Control Board (CPCB). During the visit to four selected mines in 2011, it was seen that due to dust suppression measures (like spraying water in different areas of the mines) taken by the most mining companies, the dust concentration levels were below the CPCB standards inside these mines. As the drilling and blasting in the mines are done only in the rainy season, the dust generation is limited to fair weather because of transportation and dry processing of ores. During excavation, the dust generation is much less because of high moisture content in the ore. The concentration of sulphur dioxide, oxides of nitrogen as well as that of lead and carbon monoxide were found to be insignificant.

Even then dust pollution is a major problem for the villagers around the mines mainly due to the clustered nature of these mines and transportation of ore on narrow, gravel roads by trucks making thousands of round-trips every day from the mines and beneficiation plants to the jetties on river fronts for loading unto barges. The problem is more acute in the mining areas of North Goa in comparison to South Goa. Under court orders, trucks are now being covered to transport iron ores on these roads and the government is planning to construct dedicated traffic corridors (roads) in the mining areas for exclusive use of trucks carrying ores to jetties instead of using other public roads which apart from dust pollution also results in frequent traffic jams and accidents.

Water Pollution

Water quality in the mining areas is affected due to the discharge of water from mine pits, waste water from beneficiation plants and workshops and rain water run-off from waste dumps and surrounding areas. Occasional spillages of oil by the barges during ore transportation are also a source of water pollution in Goa.

Goa has both dry and wet mine pits with a considerable number of mines (wet pits) operating below the ground water table. These wet pits discharge water which is slightly acidic with high concentration of suspended and dissolved solids, but is not toxic to biological life. Its uncontrolled discharge into the rivers could impact turbidity. Similarly, waste water from beneficiation plants also needs to be recovered and recycled in the process in order to prevent or minimize the discharge (through seepage from tailings ponds) of water with suspended solids into the river-system. Similarly, run offs from mine dumps carry huge amount of mine rejects which could get deposited in land or on the bed of the rivers, nallahs and streams in the area.

Water quality data from various iron ore mines presented in Central Pollution Control Board (2008) show that in Goa mines different major parameters were within the prescribed standards. The PH, for example, varied from 5.3 to 9.6 with an average of 6.87 (out of 103 observations) as against the prescribed standards of 6.5 to 8.5. The dissolved oxygen and solids levels were also within the limits. Since pit water, effluents from beneficiation plants and mine dump run offs do not have organic pollutants, TERI (1998) had concluded that the water of Goa's rivers "would fall in class B or C of CPCB ambient water classification". It also came to the conclusion that the major effect of mining activities on the river quality is the presence of high turbidity due to discharge of silt particles and the worst affected rivers were Bicholim, Madei and Khardepur.

Another problem that is faced is that deepening of mines (located below the ground water level) has led to loss of recharge area of the wells and springs that serve the nearby villages. NEERI (2009) had come to the conclusion that the drying up of the (Sirigaon) village dug wells could be attributed to the loss of recharge area as well as the deepening of the mine. Of course, artificial recharge can be undertaken through roof top rain water harvesting, water absorption trenches, sub-surface dykes and other such appropriate methods. The state government and mining companies have, however, installed piped water supply scheme in the Sirigaon village.

While no doubt environmental problems have arisen due to iron ore mining, the industry has also made significant contribution to Goa's economic development. The iron ore industry is the second most important industry after "Tourism" and its contribution to the state domestic product, export and employment has been substantial. Table 8.4 shows the that the share of "Mining and Quarrying " in the net state domestic product of Goa, at current prices with base 1999-2000, was only 3.3 percent in 2000-01; it rose to 5.18 percent in 2004-05 and to 9.07 percent in 2007-08.

Table 8.4: Share of different sectors in Net State Domestic Product of Goa at factor cost at current prices (Base: 1999-2000)

(In Rupees Crores)

Industry	2000-01		2004-05		2007-08	
	Value	% Share	Value	% Share	Value	% Share
Agriculture and Allied Activities	582.4	9.82	779.9	7.76	1063.5	6.42
Industry	1871.6	31.55	3887.3	38.72	6361.6	38.42
of which (Mining and Quarrying)	(194.9)	(3.3)	(520.7)	(5.18)	(1503.1)	(9.07)
Services	3476.5	58.62	5372.2	53.51	9130.1	55.4
NSDP	5931	100	10039	100	16555	100

Source: Handbook of Statistics on Indian Economy, (2009-10). Reserve Bank of India (RBI), 15 Sept 2010

It has been mentioned earlier that Goa's low-grade iron ore is totally exported out of the country which makes the state the biggest exporter of iron ore from India. The iron ore export from Goa first started in the 1940s when the quantity exported was of the order of 40, 000 tonnes. It increased to an average of 10 million tonnes in the 1970s and was of a little less than 15 million tonnes (average) in the early 2000s. Since 2004-05, there has been a further jump mainly due to the high demand for even low-grade iron ore for China (see Table 8.5).

Table 8.5: Export of Iron ore from Goa

(In million tonnes)

Year	Quantity
2004-05	23.30
2005-06	25.54
2006-07	30.89
2007-08	33.43
2008-09	38.07
2009-10	45.68

Source: "Goan Mineral Ore exports", Goa Mineral Ore Exporters' Association, Goa, 2010

Also, among all the Indian ports, Goa exports the maximum share of total iron ore export from the country. Most of the exports comprise Goan ores with some non-Goan ore (mainly from Karnataka) passing through the Goan ports. Nearly 75 percent of Indian iron ores is exported through five major ports, namely Goa, Paradeep, Vizag, Chennai and Haldia. Their respective shares in iron ore exports during the year 2008-09 and 2009-10 have been shown in table 8.6.

Table 8.6: Iron ore exports through top five major ports of India during 2008-09 and 2009-10

(In million tonnes)

Port	2008-09	2009-10
Goa	45.59 (43.0)	53.13 (45.2)
Paradeep	13.67 (12.9)	12.27 (10.4)
Vizag	8.33 (7.8)	10.15 (8.6)
Chennai	8.28 (7.8)	7.43 (6.3)
Haldia	8.58 (8.1)	7.14 (6.0)
All India	105.86 (100)	117.37 (100)

Note: Share (%) in brackets

Source: "Goan Mineral Ore Exports – Selected Statistics", Mineral Ore Exporters' Association, Goa, 2010

Since nearly 45 percent of iron more exports is through Goa, its economy has gained substantially through export earnings which may be somewhat less than what the equivalent quantity of high grade ore would fetch in the international market.

The mining industry provides both direct and indirect employment to Goa's work force. Apart from direct employment of skilled and unskilled persons in mining operations, it also creates employment opportunities in transportation business – both road transport and inland waterways – which serves the mining industry. Venkatesan (2010) has estimated that nearly 71 percent of the transportation sector is "dependent on the Iron ore sector as the prime mover". Mining activity, according to TERI (1998), provided "the trigger to boost the economies of the mining talukas and put them on higher level of economic activity" and resulted in their diversification. In addition to generating business and other economic activities in the mining areas, iron ore exports also create employment in trade, finance and hospitality-business.

According Venkatesan (2010) estimates (shown in table 8.7), 75,000 persons were employed in the mining industry during 2008-09 which was close to the approximate estimates of employment in the tourism sector. Given that the unemployment rate in Goa was about 8.7 percent of the population (20 percent of labour force estimated at 5, 82,000 persons in 2008-09), the mining industry is a crucial sector in Goa's economy. In fact, on the basis of the social cost-benefit analysis done as part of the report, NCAER has come to the conclusion that "the social benefits far outweigh the environment costs of operation of the mining industry in Goa".

Table 8.7: Mining and Quarrying related Employment for Goa (2008-09)

Mining and Quarrying (iron ore) (Direct) (Indirect)	30,000 (15,000) (15,000)
Transportation specific to "Mining and Quarrying" (Both road transport and inland waterways transport)	45,000
Total direct and indirect employment in Mining and Quarrying	75,000
All other manufacturing	70,000
Total work force	4,55,000

Source: Venkatesan, R. 2010. "A Study of Contribution of Goan Iron Ore Mining Industry," National Council of Applied Economic Research (NCAER), New Delhi, September.

In Goa's civil society, there is an appreciation of the sector's contribution although there have been various complaints against iron ore mining mainly due to the adverse environmental consequences. In particular, some leading non-government organizations like Goa Foundation and other environmental activists have opposed mining for its adverse effect on ecology in Goa. Some leading activists have argued that mining in Goa needs to be stopped as the state's villages in the plateaus and valleys along the Western Ghats have been ecologically ruined due to indiscriminate (even illegal) mining.

The assessment may not be that extreme among the general population of the state. In fact, during the focus group discussion in some of the villages in the mining areas, the residents complained about adverse impact of mining on land, water and air but also were of the view that cessation of mining activity would cause considerable disruption in their local economy and living standards. To give an example, in February 2011, when hundreds of residents of Curchorem, Sanvordem and surrounding areas in North Goa, under the leadership of Gaon Rakhon Jagrut Manch, Curchorem protested against the widening of Tilamol-Sanguem road (as that would have increased vehicular traffic for carrying mineral ores), their demand was to build mining by pass roads (exclusive mining corridors) in their area. The agitators made it clear that they were not against mining or mining companies but were demanding orderly arrangements that would prevent dust pollution in their area[3].

In these circumstances, it is essential that proper environmental protection and social development measures are adopted to meet these genuine grievances of a relatively conscious population which is not prepared to put up with environmental degradation due to mining. We will next examine what measures mining companies are already taking in Goa in order to meet this challenge.

In Goa's mining industry, the five large and prominent firms are Sesa Goa, Chowgule, Salgaoncar Mining, Formento Resources and Timblo group. There are also other medium and small firms. Although all of them have mechanical operations, there are variations in their environmental behaviour. Most of the existing mining enterprises have taken specific measures to conform to the government regulations in respect of the conservation and development of minerals and protection of environment. However, in the case of larger firms, there is a more proactive approach in meeting the challenges posed by environmental degradation and socio-economic problems in the mining villages. To that extent, these larger firms go beyond what is required by the legal requirements and seek to incorporate good management and environmental practices in their operations. Some of the more important measures are described below.

A. Scientific Mining

Systematic and scientific mining is reflected in the practices concerning (i) mine planning, (ii) mining development and operations, (iii) mineral waste management, (iv) tailings management and (v) mine closure plans.

(i) Mine planning

Major mining companies like Sesa Goa, Formento and Salgaoncar make use of modern technology in mining operations. For instance, Sesa Goa uses state of the art hardware and software packages for survey, resource modeling, mine optimization and exploration that help in scientific mine planning. These facilitate identification of the quality

[3] From discussion during field visits

and quantity of deposits and hence the potential mining areas, leading to optimal utilization of resources and their conservation. Exploration is carried out with advanced technology machines to limit the breaking of ground.

(ii) Mining development and operations

Excavation of minerals and mining operations are also undertaken through high capacity excavators and dumpers and heavy duty ripper dozers and rock breakers are used in order to avoid drilling and blasting, thereby controlling noise and ground vibration. Drilling and blasting is done infrequently only to remove very hard formation. There is a continuous up-gradation of technologies in mining equipment and methods as well as in beneficiation technologies. World class equipment incorporating advanced technologies such as log washers, dewatering classifiers cyclones, hydrocyclones and magnetic separators is used in beneficiation plants in order to upgrade the quality of ore and ensure high recovery of concentrates. As a result, the mines present a picture of systematic terraced benches and wide internal haul roads, neatly maintained through good management and mining practices.

(iii)Mineral waste management

In view of the high overburden to ore ratio, management of solid waste material presents a difficult problem. In most cases, waste dumps are outside the mining lease areas. Those are suitably terraced with proper height and angle of slopes. Each dump is terraced after every 10 metres of height and inward slope is maintained on dump surface so as to channelize run-off water through the garland drains in to the series of settling ponds at the toe of the dump. Laterite stone walls are constructed all around the dumps to control wash off, if any, from the dumps during monsoon. Moreover, geo-textiles are used on finalized dump slopes so as to prevent direct contact of rain with dump surface thus minimizing the dump run off. Special erosion control grasses are used as a cover crop to further negate the dump erosion. At most mine sites, jute/geo-textiles are used for controlling soil erosion and also for establishing grass cover. Matured or 'dead' waste dumps are regularly brought under plantation.

Box 8.1: Dump slopes stabilized with geo-textile and mixed herbs and grasses

(iv) Tailings management

Tailings from beneficiation plants are discharged into tailing ponds. Exhausted mine pits are often used as ponds. Tailings are channelized into mine pit wherein it is treated with hydrated lime and flocculants. The water from the tailing ponds are either recycled in the beneficiation plant or discharged into the natural water course. The tailings which are of less than 325 mesh size are used for backfilling of the exhausted pits, with the prior permission of IBM.

(v) Mine closure plans

Mine closure plans are prepared by most companies primarily to meet the legal requirements under MCDR 1988. What will happen to the mining area or to the people living near a mining project when the minerals are exhausted do not seem to enter into the calculus of these closure plans. All the working mines have IBM-approved mining plans, and mining schemes as well as progressive mine closure plans which are reviewed annually. Bank guarantee is provided to IBM in respect of these plans. However, there is rarely consultation with the local communities either at the stage of preparation of a mine closure plan or its review. Most mining companies claim that since the mines are still operational, no initiatives are required on this count except to the meet the legal requirements under MCDR. Sesa Goa's Sanquelin mine, however, is an exception and constitutes an outstanding example of mine closure plan prepared and implemented successfully.

B. <u>Environment Protection and Biodiversity</u>

(i) Air quality management

Most large companies have in-house laboratories to analyze ambient air samples for suspended particulate matter (SPM) and respirable suspended particulate matter (RSPM). The ambient air quality in the mining locations is regularly monitored so as to keep the parameters with the prescribed limits. Effective dust management measures are taken to ensure this objective. The principal measures adopted are the following:-

- Water sprinkling on haul roads and in the premises as of the mining lease. Fleets of water tankers maintained for the purpose.
- Dust extractors placed in the crushing and screening plants. In Sesa Goa's mines, crushing of mineral takes place in the closed system where dust is suppressed during the crushing process.
- The trucks carrying ore covered with tarpaulin to prevent dust dissemination during transportation. The trucks pass through upgraded wheel wash system before leaving the mining premises.
- Plantation on active dumps, on both sides of haul roads and creation of green belts around the mining areas act as a sink for pollutants.

However, as mentioned earlier, dust pollution affecting the mining villages as a result of transportation of ores by trucks on narrow gravel roads from mines to jetties continues to be a major problem.

(ii) Water pollution and waste water management

Major companies regularly monitor ground and surface water in the surrounding areas in order to keep the parameters within the prescribed limits and report the results to the regulatory authorities. The major steps taken in respect of waste water management and prevention of water pollution are the following:-

- Mine water is drained out and passed through a series of distilling tanks and sometimes treated with chemicals before being discharged into the natural water bodies.
- Run-off water from waste dumps are channelized through garland drains in to the settling ponds at the toe of the dump and this water is treated, if required, by adding lime and flocculent before being discharged into natural bodies.
- Exhausted mining pits are used either for rain water harvesting or as tailing ponds. All the water required for beneficiation process is met with this rain water. Tailings are treated with hydrated lime and flocculants. The overflow is channelized into other pits which are then reused for beneficiation. About 70 per cent of water is recycled and reused, with balance 30 per cent being evaporation and other losses.

(iii)Rehabilitation of degraded land

Reclamation and rehabilitation of mined out and degraded land is an important area of activity of many mining companies in Goa. Top soil, wherever, encountered is separately collected and stocked and later utilized for plantation.

The mined out pits are either backfilled and reclaimed or utilized for rainwater harvesting in order to utilize the water in the mines and/or for recharging the groundwater of the surrounding areas. Plantation on the reclaimed land appears to be the most preferred method for rehabilitation of degraded land. Many companies have their own nurseries where large samplings and suitable species are developed for plantation. Care is taken to select local species in order to promote biodiversity conservation. Earlier plantation was restricted to fast-growing acacias; now a variety of local species like Bombex (silk cotton), bamboo and Trema (charcoal tree), commercial and medicinal plants like cashew, jatropa, jamun, amla etc. are preferred.

Box 8.2: Reclamation of mined out land at Sesa Goa's Sanquelin mine

In this connection, the measures taken for rehabilitation of mined out or degraded land by Seas Goa, especially in their Sanqueline mines (106 out of 203 hectares) in Mauliguem Village of Bicholin taluka in North Goa are worthy of special mention. The good practices for biodiversity conservation adopted there and the results achieved are an example for other mining companies all over the country. Sesa Goa's strategy and methods for reclamation of its mined out areas and for the stabilization of waste dumps seem to have evolved through the following stages:-

- In the past, the emphasis was on promoting fast-growing species like acacia in order to stabilize the degraded land quickly and create a green cover.
- In the next stage, acacia was promoted with cashew plantation through a mixed approach.
- Another approach tried later was growing acacia in the beginning and after stabilization of the dump surface, thinning the acacia plants and replacing these with local species and horticulture. This improved the biodiversity of the area.
- Since 1998, with the improvement in reclamation technology through research, an "integrated biotechnological approach in mine land reclamation" is being adopted. Under this approach, all the native plants are inoculated at the nursery stage with

biofertilizers (Rhizotria and Azactbacter) and then the plants are planted in bigger pits with organic manures, top soil and mine spoil. Aftercare is provided for three to four years for these plants to grow in girth, branching pattern etc. In addition, horti-silviculture approach such as floriculture, pulses and cereal cultivation, bamboo, spice and medicinal plants cultivation are also adopted.

Sesa Goa's Sanquelin mines is easily the model reclaimed mine in India's iron ore mining industry and is an example of how a mined out area can be fully restored to its original (or even better) natural condition by systematic reclamation and rehabilitation. All the best practices in reclamation, agri-horticultural approach, water body development, pisciculture and development of medicinal plants garden, have been adopted. Exhausted mining pit has been converted to a pond for pisciculture and horticulture species of the Goan region (cashew, mango, coconut, jackfruit etc.) have been grown on waste dumps along with spice plantations and medicinal plants. These are irrigated by rainwater harvested in the mining pits. Athletic facilities like playgrounds, football academies and even a technical/industrial training school have been established on the reclaimed land.

C. <u>Stakeholder Engagement</u>

It has earlier been mentioned that the civil society and the population in the mining villages in Goa are much more conscious of their rights than the relatively backward and tribal population in the mining areas of Odisha and Jharkhand. This results in greater sensitivity of mining companies to their concerns and it is noticed that they often take proactive steps in engaging the local communities in their activities, especially in the areas of environment and economic development. In most mining companies, there is no formal institutional mechanism for stakeholders' engagement or consultation on a regular basis. Typically it takes place during public hearing for environmental clearance of mining projects and in planning and implementing local development works. Also, when grievances arise due to adverse environmental impact of mining particularly as a result of judicial proceedings, the mining companies have to negotiate with the representation of the local communities for resolving the problems. The nature, extent and quality of engagement though vary among companies. Sesa Goa, for example, claims that formal stakeholders' consultations process has been started at two major units – Kirlapel village panchyat in South Goa (near Codli mines) and Navelim and Amona panchyats. A standing committing comprising representatives of the local panchyats, non-government organization, representatives of educated persons of the area and of the self-help groups along with the company's representatives has been formed. This mechanism helps the company in better understanding the community's needs and also in planning and implementing local development programmes. Other mining companies have mostly informal arrangements to interact, when needed, with the representatives of local panchayats and communities for undertaking local development works.

D. Local Community Development

In the absence of any legal requirement, no mining company in Goa (as in other parts of the country) conducts any comprehensive social impact assessment of the villages affected by a mining project at the feasibility stage. However, as the project progresses they may be doing specific studies for taking up individual development works. There is also a higher degree of consciousness among mining firms of the need to undertake socio-economic development programmes in the villages affected by their activities. While larger companies have created in-house institutional mechanisms to handle this problem, the smaller enterprises' response is more ad hoc, responding to the demands of the villages during public hearings for environmental clearances or as a result of interactions during the day-to-day operations of the mines. The major mechanisms adopted for promoting local socio-economic development are the following:-

- Employment of local villages in the mines;
- Deployment of transport trucks and machineries owned by local villagers;
- Small contracts to the local people depending upon their knowledge and capacity;
- Village infrastructure development – construction and maintenance of village roads, tanks, wells, tube-wells, school buildings, temples, bus stops, etc.
- Assistance in farming through provision of improved seeds, fertilizers and saplings, knowledge of good agricultural practices, repair works to sluice gates, small irrigation projects and canals;
- Skill development – driving, computer training, mechanics, electricians, etc.
- Educational assistance – scholarship to students, distribution of books, note books, uniforms, school bags and transport facilities;
- Provision of health care facilities – hospitals and community health centres with doctors in mining villages, free medical camps for eye diseases, cataract, diabetes, HIV AIDS, malaria, etc.;
- Promotion of sports and sports facilities among village youth;
- Promotion of self-help groups for women (women empowerment) with financial assistance for their programmes

Some of the larger companies have set up trusts and societies for carrying out these tasks in a focused manner. For instance, Fomento Resources have set up the Ashiyana Trust in order to focus on the welfare of women and children. Sesa Goa has established the Sesa Community Development Foundation in order to promote community development in and around the mining operations of the company. The foundation is a registered society under the Societies Registration Act and focuses on the development of youth and the community through provision of technical education and sports training to the interested young persons. It also undertakes various community development initiatives. As a part of the company's 'post-mine closure plans', the foundation has established the Sesa Technical School and two sports (football) academies on the reclaimed mined-out area in Sanquelin in North Goa. The students of the technical school specialize in the trades of machinists, fitter, electricians and

instrument mechanic and are able to secure placements in large Indian and multi-national companies.

Box 8.3: Social Development Activities

Sesa Goa has also a range of need-based development and sustainable livelihood promotion programmes being implemented in its mining areas, through an approved annual budget. The thrust of these programmes is on education, health, agriculture ("back to farming"), minor irrigation, women empowerment and village infrastructure development. The company's personnel dealing with these programmes and issues have close and continuous interaction with the community leaders in the surrounding villages.

Another unique feature in Goa is the formation (in 2000), by fourteen major mining companies, of a non-government organization called the Mineral Foundation of Goa (MFG) which undertakes socio-economic development projects within the mining belt. These companies contribute to the operation of MFG on a formula based on their respective annual production. The typical projects include soil and water conservation works, educational

support, women empowerment by promoting economic activities and micro enterprises through self-help groups (SHGs), health programmes, environmental conservation and village infrastructure development. Besides, construction of roads and bridges are undertaken jointly with the Goa Infrastructural Development Co. Pvt. Ltd., an initiative of the mining companies of Goa.

E. Transparency and accountability

There seems to be relatively more transparency and accountability in the behaviour of the mining companies in Goa, in their relationship with the civil society. This is primarily due to the existence of a vigilant and proactive population and non-governmental organizations in the state. The concerned executives of mining companies regularly interact with local community leaders in order to sort out the land, water and other infrastructural problems resulting from mining and/or for initiating local development works. Some of the large companies, like Sesa Goa, publish annual sustainable development reports and other similar documents for the people.

The foregoing account refers to the activities of most mining firms in Goa who are long-term players in the industry. There are, however, a few small enterprises whose interests are short-term. Naturally their environmental behaviour leaves much scope for improvement. For example, one comes across some mining firms which are operating leases on the basis of power of attorney from the original lease holders and are, therefore, keen to recover their invested funds as quickly as possible. Their behaviour is mostly compliance-driven and not so much geared to maintaining environmental and social integrity.

The regulatory regime for mines development and environmental protection is on the similar pattern as that of other mining states. Both the Department of Mines of the Government of Goa and the Indian Bureau of Mines (IBM) of the Government of India are concerned with the implementation of the provisions of MMDR Act, 1957. While the State Department of Mines is mostly concerned with the grant, renewal and nomination of leases (MCR 1960), IBM is responsible for ensuring scientific mining through enforcement of the provisions relating to mining plans and schemes, mine closure plans and protection of mines-environment. The State Pollution Control Board is required to monitor the implementation of the Air Act, 1981 and Water Act, 1974, through the usual methods of CTE (Consent to Establish) and CTO (Consent to Operate). Environmental clearance of new mines and expansions as well as forest clearance for projects come under the purview of the Central Ministry of Environment and Forests (MoEF) with the State Government's Department of Forests involved in the various processes for such clearance including withholding of permission to divert forest land. The State Department is also required to monitor afforestation by mining companies.

As in other mining states, the "institutional confusion" in the regulatory regime for mining is also evident in Goa. Besides, the institutional capacity to implement the regulatory provisions is weak. For instance, in the Directorate of Mines and Geology, the technical staff

apart from being small in number, comprise mostly of geologists. The organization's capacity to monitor the operations of the mining companies is limited. Other agencies also exhibit similar attributes. This has led TERI (1998) to conclude that "the mining companies (in Goa) have been operating very much in an 'implementation' vacuum, since most of the bodies charged with implementation have not taken their roles seriously".

As in other mining states, there have also been allegations of illegal mining in Goa. The Justice M.B. Shah Commission of Inquiry for Illegal Mining of Iron Ore and Manganese, in its interim report on Illegal Mining in Goa, submitted to the Ministry of Mines, Government of India in March 2012 seems to have blamed both the state and central government agencies for their failure to prevent illegal mining and export of iron ore to foreign countries. The illegalities ranged from violation of environmental norms to mining outside the permitted areas and also included operation of several front companies in the mining industry[4].

It is necessary to put in place a regulatory regime which ensures effective coordination among various bodies to ensure that the mining operations use good environmental management practices and implement community development programmes in order to improve the social and economic conditions of the mining villages. The particular focus needs to be on ensuring that some of the mining wealth generated is reinvested into building human and social capital in the mining areas with a view to taking care of the time when the minerals ore is fully depleted and mines are closed. The State Government, in particular, its Department of Mines and Geology has to transform itself into an effective agency in order to ensure this outcome.

Conclusion

Goa's iron ore mining presents a picture somewhat different from that of the mining states like Odisha and Jharkand. The state's iron ore resources have relatively lower Fe content and are mostly exported to other countries. Mining takes place under relatively difficult conditions, near to crowded residential villages. Mining has both positive and negative effects on Goa's economy, environment and people. The local communities in the mining areas have a higher degree of awareness about environmental consequences than that of the communities in relatively backward states of Odisha and Jharkand and therefore, they are unwilling to accept damage to environmental and social integrity in their habitats. This has compelled the mining companies to behave more responsibly and undertake active measures for engagement with the communities and bring about socio-economic development in the villages near the mines. Apart from individual initiatives, a few major companies have formed the Mineral Foundation of Goa (MFG) to pool their resources for socio-economic development projects. Sesa Goa's Sanquelin mine in

[4] "Shah Commission report given to Centre", Times of India, March 16, 2012 available at http://articles.timesofindia.indiatimes.com/2012-03-16/goa/31201025_1_illegal-mining-shah-commission-report-iron-ore

North Goa is easily the model reclaimed mine in India's iron ore mining area. There appears to be relatively more transparency and accountability in the behaviour of mining companies due to vigilant pressure from the civil society.

Chapter 9

KARNATAKA
Case Study: Legal and Illegal Mining in Bellary [1]

Karnataka accounts for less than five percent of India's mineral production but has the distinction of being the main producer of gold in the country and also a leading producer of iron ore, chromite, felsite and dunite. It has a host of major and minor minerals located in different parts of its territory. Table 9.1 gives details of the mineral resources in respect of a few major minerals available in Karnataka.

Table 9.1: Mineral Resources of Karnataka (as on 1st April 2005)

(In million tonnes)

Mineral	Karnataka (2)	India (3)	Percentage share in India (2/3)
Iron ore (Magnetite)	7811.78	10619.48	73.6
Limestone	51885.78	175344.90	29.6
Manganese	82.74	378.57	21.9
Gold ore (Primary)	66.17	390.28	16.95
Iron ore (Hematite)	1676.22	14630.39	11.45
Silver ore (Primary)	7.59	244.63	3.1
Copper (ore)	34.40	1394.43	2.5
Bauxite	49.50	3289.81	1.5
Chromite	1.79	213.06	0.84

Source: IBM. 2011. *Indian Minerals Yearbook 2009*, Indian Bureau of Mines (IBM), Nagpur, January.

"Mining and Quarrying", however, is a very small sector in Karnataka's economy, contributing to less than 2 percent of the state's net domestic product (RBI, 2010). But its iron ore mining industry plays a significant role in Karnataka's political economy and is the largest contributor to its mineral production (see Table 9.2).

At the all-India level, Karnataka with its iron ore production of 45.9 million tonnes in 2008-09 attained the second place after Odisha which recorded a production of 74.1 million tonnes in that year (IBM, 2011).

[1] Data (both qualitative and quantitative) collected through questionnaires and personal discussions with government and mining company officials, non-government organizations, civil society and local community groups, during visits to Karnataka (Annexure 13), specifically to four iron ore mines in the mining regions of the state.

Table 9.2: Mineral Production in Karnataka

(In '000 tonnes, in rupees '000, unless otherwise specified)

Mineral	2006-07		2007-08		2008-09 (provisional)	
	Quantity	Value	Quantity	Value	Quantity	Value
All Minerals (excluding atomic minerals)		36485515		62286779		51127809
Iron Ore	40719	32130403	48990	56852999	45938	45622896
Gold (in kg)	2334	2148349	2942	2990884	2446	3099582
Limestone	14701	1293133	15010	1386638	15810	1458931
Manganese Ore (in tonnes)	251995	336364	351889	432648	337193	402533
Minor Minerals		260270		294003		304125

Source: IBM. 2011. *Indian Minerals Yearbook 2009*, Indian Bureau of Mines (IBM), Nagpur, January.

There are two important iron ore mining regions in Karnataka. Of these, in one area, namely Kudremukh, mining operations have presently been suspended. The other region, Bellary-Hospet (or the Bellary district) has the majority of iron ore mines of the state. The district is situated in the north-eastern part of Karnataka, with semi-arid climate and annual rainfall of less than 750 mm. The maximum temperature rises to about 38-39 degree Celsius in summer and the minimum temperature comes down to about 13 degree Celsius in winter (Central Pollution Control Board, 2008).

The total geographical area of the Bellary district is 8, 45,000 hectares (Government of Karnataka, 2011) of which the forest area covers 1, 37,852 hectares or 16.3 per cent of the geographical area (Government of Karnataka, 2010). In 2011, the district has 148 mineral leases covering an extent of 10,868.44 hectares; 98 of these leases are in the forest area accounting for 9527.27 hectares or more than 87 per cent of the total mining lease area (Directorate of Mines and Geology, 2011). Of the total mineral leases, 117 are iron ore leases most of which are located in the Sandur and Hospet talukas of the Bellary district (Directorate of Mines and Geology, 2011). The iron ore mining area comprises a number of hillocks around Hospet and Sandur Valley, the most prominent of them being Donimalai, Kumarswamy, Ramandurga, NEB Range and Timmappana Gudi Range. As many as 89 iron ore mining leases (out of 117 leases of the Bellary district) are located in the Sandur and Hospet talukas covering a total area of 7480.89 hectares of which 6610.52 hectares or more than 88 per cent are in the forest area (Directorate of Mines and Geology, 2011).

Most of the iron ore mines in the Bellary district are small-sized ones, with 60 per cent having land size of less than 50 hectares (Table 9.3).

Table 9.3: Distribution of iron ore mines in Bellary district by land size

Size	Number of leases
100 hectares or more	21 (18%)
50 – 99 hectares	26 (22%)
Less than 50 hectares	70 (60%)
Total	117(100%)

Source: Department of Mines and Geology, Government of Karnataka, April 2011

In fact, some of the mines have land size of 2 to 4 hectares each and less than 20 per cent of leases have an area of more than 100 hectares. It is obvious that a large number of small-sized leases have been granted in the Bellary-Hospet area where the landscape is scarred by extensive mining by small operators.

Additionally, the district has also a large number of so-called "float ore" mines where workers dig by hand, using picks, cross bars and spades, small quantities of iron ore that "float" near the surface of both private agricultural and forest land. Many of these operations, being small, are unregulated or purely illegal in nature.

All the mines are open cast mines. The levels of mechanization and technology-use vary among these mines. Large mines such as the Donimalai mines of the public sector National Mineral Development Corporation (NMDC) use highly mechanized operations and upgrade their technology from time to time. Medium-sized mines and even some small mines use mechanized operations with many of the small mines using semi-mechanized and/or manual methods. The manual mining is generally confined to float ore. Machinery is mainly deployed for mine development while actual ore collection (crushing and screening) is done manually in private sector mines (Central Pollution Control Board, 2008). In most of the manual mines, no systematic benches are being developed and the mine environment often presents a picture of chaos.

Small-sized mines operate under a number of technical and financial constraints which limit their ability to adopt modern technology and to take effective corrective measures for mitigating the negative consequences of mining. They lack capability for proper geological appraisal of the mineral deposit and hence the ability to undertake scientific mine planning. The result is to undertake selective mining of high-grade ore, adversely affecting conservation of resources. In view of the limited availability of land in their lease area and also due to inappropriate management practices, small mine operators are not able to keep top soil, overburden and different grades of ore separately and systematically on their land. Small mine entrepreneurs also lack financial and technical capability for scientific development of their deposits, for reclamation of mined out land and for undertaking adequate plantation and other corrective measures for the rehabilitation of the damaged land and for the stabilization of overburden dumps. They barely have the means or inclination to take effective socio-economic development measures for the local communities. The approach is to derive the maximum return out of their investment while trying to conform to the minimum

requirements under the regulatory mining and environmental laws. In case of illegal mining, even this requirement is not met.

Like other mining regions in the country, the Bellary-Hospet area has also suffered the negative consequences of mining on its environment and on the social fabric of the local communities living in the mining area. The problems have somewhat multiplied due to the increase in iron ore production in the area from about 12 million tonnes per annum in 2000 to 40 million tonnes and more since 2004-05 as a result of the rise in the world demand and prices of iron ore. This has also resulted in indiscriminate and illegal mining in the area which has further aggravated the problems.

Land degradation is one of the significant impacts of mining resulting from excavation of minerals and dumping of mine waste and overburden soil. The State of the Environment Report of Karnataka, 2003 quotes that in the Bellary area, the forests are in highly degraded condition and no adequate regeneration or rejuvenation of degraded mine areas and overburden dumps had been carried out. The situation seems to have deteriorated over the years due to the increased pace of mining.

Besides, in the Bellary-Hospet region, mining activities takes place on hillocks at higher altitudes. After excavation top soil and waste material are generally dumped on steep hill slopes and intermediate valleys. As a result prime forests get destroyed. Also in some mines, selective mining is done in order to extract high-grade ore for realizing quick return. After extraction of ore body, the mined out area is left without rehabilitation, resulting in further soil erosion. Inappropriate mining practices combined with absence of mitigation measures (especially on the part of small mine operators and illegal mines) have created considerable environmental problems in the Bellary mining area.

Air pollution due to dust is also a major problem in the area, although the concentration of suspended particulate matter in ambient air may be fluctuating around the norms prescribed by the Central Pollution Control Board. The semi-arid climatic condition of the area combined with unscientific mining, especially by small miners and opting for semi-mechanized and manual mining methods have resulted in dust being the main pollutant. Transportation of uncovered ore by thousands of trucks over an arterial network of gravel or “kacha” roads in the mining area has further worsened the situation. Movement of over loaded trucks has also damaged the roads, with the villages and communities suffering from dust, traffic congestion and other environmental hazards. The State of the Environment Report of Karnataka, 2003 stated that there were mine dust deposits on roadside agricultural land as well.

In Bellary-Hospet Region water shortage due to scanty rainfall is a greater problem than water pollution. Also the mines in the area do not generate any waste water as no wet process is involved in many mines. Those who treat their waste water for use internally. However, during the rainy season, run-off from the waste dumps cause water pollution as loose and fine materials, carried away along hill slopes, enter the water bodies in the region.

Bigger mining companies (like NMDC) adopt appropriate mitigating measures for controlling water pollution in their areas.

Noise pollution in Bellary's mining area also poses a problem although mining operations on hill tops are generally at a distance of 2-3 kms from human settlements. Even then due to mining activities, the traffic density in the region has increased, resulting in hours of traffic jam and noise from heavy duty vehicles used for transportation. Also dumpers, excavators, loaders and vibrators, drilling and other machines used in mining generate noise affecting the nearby communities.

Mining and associated development have had their impact on the area's socio-cultural life as well. Mining and its spin off activities have no doubt provided employment opportunities to the people of the area. At the same time, there has been influx of workers from other regions and states, putting strain on housing and other infrastructural facilities such as water, road, sanitation and the like. Slums have come up with migratory laborers engaged in illegal mining, often at night and political and social violence has increased due to alcoholism, prostitution and other illegal activities. These combined with poor sanitation in the slum areas have affected the community health conditions adversely.

Many of the mining companies producing iron ore in the Bellary district have taken measures for mitigating the negative consequences of mining. In most cases, however, their actions are designed mainly to conform to the regulatory requirements of the existing mining and environmental laws. In case of a few, especially in the case of the biggest of these companies, namely the public sector National Mineral Development Corporation (NMDC) the measures go beyond the legal requirements and seek to establish best environment and management practices designed to promote sustainable development. Some of the more important of these practices are discussed below.

NMDC's Donimalai Iron Ore Mines, with a total lease area of 608 hectares, entirely forest land, is an open cast and highly mechanized operation. Against the production capacity of 7 million metric tonnes, the company produced 6.20 million tonnes in the year 2009-10[2]. The company, through its corporate environmental policy is committed to scientific and environment friendly methods of mining, conservation of minerals ensuring minimum wastage and compliance to all environmental laws and regulations providing for prevention and control of air and water pollution and land degradation. Donamalai Iron Ore Mine adopts sound environmental system, as per ISO 1400 and also has ISO 900 certification for scientific mining.

A. <u>Scientific Mining</u>

Sound technical and management practices ensure scientific mining in Donimalai. The main elements of these practices are as follows:-

[2] Replies to Questionnaire (in discussion with company during field visit)

(i) Mine Planning

Scientific mine planning is done prior to breaking the ground through detailed prospecting and exploration in order to appraise and identify different grades of deposits.

(ii) Mine Development and operations

On the basis of the technically sound mine plans, extraction of minerals is carried out systemically, through the processes of doting and grading, drilling, blasting, excavation, loading, haulage and processing of ores. In all of these processes, high technology is used which is upgraded from time to time. Heavy earth moving equipment like 4.6 M^3 to 8 M^3 capacity electrical diesel shovels, 50 tonne and 85 tonne capacity rear discharge dumpers, 150mm-250mm diameter drills, cradler drills, and dozers are deployed in mining operations. Ore excavated is processed by wet operations in the completely mechanized ore crushing, screening, loading (OCSL) plants comprising gyratory and cone crushers, downhill conveyer system, facilities for wet screening operations, screens, and conveyer belts for transport of ore and the like.

(iii)Mineral Waste Management

The bench heights in the mines are generally kept at 12 meters and the waste (comprising mostly of shale quartzite met basalt and late rite copping) excavated is dumped in the designated areas devoid of thick vegetation and away from top soil and mineral ores which are stacked separately; shale with small percentage of Banded Hematite Jasper (BHJ) is being kept separately from other waste material for further beneficiation in the future whenever possible, and waste (other than BHJ) excavated is back-filled into the mined out areas. Proper terracing and stabilization of waste dumps has been done by planting agave, grass etc. and through afforestation inactive waste dumps are reclaimed biologically and technically in order to arrest flow of silt. Buttress walls have been constructed and trenches dug in order to reduce land erosion.

(iv)Mine closure planning

Mine closure planning is generally considered as an essential part of mining operations and in principle, is meant to involve planning all activities to produce an acceptable landscape after the operating life of a mine. In practical terms, however, NMDC tends to fulfill the legal requirements under the Mineral Concession Rule 1960 and the Mineral Conservation and Development Rules 1986 by submitting “progressive mine closure plans” to the Indian Bureau of Mines (IBM) for their approval. These are reviewed from time to time along with IBM. Since the mines are still operational, the only concrete action taken in this area relates to backfilling of a few mined out areas no longer required for excavation and raising vegetation on them through afforestation. Local communities are seldom consulted with NMDC claiming that they would do so at the stage of final mine closure plan.

B. Environmental Protection and Biodiversity

As part of the environment impact assessment (EIA) and environmental clearance process, an Environment Management Plan (EMP) has been prepared reflecting, among others, the various environmental mitigation measures and the time-frame and responsibility for their implementation. While conforming to legal requirements, NMDC goes beyond their prescriptions for mitigating the negative consequences of mining on the environment and biodiversity. The major environmental practices adopted at Donamalai are described below.

(i) Air quality management

Dust in the main air pollutant in the semi-arid Bellary-Hospet area. At Donamalai, the following are the major steps taken to reduce the dust in the ambient air:

- Wet drilling of blast hills, providing the drills with effective dust collectors, and avoiding blasting during high wind speed are some of the measures taken to control dust generation during drilling and blasting.
- In the ore crushing, screening and loading (OCSL) plants, high pressure jets with special nozzles inject water mist at the primary crusher level; and water is sprinkled over the dumper platform area and dust suppression system is provided at the hoper and transfer points.
- Wet screening operations in the screening plants reduce dust.
- Crushed ore is transported to the screening plants through closed conveyors.
- Haul roads are graded and sprinkled/sprayed with water continuously. Also water sprinklers are used for spraying water on other roads and dust generating centers.
- Green belts and barriers have been developed around the mining areas and the township in order to prevent propagation of particulate and gaseous emissions.

Box 9.1: Dust suppression with fine spray on mine haul roads & Washing of asphalted roads

(ii) Water pollution management

Effective steps have been taken at Donamalai for waste water management and for controlling water pollution. There is no discharge of waste water from the mine. Water is used for wet screening of iron ore and the wet circuit comprising classifiers, dewatering screens, hydro cyclones and thickness is used for the recovery of solids from the waste water and also to enable recirculation of water for reuse in the screening plant. Tailing dam has been built for impounding slimes/tailings discharged from the screening plants. The effectiveness of these measures is evidenced by the fact that only clear water is discharged from the tailing dam. However, the continuous seepage from the tailing dam is helping in the recharge of the ground water of the area.

In order to check any waste-outs of the waste dumps into the water bodies of the surrounding areas, check dams have been constructed at the foot of the mine (hill) across the water courses. These check dams arrest the silt carried through rainwater from the mining area during monsoon. Prevention of soil erosion/waste outs at the mined out areas and dumps is also achieved by means of afforestation in these localities. Provision of oil and grease trips and settling tanks enable the company to treat the oily waste water from workshops and vehicle depots.

(iii)Noise pollution

Noise pollution is sought to be reduced through regular and timely maintenance of the heavy equipment and vehicles used in the mines. Wet drilling and controlled blasting techniques with mili-second delay detonators are used to control noise pollution and ground vibration.

(iv)Rehabilitation of degraded land

At Donamalai mines, a massive afforestation programme has been implemented in a planned and systematic manner in order to increase the density of vegetation in and around the mining areas and the township. Plantations of local species, fruit-bearing trees, ornamental plants and those with wider foliage have been undertaken on the mines, along the haul roads, on the waste dumps, in the township, in fact on all available vacant land so as to increase the ‘green cover”. Mined out areas are being reclaimed through plantation under the progressive mine closure plan. Extensive afforestation has helped in the stabilization of degraded land and waste dumps, prevented slimes flow and water pollution, and improved the condition of the catchment area while at the same time enhancing the aesthetic look of the township.

C. <u>Stakeholder engagement</u>

NMDC’s Mission statement provides for the company to “emerge as a global mining organization with international standards of excellence rendering optimum satisfaction to all

its stakeholders". This objective is sought to be translated through the company's Corporate Social Responsibility (CSR) Policy and actionable programme at the mine-level. However, there does not appear to be any formal institutional mechanism for consultation with the local communities in Donamalai mining area. However, as most of its employees are from the local communities, the company officials interact with these through their welfare associations, trade unions, Scheduled Caste/Scheduled Tribes employees association etc. Also, interactions take place frequently with the local grampanchyats and district administration, particularly in selecting specific CSR activities and local development works in the villages around the mines.

D. Local community development

No comprehensive social impact assessment of the mines development in the surrounding villages has been done. But the company claims that it carries out baseline studies for environmental and social impact assessment, land acquisition, rehabilitation and compensation, presumably during the preparation of the Environment Management Plan (EMP) as part of the environment clearance process. The development programmes are formulated from time to time, keeping in view these studies and mainly relate to the areas of education, skill development, medicare, integrated development of villages and infrastructure. The typical development programmes implemented as part of CSR activities including plans for generating community income are the following:-

- Promotion of self-help groups (SHGs) and skill development of the local tribal youth in artisanal areas such as bamboo products, bell metal and terracotta
- Development of village infrastructure such as construction of roads, culverts, community halls, school buildings, etc.
- Community education initiatives such as promotion of female literacy centres, establishment of residential and technical schools, educational scholarships for schedule caste and tribe students
- Provision of health care facilities-organization of medical camps in villages, free medicines and treatment, mobile medical vans with state-of-the-art medical facilities, organizing AIDS awareness programme and the like
- Establishment of drinking water facilities (bore wells) in the villages
- Promotion of sports among the village youth

Being a public sector organization, NMDC's executives display an orientation for promoting socio-economic development of the villages around the Donimalai mines.

E. Transparency and Accountability

NMDC does not have a published disclosure policy on sustainable issues. It is, however, a member of the Global Compact and Transparency International, India. Its interaction with the local communities is mainly restricted to the planning and execution of

local development works. Being a public sector organization, its approach to company-community relations is one of fairness and transparency.

It is evident that the public sector Donimalai Iron Ore Mines of NMDC has a comprehensive set of activities, going beyond the requirements of the regulatory provisions, for promoting sustainable development in their area. Other large mines in the private sector have similar activities, but on a smaller scale, designed primarily to conform to the requirements of the law. The smaller-sized mines, as has been mentioned earlier, neither have the motivation nor the resources or knowledge to undertake scientific mining and/or adopt all the necessary mitigating measures to counter the environmental and social damages. For instance, most small mines are unable to take up plantation programmes in their areas due to non-availability of enough saplings in time; and they lack resources and capacity to execute local development works. It would be desirable to encourage formation of consortia or cooperatives of small miners in order to pool their resources for undertaking plantations and executing village infrastructure development works in their common mining area.

Illegal mining in Bellary

One estimate puts the extent of illegal mining at more than 55% of the leased area or nearly 9941 hectares of land in 44 villages in Hospet and Sandur talukas of the Bellary district (State of Environment Report, Karnataka, 2010 (draft)).

Apart from the handicaps suffered due to the existence of a large number of small mines, sustainable development of the iron ore mineral resources in the Bellary-Hospet region has also been grievously damaged by the existence of indiscriminate and illegal mining in the area since 2004. This matter has been the subject of enquiry by the Lokayukta of Karnataka as well as the Central Empowered Committee (CEC) set up by the Supreme Court of India. The Karnataka Lokayukta has submitted his report in two parts — Part I in December 2008 and Part II in July 2011. CEC submitted its report to the Supreme Court of India in July 2011. Their findings present a very bleak picture of the situation on the ground.

According to these reports illegal mining, meaning mining operations in contravention of the provisions of the country's mining and forest conservation laws, have taken place in a number of ways in the Bellary district. The main forms of such illegal operation which has harmed the environment considerably are outlined below.

(i) "Raising Contracts" in violation of the law

Under the MMDR Act 1957 mining leases are granted to the applicants (persons and companies) who have the expertise in mining and also adequate funds and infrastructure to carry out mining operations. Various legal provisions (such as Rules 37 and 46 of the Mineral Concession Rules, 1960) as well as the mining lease agreement signed with the mineral rights holder prohibit transfer or assignment of the mineral lease or mineral right by the original lessee to another person (or company) without the consent and approval of the government.

There is also a prohibition against entering into contract or arrangement under which the lessee may be under direct or indirect financial or operational control of another party. In spite of these legal provisions many mining companies (including the State sector M/S Mysore Minerals Ltd.) have entered into the so-called "raising contracts" with other parties giving them the responsibility of carrying out mining of mineral/quarrying of minor minerals and to sell these minerals or use them for self-consumption, on payment of consideration or premium to the holder of the mining or quarry lease. These arrangements are without any approval from the government. Such a system gives the impression that the original lessee is carrying out the mining operations but in effect the contractor is in complete control although he may not have the requisite technical expertise and infrastructure.

This illegal arrangement has many adverse consequences for sustainable mining. The main focus of the middleman-contractor is primarily on extracting high grade minerals for maximum gain without much concern for resource conservation or scientific mining. Other irregularities follow, such as mining outside the leased area, encroachment into adjacent forest land (if any), raising minerals beyond permissible limits, illegal transportation and avoidance of government royalty. The 'raising contractor' whose focus is on the short-term also does not show much concern for environmental protection and local area development which are long-term issues. There is the possibility of corruption in the public services as the officials of the concerned regulatory agencies are offered "incentives" to close their eyes to the violation of the legal provisions and to various illegal activities of the 'raising contractor' and his associates.

(ii) Grant of mining lease in contravention of the Forest (Conservation) Act 1980

Grant of mining lease in respect of any forest area (irrespective of ownership or classification) requires the prior approval of the Central Government under the Forest (Conservation) Act, 1980. In the Bellary district, there are a number of cases where mining leases have been granted in violation of this requirement as a result of the irregular and corrupt behaviour of the local revenue, forest and mining bureaucracy. In Sandur and Hospet taluks of the district large extent of government land and uncultivated private land is covered under forest. In spite of this condition, mining leases have been given in respect of these areas on the basis of 'no objection certificates' issued by the concerned revenue and forest officials to the effect that these were not forest lands, often without verifying their status from the relevant government records.

(iii)Mining beyond leased area and above permitted levels

There are numerous instances of mining lease holders (including their raising contractors) mining beyond their respective lease areas, trespassing into the adjacent government land and forest areas, construction of mining roads in the forest area without approval and dumping of waste material outside their lease area (including hill slopes) without any permission from the competent authorities.

There are also many instances of miners extracting mineral ore beyond the quantity permitted in their mining plans. The report of CEC referred to earlier has pointed out that the production of iron ore by 124 mine lease-holders (7646 hectares) in Bellary increased three-fold, from 16.01 million tonnes in 2002-03 to 44.38 million tonnes in 2008-09. The assessment is that nearly 15.8 million tonnes of iron ore were extracted by these firms in 2008-09 either through over extraction or other forms of illegal mining (Mahapatra, 2011).

(iv) Illegal digging of float ore

Large-scale rampant "digging"(i.e. extraction of (iron) ore up to a depth of nearly 10 meters from soil surface or float ore mining) has taken place in the private (or "patta') land, government land and forest land in the Bellary district in gross violation of the provisions of MMDR Act which require a mining license even for such operations. The Report of the Karnataka Lokayukta (Karnataka Lokayukta, 2011) indicates that farmers "lease" their private land to traders who undertake mining with heavy machinery and manual labour and then sell (iron ore) to middlemen or industrial users or even export. In Hopet-Sandur-Bellary area stocks of iron ore can be seen lying by the side of public roads, on private and government land (including forest land) and a number of traders in iron ore have come up many of whom indulge in illegal transportation and trade. "It is observed that", notes the Lokayukta Report, "due to a big margin of profit in the illegal trade a mafia-type operation has started with full connivance and support of politicians and the Departments of Police, Regional Transport Office, Mines, Forest, Revenue, Commercial Taxes, Karnataka SPCB, Labour, Weight and Measurement Department and others." It is also evident that these illegal and irregular operations have severe adverse effect on environment.

(v) Irregularities in transportation and sale/export of minerals

Illegal and irregular extraction of minerals leads to other illegalities, in transportation, in the use of regulatory clearances, and also in export transactions. Transportation of iron ore from a lease area to various destinations (steel plants or ports) requires three to four permits issued by different departments including mining and forest. Karnataka Lokayukta (2011) points out a number of cases where extracted ore was transported using fake or forged documents, through vehicles without any permit or overloaded trucks

Also there is a unique illegal method of transportation, the so-called "zero-risk" system, under which a middleman assumes the entire risk of transporting the "zero material" (illegally mined iron ore) from mine to port including paying off all officials on the way.

Karnataka Lokayukta (2011) estimates that large quantities of "illicit" iron ore of Karnataka origin were exported through various ports by under invoicing export payments

Governance system for minerals

The question that naturally arises is about the integrity and effectiveness of the governance and regulatory system for minerals that is in place in the Karnataka state for ensuring proper implementation of the mining and environmental laws designed to promote sustainable development.

On the lines of similar arrangement in other mining states of the country, Karnataka has rather an elaborate mineral administration and regulatory system comprising both central and state agencies. The two main central agencies are the Indian Bureau of Mines (IBM) and the Ministry of Environment and Forests (MoEF). While IBM has a zonal and a regional office in Bangalore, MoEF has a regional office there. Both organizations have technical and administrative personnel to monitor planning, production and environmental issues in the operational mines in the state.

The main agencies of the Karnataka Government are: the Department of Mines, the Department of Forests, the Revenue Department and the Karnataka State Pollution Control Board. Other agencies that have a supporting role in mineral administration include the Police and Commercial Taxes Departments. All these state government agencies have their respective and extensive field formations in the district which in combination is loosely termed as the "district administration"

A reading of Part I and II of Karnataka Lokayukta Reports on the "collapse of administration and governance system" discloses a sad state of affairs about the capacity, integrity and effectiveness of the present regulatory system (for ensuring sustainable and scientific mining) in the state. After citing numerous instances of deliberate violations of both mining and environmental laws on the watch of the officials who were supposed to implement and enforce them the Report comes to the painful conclusion that "the entire administration, especially of Bellary, has failed to discharge their duty with sincerity and loyalty to the Government." It further points out that "corruption prevailed in all Departments connected directly or even indirectly to mining" and that both high and low level officials were bribed for turning a blind eye to the illegalities in the extraction and transportation of minerals in the Bellary district.

The Report also cites political manipulation and muscle power as one of the "main reasons for (the) failure of administration in Bellary." A minister of the Karnataka government who himself had business interests in mining used his (manipulative) power and influence as the Minister in charge of the Bellary district to post and retain (against all norms of propriety and probity) pliant officials exercising considerable discretionary powers at strategic positions in mines, forest, police and other departments in the district. These officials were all in the know and on the take and facilitated illegal mining activities including coercing other mining companies to enter into collaborative arrangements with the companies and firms with whom the minister was associated. In view of the Minister's

political clout the State Government remained a mute spectator when illegal mining was continuing in the so-called "Republic of Bellary"!

The central government agencies were also ineffectual in checking and preventing illegal mining in Bellary. The stated position of IBM is that "the issue of prevention of illegal mining is not covered within the functioning of IBM" as it is the State government which grants a mining lease, marks its boundaries on the ground and also makes rules for preventing illegal mining, transportation and storage of minerals. It merely associates itself with various task forces set up at the state-level and informs the cases of illegal mining noticed by it to the concerned state governments. However, through its responsibility of approving a mine's mining plan and giving consent for the quantity of minerals to be mined, IBM might have contributed to over exploitation of iron ore resources in Bellary. For, Karnataka Lokayukta (2011) points out that after 2007 or so, IBM gave its consent to increase the permissible quantity of production (of iron ore) in respect of some mines "irrationally without keeping in view the total deposit (ion) of the ore in the leases and environmental damages." MoEF followed IBM in giving environmental approval in respect of the higher quantities. Due to somewhat "arbitrary" consent given by MoEF and the Karnataka Pollution Control Board, the production increased manifold in some cases "without looking into the reserves available."

The report of CEC (2011) also makes a similar point. It indicates that large increase in production of iron ore was possible as under the present system individual mines decide "their level of production without any linkages to weak mineral availability, status of roads, maximum number of trucks that should be permitted, etc" CEC's recommendation, therefore, is to fix the maximum quantity of iron ore that should be permitted for extraction in a mining district or region keeping in view the mineral availability in the region (or district) and the "sustainable capacity" of the roads and other infrastructure in the area and then determine the maximum production level of individual mines in that region (or district). This is in consonance with the idea of 'limits' that is inherent in the concept of sustainable development.

Conclusion

The example of Bellary and Karnataka goes to show that in the Indian conditions (for that matter in a developing country context) having the best of mineral and environmental legislation and associated regulatory institutional structure is not a sufficient condition for ensuring sustainable development in the mineral sector. There has to be the political will and integrity of institutions and its officials and also a willingness to take hard and unpleasant decisions to ensure such outcomes. In the ultimate analysis, it is only a strong public opinion in support of sustainable development and popular outrage against state misdemeanors as and when they occur that will ensure that the country's mineral resources are developed in a sustainable manner.

Chapter 10

JHARKHAND
Case Study: Coal and Bauxite Mining[1]

Jharkhand, like Odisha, is a leading mining state of India, both in terms of mineral resources and production. According to the Indian Bureau of Mines (IBM), the state accounts for nearly 29 per cent of coal reserves, 28 per cent of iron ore resources and about 3.6 per cent of bauxite reserves of the country (shown in Table 10.1). It is also rich in many other minerals such as chromite, copper, dolomite, feldspar, fire clay, graphite, limestone, manganese, mica, quartz/silica sand, uranium, gold and silver.

Table 10.1: Mineral Resources of Jharkhand (as on 1st April 2005)

(In million tonnes)

Mineral	Jharkhand (2)	India (3)	Percentage share in India (2/3)
Coal	75460.14	264535.06	28.52
Iron Ore (Hematite)	4035.74	14630.39	27.58
Copper Ore	226.08	1394.43	16.21
Fireclay	66.80	704.76	9.47
Graphite	10.34	168.77	6.12
Bauxite	117.54	3289.81	3.57
Manganese Ore	7.47	378.57	1.97
Feldspar	1.65	90.78	1.81
Dolomite	51.09	7533.10	0.67
Limestone	745.77	975344.90	0.42
Chromite	0.74	213.06	0.34
Iron Ore (Magnetite)	10.26	10619.48	0.096

Source: IBM. 2011. *Indian Minerals Yearbook 2009*, Indian Bureau of Mines (IBM), Nagpur, January.

In terms of the total value of mineral production, Jharkhand ranked fourth among all the states with 8 per cent of the total value of mineral production in the country during 2008-09 (IBM, 2011). The total value was Rs. 9,411 crores as against the country's total of Rs. 1,24,321 crores. Coal accounted for nearly 91 per cent of the total value of mineral production (see table 10.2). The other principal minerals produced in the state were iron ore, bauxite, dolomite, limestone and feldspar.

[1] Data (both qualitative and quantitative) collected through questionnaires and personal discussions with government and mining company officials, non-government organizations, civil society and local community groups, during visits to Jharkand, specifically to various coal and bauxite mines (Annexure 13) in the mining regions of the state.

Table 10.2: Mineral Production in Jharkhand

(In '000 tonnes, in Rupees Crores, unless otherwise specified)

Minerals	2006-07		2007-08		2008-09 (provisional)	
	Quantity	Value	Quantity	Value	Quantity	Value
All Minerals (excluding atomic minerals)		83018591		96214646		94105268
Coal	88764	75765400	90895	84356924	96278	82179049
Bauxite (in tonnes)	1428154	430047	1249605	406395	1582063	492990
Iron Ore	18608	5511563	20752	10148084	21208	10046276
Dolomite (in tonnes)	268214	201111	307826	237886	301341	245292
Limestone	1943	396422	2037	405070	1674	205587
Feldspar (in tonnes)	11175	1853	10893	2081	10739	1711

Source: IBM. 2011. *Indian Minerals Yearbook 2009*, Indian Bureau of Mines (IBM), Nagpur, January.

Within Jharkhand's economy, the mineral sector occupies an important place both in terms of its contribution to production and employment. "Mining and Quarrying" contributed more than 11 per cent to the Net State Domestic Product (NSDC) at factor cost and current prices during 2008-09. The equivalent figure for the country is 2.5 per cent (RBI, 2010).

Besides its mineral resources, Jharkhand is also rich in forests which provide habitat to its large tribal population (26.3 per cent as against the country average of 8.20 per cent). More than 28 per cent of the state's geographical area (79,714 sq. km.) is under forest cover (22937.49 sq. km.) which include 4918.86 sq. km. of dense forest (Government of Jharkand, 2009). The conjunction of mineral resources, forest areas rich in biodiversity and the presence of marginalized tribal communities in these areas present a challenge for sustainable development of the state's mineral sector.

Another important feature is that mining resources are spread almost all over the state, in as many as 18 out of its 24 districts. Accordingly, the state's 323 mining leases (as on 31st March 2007) were spread over all these districts. Additionally, a large number of leases for extracting minor minerals dotted the entire state. Coal, the most important mineral resource is available in 8 districts – Bokaro, Chatra, Denghar, Dhanbad, Dumka, Garwa, Griridih and Hazaribagh. Some of the country's famous iron ore mines (Nuamundi, Kiriburu, Meghataburu and Chiria) are located in West Singhbhum while East Singhbhum has uranium and copper mines, in addition to gold, silver, kaolin and fine clay. Bauxite is available in Gumla, Latehar, Lohardaga and Palamau. There are larger number of small mines in many districts of Jharkhand – producing a variety of minerals such as fire clay, dolomite, mica, feldspar, limestone, kaolin and stone chips. Mining's impact is thus felt in almost all the regions of the Jharkhand State.

As in other states, mineral development has both positive and negative effects on the state's economy and people. Apart from the sector's substantial contribution to state GDP,

Jharkhand's rich mineral resources have led to the development of a number of large and medium-scale mineral-based industries in the organized sector. These include steel plants, pig and sponge iron plants, ferro-alloys, cement plants, power projects, ceramic, refractory and alumina production. A few more large and integrated steel plants (annual production capacity of 12 million tonnes) as well as power and other industrial projects are under active consideration as part of the state's industrialization programme.

Mineral production has also been a major source for the state's revenue collection. According to the data obtained from the state's Directorate of Mining and Geology (2011), the mining sector contributed Rs. 1170.41 crores to the state exchequer in 2007-08; the amount went up to Rs. 1730.31 crores in 2009-10 and to Rs. 1646.06 crores in 2010-11. Revenue from mining accounts for a substantial portion of Jharkhand's total revenue – between 11-13 per cent.

Mineral development has also had its negative impact on the environment and the socio-economic life of the tribal communities living in the mining areas. The most visible effect of course has been on Jharkhand's forests where mining has resulted in deforestation and forest degradation. According to the Government of Jharkand (2009), 10452.858 hectares of forest land (which included 2467.98 hectares of reserved forests and 7342.92 hectares of protected forests) in Jharkhand had been diverted under the Forest Conservation Act, 1980 for non-forestry purposes (including mining) till the year 2008-09. Prior to the operation of this law, millions of hectares of forest land had been used under various legislations for industrial development and mining.

During 1980s, coal companies acquired thousands of acres for mining operation in the Damodar valley. Similar diversion had taken place in Singhbhum for the development of iron ore mines. In view of the known negative effects of deforestation on the natural water-systems and the habitat of various species, the measures relating to compensatory afforestation and raising vegetation on mined out areas are of great significance. Land degradation, air and water pollution, subsidence and underground coal fires and illegal mining are also major issues in Jharkhand's mining areas.

The topography of all the areas for mining are obviously altered, due to the excavation of mineral pits, dumps for ore and waste material and tailings ponds. In the case of coal mining, for example, land is affected by the stripping off the overburden over the coal seam, by the excavation of pits made for extracting coal, removal of coal, deposit of waste material and other allied operations. In the past, stripping of overburden has often been done in not very scientific manner, leaving considerable abandoned areas in sterile and derelict conditions. Back filling of mined out areas has been neglected resulting in a large number of waste external dumps occupying large areas of land. Top soil management has also been poor in as much as at many places it has not been kept separately for reuse for subsequent land rehabilitation. Also in the past, not much concern was shown to restore mined out areas and utilize the land affected by mining. The presence of degraded land in the mining areas, apart

from causing dust and water pollution, can also affect the local communities adversely through lowering of land values, loss of productivity and general economic deterioration.

The air quality in the mining areas depends on the nature and concentration of emissions from the mines. Also congestion on the narrow roads in the mining areas is another reason for pollution. In the coal mining areas, air pollution due to particulate matter is a major problem. For instances, the Central Pollution Control Board (CPCB) had estimated that in the Jharia coal mining area, while average concentration of gases like sulphur dioxide and nitrogen oxide levels are within the national parameters, RSPM (respiratory suspended particulate matter) and SPM (suspended particulate matter) levels were above the national ambient air quality standards in many years (Central Pollution Control Board, 2007). In the areas of iron ore and bauxite mining, dust pollution generated by the heavy traffic of trucks carrying ores on narrow gravel roads is a major problem.

Water pollution is caused by surface run-off from various mining areas during monsoon – from mineral and waste dumps, solid waste disposal sites, oil and grease pollution from workshop effluent and tailings pond seepage. Extensive coal mining in the Damodar River's watershed, for example, has made stretches of the river heavily polluted, carrying suspended solids (fine coal particles) and various minerals, making their water black and turbid.

In the mining areas of Dhanbad-Jharia, fires in underground coal mines and subsidence are major environmental hazards.

Illegal mining is another important issue in Jharkhand's mineral sector – in respect of iron ore in West Singhbhum and Coal in Hazaribagh-Dhanbad area. Illegal mining and theft of coal from company-operated mines in the Jharia (Hazaribagh) area, according to Bhushan and Hazra (2008), "has become almost impossible to control", operated as it is by the powerful coal mafia, "with the connivance of public sector mining companies and local officials". A large number of poor people are engaged in this trade, buying coal from illegal contractors, carrying it on bicycles and supplying to the mafia for small sums of money.

Mining and the associated practices have had their impact on the socio-cultural life of the people living in the vicinity of the mining areas. Mining of coal, bauxite, iron ore etc. is carried on in remote forest areas of Jharkhand populated mostly by various tribal communities. Originally they had very limited contact with the outside world and depended on subsistence agriculture, forest products and hunting. Mineral development in their areas has no doubt created employment opportunities and developed roads, electricity, water supply, health, medical and educational facilities; it has also led to loss of their land used for cultivation and grazing as also homestead (in many cases), brought in a large number of outsiders into their areas and disrupted their traditional social and cultural life. While livelihood possibilities based on the traditional skills and assets have declined, many of them do not have the qualifications and skills to take advantage of the new employment opportunities in mining and other modern industries except as unskilled manual labour. This

can result in the decline of living standards in some groups and increase social differentiation based on differential access to employment. Thus, loss of agricultural occupation and livelihoods and consequential indebtedness to money lenders, poverty and unemployment, alcoholism, drug abuse along with environmental pollution are the major problems that these communities face.

Resentment arising out of these problems combined with inequity, unemployment, denial of justice and non-fulfillment of the rising aspirations, especially among the youth of these communities, has resulted in the growth of resistance or Naxalite movements in the tribal-cum-mining areas of Jharkhand and the neighbouring states of Odisha, Chhattisgarh, West Bengal and Andhra Pradesh. There have been many instances of mining company employees in these areas being abducted and physically harmed by the rebels (Naxalites), often to extract ransom money from the relevant authorities.

Ecological management practices followed in a few selected coal and bauxite mines in Jharkhand were studied in order to assess the effectiveness of the measures adopted (by the mining companies) for mitigating the negative consequences of mining. The mines (and the companies) studied are the following:

(1) Coal mining (open cast) in the Pipparwar and Ashoka mines of the Central Coal Fields Ltd. (CCL) in the Chatra district and the West Bokaro coal mines of the Tata Steel Ltd. in the Ramgarh district; and
(2) Bauxite mining in the Lohardaga district by Hindalco Industries Ltd. (Bagru Hills) and by a small mining enterprise (Chapi bauxite and Laterite mines)

Additionally, data collected from a few responses received to a mailed questionnaire were utilized to draw an overall picture of the environmental behaviour of the mining enterprises.

(1) Ecological Management practices in coal mining

Since the nationalization of the coal mines in the early 1970s, almost the entire coal sector came under the purview of the Coal India Ltd. (CIL). This public sector company operates the coal mines in the country through eight subsidiaries. The Central Coal Fields Ltd. (CCL) is one such subsidiary which has 58 coal mines in 6 coal fields in Jharkhand (Central Coalfields Limited, 2011) Tata Steel, a leading producer of steel in the private sector also operates coal mines (in Jharkhand) as captive mining is permitted for the producers of steel. Both these companies have underground and open cast mines. This analysis, however, deals with ecological management practices in open cast coal mining which has more pronounced impact on environment.

Coal India Ltd. (CIL) has laid down corporate strategies and policies in the areas of land reclamation and environment protection, corporate social responsibility (CSR), and peripheral and community development in the mining areas for all its subsidiaries. One of its subsidiaries, the Central Mine Planning and Design Institute Ltd. (CMPDI) provides

technical advice and assistance to all the operational subsidiary companies in the fields of exploration, mine planning, technology and research and development. Tata Steel has also well-laid out policies and institutional arrangements for ensuring scientific mining, protection of environment, and socio-economic development in their mining areas. The management personnel at both policy and operational levels in both CCL and Tata Steel are sensitive to the needs for sustainable development in the mining sector. As a consequence, the measures adopted in the coal mines of both these organizations are not restricted merely to conform to the regulatory requirements of the relevant laws; these seek to strive for achieving sustainability in mining operations. Some more important measures adopted in their coal mines are discussed below:-

A. Scientific Mining

Prior to the 1970s, haphazard and unscientific mining was widely prevalent in the Indian coal industry. The nationalization of the coal mines changed the situation. In both CCL and Tata Steel, the accent now is on scientific mining which is sought to the realized through a series of technical and management mining practices in their coal mines:-

- Preparation of systematic mining plan and use of state-of-the art mining softwares (SURPAC and MINEX) in mine planning and implementation;
- Formulation of EMP through the EIA process;
- Adoption of wet drilling and controlled blasting techniques in order to reduce vibrations and dust;
- Use of high capacity shovel-dumper combination for removal of overburden and mining of coal;
- Blast-free mining using surface miners for producing coal with reduced air pollution and improved quality and conservation of coal;
- In-pit crushing and conveying of coal (in Piparwar project);
- Thin scam mining by using Rippers;
- Crushing and conveying of coal (to wasteries) through conveyor belts/pipe conveyors (less dust and noise);
- Use of advanced equipment and instrumentation in washeries (such as 'low ep scrolled evolute cyclones' in place of conventional DSM cyclones and vacuum belt filters for dewatering the froth concentrate in Tata Steel's West Bokaro mines) for coal beneficiation and reducing ash content of coal;
- Continuous up-gradation of technology in mining operations and beneficiation

An important aspect of scientific mining relates to mineral waste management. In the open cast mines, provisions are made for the removal and storage of top-soil and sub-soils separately so that these can be re-laid at the time of reclamation for developing the land uses of the reclaimed land surface. The external waste dumps are provided with toe walls, toe drains etc. in order to reduce soil erosion. Solid and liquid (used oil) waste management also includes proper identification, segregation, collection and disposal of solid waste, safe

disposal of hazardous waste into impervious concrete bins, disposal of tailings for reuse in brick kilns, use of washery rejects as fuel in power houses, collection of used oil by oil recovery system and its disposal through authorized recyclers.

Preparation and progressive implementation of mine closure plans is a vital aspect of scientific mining. However, this subject does not get as much importance as it deserves. In CCL, most mines do not have mine closure plans. CMPDI has been entrusted with the preparation of these plans in phases on the basis of the guidelines of the Ministry of Coal. These guidelines require coal mines to prepare progressive and final closure plans and also earmark/deposit amounts of money equal to the annual cost of such closure in a separate bank account. However, no stakeholder consultation is mandated in preparing or implementing the closure plans and it is doubtful if there are measurable and time-bound performance targets.

In Tata Steel, mine closure plans are prepared at the level of the company, again without any consultation with the local communities. In most coal mines, mine closure activities are restricted to progressive backfilling of mined out areas, followed by plantations and/or building of parks (or golf courses) on the reclaimed land.

B. <u>Environmental Protection and Biodiversity</u>

Both CCL and Tata Steel have utilized the ISO 14001 for their coal mines and have prepared environment management plans (EMP) through the environment impact assessment (EIA) process. Their claim is that a series of steps are taken to maintain and improve biodiversity in the mining areas. Key activities in order to maintain a harmony between mining operations and environment are the following:-

(i) Air quality management

Air pollution through particulates generated during mining operations are controlled through the following measures:-

- Regular water spraying over haul roads
- Dry fog system over conveyor
- ESP in power houses to control stack emission
- Providing green belt around mines, haul roads and residential areas and black-topping of roads in the mining areas

(ii) Water pollution and waste water management

Water pollution management has a number of distinct elements. Mine seepage water is channeled through a series of settling ponds in order to remove impurities. Toe drains around dumps and sedimentation ponds are utilized for separating suspended solids from rainwater from overburden and coal dumps during the monsoon. Then there are effluent

treatment plants and effluent recycling systems in all operating units for the treatment of effluents, recycling of clear water, dewatering of tailings through centrifuges and high frequency screens and cascading of tailings in a series of tailings ponds and recycling clear water to washeries.

(iii)Rehabilitation of degraded land

This includes biological reclamation of degraded areas, afforestation and green belt development and creation of water bodies in final voids in the mining areas in order to recharge ground water and benefit the flora.

In coal mines of these companies, progressive backfilling of mined out area is a regular activity along with covering up of old overburden/waste dumps with a thick layer of soil for land reclamation. The dump soil is improved through stages using modern techniques in order to bring back fertility. Afforestation on backfilled land, overburden dumps, ash dumps and other waste lands and greenery in and around operational units and residential areas are ongoing activities. Development of parks and gardens is an integrated element of environment management. Generally mixes of different varieties of trees, including local fruit-yielding species and broad leaved varieties for dust entrapment are planted in order to provide a green cover to the area.

(iv)Noise pollution mitigation

Noise pollution is mitigated through the use of silencers in high noise areas, provision of ergonomically designed sound proof cabins in HEMMs and green belts around the quarry, infrastructure sites, service buildings and township.

(v) Sustainable consumption of resources

Sustainable consumption of resources like water, energy, fuel and lubricants is another area of constant attention in these mines. Mine water is stored to the extent possible in the worked out quarries designated as water reservoirs. All the industrial requirements are met from these reservoirs. The reservoirs also act as water harvesting structures (for rain water and help in maintaining the ground water table of the locality). Various energy conservation practices are adopted in the operation of plants and machines. Reduction in oil leakages from machine, re-circulation of clear water from effluent ponds, minimization of coal spillage from conveyors and various transfer points and waste minimization through improved housekeeping are the other activities in the field.

C. <u>Stakeholder Engagement</u>

Neither the management of CCL/Tata Steel nor their executives in the mines consider the local communities living in a mine area as direct stakeholders in the mine's development and operations. Therefore, they are never consulted in technical and operational issues such

as progressive development of mines and preparation and implementation of mine closure plans. Consultations with local communities are held only in respect of local development works. An important forum for consultation is the public hearing that takes place as part of the environmental impact assessment process. Also, interaction takes place with the representatives of the local communities for the selection and implementation of local development works as part of the CSR activities. There does not appear to be formal institutional arrangements for consultation on a regular basis. Mostly ad-hoc meetings are organized periodically to hear the views and grievances of the residents of the villages (usually within a periphery of 8-40 kms. from the mine) and then appropriate follow-up action is taken.

D. <u>Local Community Development</u>

As mentioned earlier, CCL has its CSR and periphery development policies which provide guidelines for undertaking development works for the local communities. Five percent of the retained earnings of previous year subject to a minimum of Rs. 5 per tonne of coal production of previous year is allocated to the CSR fund and the activities are organized and maintained by CSR cells and committees at various levels of the organization. The policy for community and peripheral development lays down guidelines for taking up community development projects in the periphery of a coal mines, normally within 8 kms of the project(s) – nearly 20 villages around the Piparwar Project.

In the case of Tata Steel's West Bokaro Project, local development works are being undertaken in around 34 villages in the Mandu Block predominantly inhabited by various tribal communities. As is their practice, these works are executed through Tata Steel Rural Development Society which implements a comprehensive development package in the area.

In the absence of any guidelines or legal requirement to that effect, no comprehensive social impact assessment survey is done at the feasibility stage for preparing a comprehensive development programme for a mining area. However, baseline information is sometimes collected before starting a specific local development project. The typical projects that are taken up are as follows:-

- Income Generation: agricultural development and crop extension, village industries and handicrafts, animal husbandry, etc.
- Empowerment: skill and vocational training programmes, primary, middle and high school education, girl education, training programmes for women in tailoring, pickles making, home food cooking etc., adult literacy, dairy management, formation of self-help groups, etc.
- Water Supply: installation and repair of hand-pumps, tube wells and wells, construction of water tanks, rain water harvesting schemes, etc.
- Health and Hygiene: maternal and child health, AIDs, mobile health vans, medical camps, family planning and immunization drives.

- Sports and Youth Development: promotion of sports and cultural activities.
- Infrastructure: construction and repair of village roads, community centres, play grounds, etc.
- Environment: greenbelt development, social forestry, afforestation, etc.

In addition, local villages are provided with employment (particularly if their land is acquired for the project) and some residents also get petty civil and transport contracts in connection with the mining operations.

(2) Ecological Management Practices in Bauxite Mining

Bauxite reserves in India occur in flat plateaus on tops of mountains and hills. Usually there is no vegetation on the surface of the land having bauxite minerals underneath.

In the Lohardaga district of Jharkhand, there were in all 16 bauxite mining leases in May 2011. The area of individual leases varied from 24.39 acres to 284.38 acres (Directorate of Mines and Geology, 2011). The two bauxite mines studied were the following: the Bagru Groups of Bauxite Mines (four contiguous leases) of HINDALCO (a large private sector aluminium producer) with an aggregate lease area of 164.75 acres and the Chapi bauxite and laterite mines of Sri Arvind Kumar Singh (Proprietor) with a lease area of 24.39 acres. Mining in both the mines is done by open cast method. While the Bagru group of mines had an annual production of nearly 4.50 lakh tonnes of bauxite, the Chapi mines produced about 25,000 tonnes of the minerals per year. The study thus helped in understanding the differential practices followed in large and small mines extracting bauxite mineral.

In the Bagru mines, the lithological sequence from top to bottom is top soil, murrum, laterite, bauxite and clay. Mining operations (by HINDALCO) are fully mechanised and are carried out as per the approved mining plan. Top soil and murrum are removed by hydraulic excavator – dumpers. Controlled drilling-blasting for laterite and bauxite is carried out using non-electric detonator method in order to reduce ground vibration dust and noise. Mineral extraction and ROM (run-of-mine) are handled by shovel-dumper combination. Crushing and manual breaking of the ore to less than 8” size takes place before transportation of mineral using aerial rope way.

Top soil and overburden/waste removed from the ground are kept separately. In fact, backfilling of mined out area takes place simultaneously with the mining operation. Waste is dumped to designated backfilling area, followed by leveling and spread of top soil over the backfilled area. The area is then rehabilitated by plantation.

For the Bagru mines, there is an IBM-approved mine closure plan which is generally prepared along with the mining plan. This is revised from time to time along with the modification of the mining scheme(s). Normally there is no consultation with the local communities while preparing the mine closure plan or modifying it from time to time. The steps are taken basically to conform to the requirements of the law.

However, most elements of the scientific mining seen in the case of the Bagru Mines were not present in the small Chapi mines where mining operations were done manually. Jack hammer was being used for drilling, followed by blasting by the traditional methods, then breaking of bauxite mineral into appropriate sizes or sorting these out by manual labour. Trucks are loaded by labour for dispatch to their destinations.

The mine presented a chaotic picture, with no proper benches, with bauxite and laterite stones lying in a scattered manner. A portion of the mined out area had been backfilled in a haphazard way. The Mines Manager was not aware of the existence of a mine closure plan and no particular measures were being adopted for dust management in the mines.

The Chapi mines are too small an entity to adopt and utilize any formal environmental standard. In fact, they hardly took any environmental protection measures in order to mitigate the negative consequences of mining. The focus of the mining operation was to dig bauxite to the maximum extent possible and sell to traders. On the other hand, in the case of Bagru group of mines, a series of initiatives had been taken for the protection of the environment in the area:-

- Sequential backfilling of mined out areas followed by leveling and top soil cover;
- Return of reclaimed land to original farmers (rayats) for agricultural and other productive use;
- Afforestation over reclaimed land by planting local species- high timber value and fruit bearing (naspati, mango trees);
- Water sprinkling on haul roads and mining areas;
- Movement of minerals by trucks covered with tarpaulin;
- Green-belt development around haul roads and mine pits to reduce dust and noise;
- Eco-friendly ropeway transportation of minerals;
- Extensive rain water harvesting through construction of dams and ponds;
- Efficient waste water and water quality management through use of harvested rainwater for domestic purpose, ground water for drinking and treated sewage water for dust suppression and plantation;

The Bagru mines also utilized ISO-1400 and other environmental management standards in its operations.

For unskilled work, both the companies employ local labour. In HINDALCO, nearly 90 per cent of the total number of employees was from the villages around the mines. However, as in the case of most mining companies, the company executives do not consider the residents of the nearby villages (affected by mining) as direct stakeholders, neither do they consult with them for technical mining operations or mine closure. While the small Chapi mines have neither the resources nor capacity to undertake local development works in

the nearby villages, HINDALCO has a comprehensive rural social-economic development programme that it implements as part of its corporate social responsibility activity. The planning and execution of this programme in the identified villages is done by a separate Rural Development Wing of the company.

The main components of the rural development programme and the activities covered are described below:-

- Promotion of economic self-reliance: formation and linkages of self-help groups, especially of women, to take up different income-generating activities such as goat rearing, fishery, mohua collection etc.; tailoring, knitting and embroidery training, distribution of cycle repairing kits, quality seeds of lac (brood lac), fingerlings (for fishery), etc.
- Watershed development for land and water management: construction of tanks for water harvesting; construction of bunds and channels for flow irrigation; distribution of pump-sets for lift irrigation; distillation of ponds; construction and repair of wells etc.
- Assistance in Agricultural Practices: distribution of quality seeds and fruit-bearing plants; training in improved methods of agriculture, use of bio-fertilizer and compost etc.;
- Education and capacity building: promotion of functional and adult literacy, management of primary schools in villages and providing services of teachers and reading materials, uniforms etc. to the children of the local primary schools, providing scholarships to meritorious students, etc.
- Health and family welfare: health and disease awareness programmes, maternal and child health care including family planning, immunization against diseases, provision of essential medicines, rural health and medical camps, eye screening programme, control of malaria and diarrhoea, TB eradication, cataract operation camps, AIDs awareness camps, provision of safe drinking water, etc.
- Rural infrastructure development: Construction and repair of village roads, school buildings, establishment of nurseries for providing plant saplings to villagers, construction and repair of village tanks, community centres, temples, etc.
- Promotion of social and cultural activities: assistance in organizing sports activities in the villages, provision of utensils and other utility packages for community functions, assistance in organizing village fairs and exhibitions of rural craft products, etc.

The company officials interact with the local communities in the process of implementing these development works. HINDALCO claims that it makes a continuous effort to mitigate the adverse impact of mining on environment through these activities. In addition, it also uses appropriate methods to reclaim its mined out area and makes it cultivable.

Box 10.1: A few rural development activities undertaken in Jharkand

Conclusion

The foregoing account shows that as in other mineral-rich states, mineral development has both positive and negative effects on the environment and social cultural life of Jharkand. On the lines of similar arrangement in other states, there is an elaborate mineral administration and regulatory system comprising both state and central agencies. These are, however, not effective in controlling illegal mining activities in various mining regions of the state. In some parts of the state, violent resistance movement (Naxalite movement) has grown mostly among tribal communities, which is affecting economic operations adversely.

The large coal and bauxite mining companies studied adopt appropriate environmental protection measures but their record of engaging stakeholders in their operations is poor, as is the case in most other states. The environmental behaviour of smaller companies leaves considerable scope for improvement.

Section IV
INTERNATIONAL EXPERIENCE IN SUSTAINABILITY PRACTICES IN MINING: Selected Cases

Chapter 11

SUSTAINABILITY PRACTICES IN CANADA, AUSTRALIA, SOUTH AFRICA AND PAPUA NEW GUINEA (PNG)

In this chapter, the sustainability practices (in mining) being followed in four leading mining nations - Canada, Australia, South Africa and Papua New Guinea (PNG) – located in different regions of the world and at different levels of development have been discussed. The analysis, it is hoped, while highlighting major international practices, will facilitate identification of a few initiatives that may have relevance for the Indian conditions.

A summary of the legislative provisions and procedures concerning sustainable mineral development in these countries is at Annexure 14. The sustainable development measures in mining comprise the following major elements: environment protection, local stakeholder engagement, socio-economic development in mining project areas and benefit-sharing of mineral resources revenue. The highlights of these elements are discussed below.

1. Environment protection measures in mining

Safeguarding the environment through environment impact assessment and environment management plans is a prominent feature in all the four countries, as in the case in India. While in Canada and Australia, both national and provincial governments administer this process in their respective defined areas; in South Africa and PNG, the responsibility rests at the national government level. The distinguishing feature both in Canada and Australia is that the provinces have more important powers and responsibilities as they are primarily responsible for mining in all its phases. Arrangements have been made for coordination between federal and province governments in order to avoid duplication and overlapping.

South Africa's environment authorization and environment impact assessment (EIA) process has some unique arrangement for coordinated approach in the administration of environment clearance of mining projects which is worthy of emulation. The country's EIA Regulations contain provisions for formal cooperative agreements between the Ministry of Environmental Affairs and Tourism (the administrative ministry for EIA) and other administrative authorities in order to avoid duplication in carrying out environment impact assessment. A further improvement has been done in the case of mining by amending both the environment and mining laws in order to harmonize the process of environment approval of mining projects. Through these amendments, the Minister for Minerals and Energy has been authorized to issue environmental authorization (under the environment law) in respect of mining projects. This is of particular significance for the Indian situation where there have often been complaints about delay in the grant of environmental clearance for mineral development projects.

Another important feature relating to environmental clearance in South Africa is the prescription of time limits for various stages in the EIA/environmental authorization process.

The Canadian law also lays down regulated deadlines that ensure that environmental assessment is completed within a reasonable time. Normally in both these countries clearances are given within a year whereas absence of any time- discipline in India does prolong the process and cause avoidable delay.

In addition to the impact assessment regime, all these countries also, have regulatory laws for controlling air and water pollution and also for mitigating the impact on land due to mining and other industrial activities. While in the developed countries (like Canada and Australia), there is effective enforcement of these laws and regulation; Papua New Guinea's administration suffers due to lack of capacity both in national and provincial governments. Inadequate manpower and budgetary support as well as corruption at various levels deter effective enforcement of the prescribed laws and regulations. This is typical of the situation in many developing countries (including India) which need to be addressed for ensuring sustainable mineral development.

In the developed mining nations (Canada and Australia), mine closure plans are an important part of environmental impact assessment as well as of environmental management plan. Mine closure planning is initiated from the exploration stage and the process continues throughout all the phases of mine life cycle.

In both the countries, detailed mine closure requirements and procedures have been established. More importantly these are strictly enforced and complied with by the mining companies. Also most mining closure regulations require that environmental liabilities incurred during mining operations be financially secured to cover future remediation costs. Mine closure plans and financial security need to be filed prior to issue of permit for new mining operations. Also there is close public and community involvement in the preparation and implementation of mine closure plans.

Both in Canada and Australia, there is considerable emphasis on the reclamation and rehabilitation of mined out lands. Rehabilitation of abandoned mines is addressed through developing partnerships among the government agencies, the mining industry and the local communities.

In South Africa, the mining and environmental laws impose obligations on a mining company causing environment degradation to mitigate its effects and incorporate the "pollution pays" principle by providing that the cost of environment degradation and associated adverse effects on health and environment must be paid for by those harming the environment.

The mineral rights holder remains responsible for any environmental liability and is required to maintain the prescribed financial provisions until closure certificate is issued by the relevant government authority.

PNG's mining laws do not give much attention to mine closure planning. However, individual cases of mine closure have been addressed under the existing laws as in the case of OK Tedi mining project where mining operations are to cease in 2013. A series of mine closure plans has been prepared after detailed consultation with the stakeholders and communities. The mining company has conducted a number of workshops and discussions in the mining area in order to apprise the community leaders and other stakeholders of the developments in respect of the mine closure.

Thus, in one way or the other, adopting proper mine closure process from the beginning of mine life cycle has come to be established as an international best practice in the mining industry.

Also, active public participation in the administrative and judicial processes relating to environmental protection is a prominent feature of the mining scenario in these countries. In Canada, the statutory provision under both federal and provincial legislation provide for public's involvement in the decision-making process and to seek redress in cases concerning the environmental effects of mining. The members of the public are entitled to use public resources for their environment related action and also to take class actions for mass harm done to individuals or environment. In Australia, the rule of public participation in environmental matters is well accepted and is at a very developed level.

In South Africa, the environmental law and regulations require engagement with the public at multiple stages of the environment impact assessment and authorization process. An entire Chapter 2 of the NEMA Regulation 2010 is devoted to the public participation process which is required at the initial stage of applications for environmental authorization, during basic assessment and scoping and also when the environment impact assessment report is prepared.

Major mining projects in PNG are subject to a process of public and detailed consideration of environment implications through the EIA (Environmental Impact Assessment) process. Besides, due to the practice of community land ownership, local communities are closely involved in the various processes of mining operations including environmental evaluation and protection.

Stakeholder engagement

Proactive stakeholder engagement and local community consultation in mine planning, development, ongoing operations, closures and post closure operations is a prominent feature of the mining scenario in all the four countries.

In Canada, constitutional legal provisions make it mandatory for the Government and also mining companies to engage in meaningful consultation with Aboriginal Communities who occupy land upon which mineral development is proposed. The main basis for engagement is the fact that these communities have special rights to land and resources in the areas where they live.

Also, Aboriginal communities themselves took a number of initiatives to increase their participation in mining activities in their land. These included law suits, negotiation and collaboration with industry and mobilization of protest which sometimes included armed resistance.

Both federal and provincial government have framed laws and regulations to promote consultation with communities and the mining industry itself has taken a number of initiatives such as community orientated policies, protocols, codes and guidelines to direct community relations policies and provide greater involvement in the overall development of the local communities. The Whitehorse Mining Initiative (WMI) Leadership Accord (1994) specifically provided for Aboriginal Peoples' participation in all aspects of mining.

Consultation between the mining industry and stakeholders including Aboriginal Communities takes place at various fora – in various processes of environmental impact assessment and environment protection, and also during mineral project development. In the latter case, Aboriginal communities and mining companies initially enter into non-binding Memoranda of Understanding (MOU) which are later negotiated into full fledged and legally binding Impact Benefits Agreements (IBAs). An IBA generally outlines both negative and positive effects of a mining project and then spells out the mitigation measures (for negative effects) and positive developmental measures which include guaranteeing local employment, education and skill development of the local people and various other benefit-sharing initiatives.

In Australia also, the recognition of Native Title of indigenous communities has led to local indigenous inhabitants in mining areas to become integral stakeholders in mineral resources development. This has resulted in increased consultation between the mineral industry and these communities. To facilitate participation, the mining industry enters into various joint management and land agreements with these communities.

Recent developments in mining laws in Australia emphasize, as part of the initiative to introduce sustainability principles, the need for consultation with local community in various phases of the mine life cycle. For instance, in 2006, the Victoria State's mining legislation, the Mineral Resources (Sustainable Development) Act 1990 incorporated a section (Section 39A) making it obligatory for a mineral rights holder to consult with its local community across the entire life cycle of the project from exploration, through development, operation, closure and post closure. Another section provided for the preparation of a work plan containing among other things a plan for consulting, with prescribed guidelines and regulations.

South Africa has a series of legal provisions (both in mining and environmental laws) necessitating involvement of local public and especially local communities in mining areas during planning stages and throughout the life of a mine. The country's black economic empowerment (BEE) policy also contributes to the integration of mining with local communities and to sustainable development in the mineral sector. Another significant aspect of stakeholder engagement in South Africa relates to the requirement in the mining law for the submission of a Social and Labour Plan as a pre-requisite for the grant of mining or production right.

In PNG, local tribal communities are continuously engaged with mining companies in their respective areas. There are two key aspects of community scenario which determine the nature of such engagement. One is the nature of the land tenure system under which 97% of the country's land is "customary land" owned by a clan or tribe or extended family. The concept of inalienability prevails. Secondly, among local communities in remote areas there is disillusionment with weak national and provincial governments who have not been able to provide job opportunities, and good health and education facilities. On the other hand, mining companies are seen as bringing development into these areas. As a result after the closure of the Bougainville Copper Mine in 1989, communities while negotiating vigorously with mining companies or expressing strong disappointment of negative environmental and social consequences of operational mining projects have rarely came out against proposed mines or asked for closure of operating mines. Instead, there has been unrelenting pressure on and sometimes violent agitation against mining companies for tangible benefits from mining projects including mitigation of negative environmental consequences.

Government policy and legislation since the late 1980's have also required resources developers to negotiate access to land with landowners and suitable institutional arrangements and practices have developed legitimizing and facilitating the participation of local communities in various stages of the mineral development process.

Socio-economic development in mining areas

Closely associated with community engagement is the issue of execution of socio-economic development projects in mining project areas which create alternate assets in place of depleted mineral resources. In PNG, the mining law (the Mining Act 1992), for example, provides for the constitution of a Mine Development Fund (MDF) before the grant of a special mining lease to a project proponent or applicant. The Development Forum comprises the landowners affected by mining lease, the representatives of the national and provincial governments and the project proponent. The forum has two main functions. First, it provides the venue for consultation among the stakeholders about the scope and impact of the project. Second, it leads to the signing of a number of Memorandum of Agreements (MOAs) between Government, mining company and community, outlining their respective responsibilities and the services and benefits that will be provided in the project affected area.

Negotiations in MDF may enable local communities to ensure them that a mining company agrees to give them a "preferential area states" which enables them to obtain preferential treatment in employment opportunities, education, training and business development assistance. MOA may also provide for the establishment of Sustainable Development Foundations/Trusts at mine sites as cooperative ventures between government, mining company and community to ensure that development programmes (on poverty alleviation, health, agriculture development, training and capacity building, maintenance of infrastructure and public services beyond mine life) are carefully planned and effectively implemented. Thus the approach in MDF negotiations and outcomes, which have legal underpinning, is basically participative and inclusive in nature with local communities involved in decision-making.

There are also other legal provisions in PNG providing for community consultation on local area development. The mining law, for example, provides for a Mining Development Contract (MDC) between the project developer and the state, specifying the prescribed infrastructure development, education and health facilities essential for mining operations and communities.

In PNG, multinational mining companies and resource developers often carry out projects in local communities over and beyond the requirements under the mining law and MDF agreements. This is done under intense pressure and aggressive demand from local communities, backed by political process and institutional arrangements supporting community involvement in mining. Often mining companies undertake these additional activities in order to gain "project security" and "social licenses to operate" in these communities. This situation is in sharp contrast with the conditions prevailing in India and in other developing countries in Asia and Africa where it is usually considered the prerogative of resources developers to determine and undertake local development projects as part of the so called CSR (Corporate Serial Responsibility) activity which implies a donor-recipient relationship between mining companies and local communities.

In South Africa also there is a formal legal requirement for mineral rights holder to make arrangements of socio-economic development plan in his mining project area. The mining law (Mineral and Petroleum Resources Act 2002 – MPRDA) provides for the submission of a Social and Labour Plan as pre-requisite for granting of mining and production right. The objectives of the plan are to promote local employment and contribute towards the socio-economic development of the relevant mining area. The Plan needs to include programmes for human resources development and local area economic development as well processes pertaining to management of retrenchment and downsizing.

The mineral right holder has to make financial provisions for the implementation of various components of the Plan, make known its contents to various stakeholders and ensure compliances.

It has already been mentioned that in Canada, the system of mining companies entering in to legally binding Impact Benefit Agreements (IBAs) with Aboriginal Communities in mining areas ensures provision of significant socio-economic development benefits to these communities. BHP Billion's Ekta Mine, for instance, provides a wide range of benefits such as preferential employment and training and compensation and business opportunities to signatory Aboriginal groups. Other multinational mining companies have also taken similar initiatives in their respective project affected areas.

Benefit-sharing of mineral resources income: Socio-economic development in mining project areas is but one aspect of the larger issue of benefit-sharing of mineral resources income between mining companies and communities and nations in which mineral development takes place. Such benefit sharing is an important feature of sustainable development measures by the mining industry world wide. In Canada, Australia and PNG, communal ownership of land where mining operations take place, provides legitimacy and urgency to the need for defining various benefit sharing instruments to spread the fruits of mineral extraction to communities directly affected by mining and also across the economy. In Canada, Impact Benefit Agreements (IBAs) between mining companies and Aboriginal Communities residing in mining areas also provide for sharing of royalty revenue. Where mineral extraction taken place on provincial government land ("crown land"), royalty revenue and taxes go to the provincial government and its parliament then decides how to allocate money among projects, and funds. This happens, for instance, in Alberta (Canada) where nearly 80% of oil and gas production takes place on provincial government land. The province has several trust funds, the most important being in Alberta Heritage Trust Fund (Heritage Trust). As Carolyn Fischer (2007) has pointed out, "both oil revenues in general and the Heritage Fund in particular are used to benefit current and future residents of Alberta via provincial government programmes".

In Australia, the Aboriginal Law Rights (Northern Territory) Act 1975 granted land in the Northern Territory to its traditional Aboriginal owners which entitled them to acquire effective control over activities on their land. The Law Rights Act establishes a regime under which local councils, Aboriginal people affected by mining and the broader Aboriginal population in the territory receive a share of mining royalties earned from mining activity on the Aboriginal land.

A statutory Aboriginal Benefit Reserve (ABR), a sharing house for payments, receives and disburses mining royalties to Aboriginal stakeholders to be used for capacity building and infrastructural development.

In PNG, royalties are levied under the Mining Act 1992 which stipulates that a minimum of 20 percent of royalties received must be paid to the landowning communities in the mining lean areas, the balance being paid to the provincial governments. In practice the percentage is settled through negotiation between the stakeholders through the Development Forum consultation process and recorded in the relevant Memorandum of Agreement (MOA). The percentages rank from 20 percent up to 80 percent to land owners. In respect of

OK Tedi and Lihir mines the percentage was fixed at 50 percent. Mining companies pay the affected land owners in cash directly and pay the balance to the State which uses its share for sustainability measures such as infrastructure, future generation trust funds and sustainable development foundations. Also in some cases, compensation packages include in lieu of (or in addition to) cash, infrastructure development and benefits in the form of education, training, production of business ventures, youth and women welfare and general community development programmes. For example, the OK Tedi Mining Ltd (OTML) has established several trusts and foundations to administer land owners compensation and also to take up infrastructural and economic development projects in order to expand socio-economic development in the areas affected by its mining operations (Hancock, 2001).

Many other mining nations have also legal provision and practices for distributing a portion of the fiscal benefits that arise from mining to affected communities in the interest of promoting sustainable development. However, the mechanism of such distribution and the manner of utilization of resources differ from country to country depending on a variety of factors such as legal system, political and governance institutions, interest groups, extent of dependence on mineral development and the level of development of the country. The note at Annexure 15 gives an account of the practices in a few developed and developing countries (apart from Canada, Australia, South Africa and Papua New Guinea).

The experience of the countries throw up a few lessons which need to be taken into consideration while defining a benefit sharing system of mineral resources revenue with project affected local communities in mining areas.

First, most countries use mineral royalty for local distribution as among all levies, royalty, being a unique tax levied on mines in well-suited for such local distribution.

Second, normally most nations prefer to transfer royalty (and other taxes) collected from mining companies to the general fund, allowing central or provincial government to determine where and how money should be spent for public good. It is, however, not possible to ensure that mining area get bulk of these funds or even their due share. For, in the budgetary process, the sharing of revenue depends on the relative powers of the respective levels of government. Besides, even if local government authorities are allocated funds, there is also no guarantee that these would mostly flow to project affected communities. In these circumstances, therefore, local activism which may include actions resulting in the preservation and closure of a mine, can lead, in some instance, to rebalancing distribution of mineral resources revenue (or royalty) in favour of local communities. This seems to have happened in the case of Aboriginal Communities in Canada and PNG. Also in many of these countries, mining companies have taken up infrastructural and development projects in their respective mining areas, beyond what is required by laws and regulations, in order to acquire their ‘social license to operate’ and maintain ‘project security’.

The next question relates to the manner of distribution of mineral resources revenue to local communities. Of course, where well-functioning governments and institutions operate,

as in Norway or Botswana, earmarking revenues for specific groups or development programmes is avoided as it enables the government to respond flexibly to changing requirements. Priorities as reflected in the general planning and budgetary process take care of the entire population of the country. Most developing countries are, however, not so fortunate and earmarking of funds for specific areas, programmes and groups is inevitable.

In some cases, resource benefits are distributed in cash directly to defined stakeholders (individuals) or affected parties in mining areas. In Papua New Guinea, designated landowners often receive compensation in cash as part of the agreements for the development of mineral resources. In Australia, payments are made to Aboriginal land councils via Benefit Reserve for mineral extraction on Aboriginal lands. Having a fair and transparent process for identification of the affected parties is essential for the success of such a cash distribution scheme which in a normal developing country situation can be bedeviled by political manipulation and corruption.

Also, cash transfers are much more likely to be spent on current consumption expenditure rather than saved or invested for economic development. In Papua New Guinea, there is now a recognition that cash in hand leads to dependence rather than independence from the mine. The problem becomes acute when cash income will cease on the closure of the mine if alternative productive assets have not been created in the meantime. Some communities in PNG, therefore, are opting for "development packages" that include infrastructure, housing etc. Also expenditures to invest in infrastructure, education and services contributing to development will benefit both the current and future generations in the local communities.

A related issue is that of the designation of appropriate agency(ies) for public expenditures of mineral resources revenue for the benefit of local communities. The experience of Papua New Guinea and Colombia show that lack of capacity at the provincial and local government levels prevented effective delivery of services. Political strife and corruption also further complicate the situation. This situation is typical of many developing countries. Therefore, mechanisms of savings and trust funds and development foundations have been set up in order to channelize the allocated funds for local development projects.

Another option is to require (or permit) mining companies to provide public benefits and take up socio-economic development projects in their respective mining areas as part of the condition of licensing and operation. In remote areas, where government presence is rare, it may be logistically possible for mining companies to provide these services more conveniently and effectively than can be done by weak government agencies. Also, these companies need to undertake such development projects in order to earn goodwill of the communities in which they operate.

Technology and mining practices

Lastly, an important factor that contributes to conservation and efficient exploitation of mineral resources and consequently to sustainable mineral development, is the adoption of technologically advanced mining methods and machinery in mining. In Canada and Australia, developed mining nations, science and technology play an important role in mining industry, thereby ensuring sustainable exploitation of their mineral resources. The industry in both the countries is technologically advanced and over the years improvements have been made focusing on reduction of costs, increase in productivity and enhancement of environmental performances. In recent years most technological advances have taken place as a result of the application of Information Technology (IT) to mining methods at different stages of mining operations. Innovative technologies and machinery have been developed for mineral exploration, geophysical and geochemical analysis, 3D modeling, blasting, mining operations and processing. These have assisted in improving productivity and efficiency of the mining industry.

Also, technological improvements have been done in environmental management. Since these countries are also exporters of machinery and software and thorough operation of multination mining companies, the advantages of these technological advances have been made available in other mining countries as well.

Conclusion

Sustainability issues are assuming increasing importance in major mining nations, as the account in respect of Canada, Australia, South Africa and Papua New Guinea (PNG) shows. These countries are now taking a comprehensive view of sustainable development in mining that includes, apart from environment, other important dimensions such as local stakeholder engagement, socio-economic development in mining project areas and transparency in communication with stakeholders. Also emphasis is placed on socio-economic development in mining project areas in order to compensate for the loss of natural capital that results from mineral exploitation. Mining companies undertakes these activities, even beyond the legal requirements, in order to earn their ‘social license to operate’ in a mining area. Technological advances in mining also contribute to sustainable mineral development.

Chapter 12

INTERNATIONAL INITIATIVES TO PROMOTE SUSTAINABLE DEVELOPMENT IN THE MINERALS SECTOR

I. Introduction

The mining industry worldwide faces sustainable development challenges, to which it responds by undertaking a number of international sustainability initiatives and programs. To enhance the contribution of mining to sustainable development and to have a common vision for sustainable development, actions at global and national levels have been undertaken to develop a comprehensive sustainable development strategic framework for the mining industry. The framework provides codes, guidelines and indicators to the mining industry, government and other key stakeholders and ensures transparent and accountable enforcement, as demonstrated in the next section.

Mining companies also measure the effectiveness of their sustainability programs. The chapter examines the most recent initiatives taken by six multi-national mining companies: Anglo American, BHP Billiton, Rio Tinto, Vale, Barrick and Vedanta. This chapter also looks at the environmental and social practices of each of these mining companies, the focus being on the chosen five dimensions of sustainability. Dimensions of sustainability examined are technological advancement, environment protection and biodiversity, stakeholder engagement, local community development, and transparency and accountability.

We have focused primarily on public information provided by these mining companies, including annual reports, performance reports and sustainability reports. The study uses the most recent reports available when the research was conducted.

II. International Fora to measure performance in sustainable mining

Mining, since its origin, has been conducted on the principle of maximum extraction of minerals lying underground along with minimal attention to mine workers' safety. Mineral development, as an extractive industry, is about exploitation and depletion of non-renewable finite natural resources used by mankind. Therefore, "sustainable mining" was considered by many as a contradiction in terms, not worth much attention. Although mining interests made vast fortunes over the years, the mining industry for most of its history did not have to recognize the long-lasting environmental and social effects of its operations or give any attention to the local communities residing in mining areas. Generally speaking, society, often mainly comprising backward indigenous population inhabiting the world's mining areas, has been silently tolerating the damaging impacts of mining. The advent of the so-called "environmental era" and environmental activism since the 1980s has changed the

situation somewhat. Initially, the industry was reluctant to move into a posture of environmental mitigation and restoration or social development of the communities affected by mining. Antagonistic campaigns by civil society members about poverty resulting from "resource curse" in the mining areas, environmental and safety hazards, difficulties in getting access to new mineral resources, community conflicts in some mining areas combined with regular media coverage emphasizing the need for a greater responsiveness to society's concerns by the mining sector have slowly brought about change in the attitudes of the global mining industry. Since the 1990s, there has been an inexorable shift towards the recognition that mining industry must work with the consent of local communities and take proactive measures to protect environment and conserve the resources to the extent possible.

The initial response has been to improve environment management practices through better environmental impact assessment and auditing, pollution prevention and control and the development of integrated environmental management systems. International agencies developed environmental guidelines for mining operations such as the Berlin Guidelines, 1991 and reviewed in 1999 and the various modules and technical reports published by the United Nations Environment Programme (UNEP). Subsequently, initiatives that reflected a more comprehensive approach to sustainable development in mining were undertaken by international organizations like UNEP, the United Nations Commission on Trade and Development (UNCTAD), the International Council on Mining and the Environment (ICME) and the World Bank which in 1998 launched the Business Partnership for Development (BPD) (Natural resources Clusters) programme with the objective of managing social issues in the extractive industries (ICMM, 2002). It pioneered a move towards "partnerships" between private, public and civil society sectors and "multi-stakeholder processes" and encouraged the industry to move from an enclave mentality to one in which it could meaningfully address sustainable development issues through social investment, poverty mitigation measures, engagement in community affairs and establishing new communication links and networks.

These international initiatives combined with the climate of change generated by various international conferences on environment and development (such as the 1992 Earth Summit in Rio de Janero) made the world mining industry aware that environment management supported, rather than acted as a constraint to good business management. The fact that both national and international legislation was being tailored towards promoting sustainable development helped in the process. Slowly there was also recognition that in addition to environmental dimension of the problems, there were also issues relating to community relations, social justice, poverty alleviation and good governance that were as much part of sustainable development as were site-specific environmental concerns.

As a consequence, the world mining industry, represented by the Mining and Minerals Working Group of the World Business Council for Sustainable Development (WBCSD), commissioned in 1998, undertook the Global Mining Initiative (GMI) project in order to improve the industry-wide sustainable practices. This initiative generated a world-wide research and consultation study, called the Minerals, Mining and Sustainable Development (MMSD) project carried out by the International Institute for Environment and Development

(IIED). The MMSD Project brought out a document entitled "Breaking New Ground: Mining, Minerals and Sustainable Development" published in 2002. This report examined, in a detailed manner, a wide range of mining-related issues, defining the challenges faced by the mining sector from the perspective of sustainable development such as strict environmental regulations, reduced land access, management of mineral wealth, engagement with local communities and governance (PDAC, 2007).

The GMI also led to the establishment of the International Council on Mining and Metals (ICMM) in 2001 as a global leadership body for the mining industry mandated to develop a work programme to implement the Toronto Declaration and the MMSD recommendations. The ICMM Sustainable Development Framework Principles (2003) (see table 12.1) were developed based on the issues identified in the MMSD Project and various voluntary principles and standards developed by other international organizations and business associations.

Table 12.1: Ten principles of ICMM

1. Implement and maintain ethical business practices and sound systems of corporate governance.
2. Integrate sustainable development considerations within the corporate decision-making process.
3. Uphold fundamental human rights and respect cultures, customs and values in dealings with employees and others who are affected by our activities.
4. Implement risk management strategies based on valid data and sound science.
5. Seek continual improvement of our health and safety performance.
6. Seek continual improvement of our environmental performance.
7. Contribute to conservation of biodiversity and integrated approaches to land use planning.
8. Facilitate and encourage responsible product design, use, reuse, recycling and disposal of our products.
9. Contribute to the social, economic and institutional development of the communities in which we operate.
10. Implement effective and transparent engagement, communication and independently verified reporting arrangements with our stakeholders.

Source: ICMM website, http://www.icmm.com/our-work/sustainable-development-framework/10-principles, assessed on 30th September 2011

Also, the MMSD report was an input to the deliberations at the 2002 World Summit on Sustainable Development in Johannesburg, resulting in a formulation of the Johannesburg Plan of Implementation (JPOI) which noted that "mining, minerals and metals are important to the economic and social development of many countries. Enhancing the contribution of mining, minerals and metals to sustainable development includes…..supporting efforts to address the environmental, economic, health and social impacts and benefits of mining…enhance the participation of stakeholders…and foster sustainable mining practices" (WSSD, 2002). Progress against these objectives will be critically reviewed in the deliberation of the UN Commission on Sustainable Development from time to time.

Another important multi-stakeholder international effort is the Global Reporting Initiative (GRI) whose aim is to develop and publish Sustainability Reporting Guidelines which provide companies a common framework for measuring and reporting environmental, economic, governance and social dimensions of their activities. The basis of GRI's reporting

framework is the G3 guidelines launched in 2006. In 2011, these were updated to G3.1 guidelines to provide a comprehensive and transparent sustainability reporting guidance. Many leading mining companies including Argyle Diamonds, Hillside Aluminum, Shell International and Tata Steel have already adopted these guidelines (Azapagic 2004).

The World Bank Group (WBG) also created the Extractive Industries Review (EIR) in 2000 and launched the Extractive Industries Transparency Initiative (EITI) in 2003. While EIR was basically a review and consultation process relating to the World Bank's operations in the extractive industry sector, EITI was a transparency initiative which set principles and criteria to encourage high standards of accountability and transparency in transactions between governments and mining companies, especially in areas relating to the management of revenues from extractive industries. Both EIR and EITI emphasized the importance of good governance and transparency in behavior and transactions required to ensure sustainable development in the extractive industry sector.

Finally, there were also various other examples of similar activities in the mineral sector at the national and international levels, such as the US-based Sustainable Minerals Round Table, the Canadian Mining Association's Whitehorse Mining Initiative (WMI) and Towards Sustainable Mining (TSM) programme, and the work of the European Industrial Minerals Association. The Federation of Indian Mineral Industries (FIMI) has started the "Sustainable Mining Initiative" aimed at increasing awareness and compliance levels of the country's mining industry which, it is hoped, would replicate sustainable practices in its operations.

There are also proactive attempts for the development of quantitative sustainability indicators for mining and minerals sector in order to measure a mining company's economic, environmental and social performance. Combining global, national and local initiatives, there are numerous efforts to define appropriate indicators as to measure them.

In one sense, all these initiatives, both at the national and international levels are in the nature of academic or theoretical exercise resulting in various guidelines, principles and codes of behavior (for mining companies). The extent to which these have been operationalized by mining companies, both in shaping or changing their mindset and attitudes as well as undertaking mining activities will, in the final analysis, determine their utility and effectiveness in bringing about sustainable development in the minerals sector. We next look at the sustainability performance of some of the leading mining companies in order to gain an understanding of the situation.

III. Initiatives by selected multi-national mining companies

In line with the emerging trend in corporate reporting, a number of multi-national mining companies publish annual sustainability reports integrating elements of the financial, environmental and social facets of the company. These give an idea about the sustainable development activities of these companies.

Using company-supplied information, five dimensions of their sustainability performance have been examined. These are technological advancement, environment protection and biodiversity, stakeholder engagement, local community development, and transparency and accountability. In all cases, the study used the most recent reports available when the research was conducted. For Anglo American, BHP Billiton, Rio Tinto, Barrick and Vedanta reports are for the year 2010; and for Vale, report is for the year 2009. Following is a brief outline of the chosen dimensions where each company is evaluated individually for its self-reported initiatives.

1. Technological Advancement

Mining companies need to develop and foster technological innovations to address sustainability concerns facing the mining industry and to achieve sustainable mine development. This enables a company to maximize eco-efficiency, safety and sustainability of its mining operations.

Anglo American makes use of closed drilling system to minimize adverse impact on environment; water treatment and reclamation technology to reduce the possibility of acid mine drainage; and collision avoidance tools with global positioning systems**.**

BHP Billiton implements innovative technologies such as in-cab global positioning system and machine control systems, allowing wireless transfer of electronic data. The company has also developed and demonstrated low-emission technologies.

Rio Tinto consists of a team of technology professionals and a number of technology centres, called the Technology & Innovation group, to develop and promote innovative technology solutions in mining, energy use, project development and execution.

Vale invests in advanced technologies that increase the efficiency of water use, that improve waste management and that control dust pollution. For instance, technology in one of its iron mining plant resulted in more than 60% reduction in the amount of water withdrawn from the dams and increased the use of recycled water at the plant.

Barrick also looks for innovative ways to reduce water use at its plants. For example, one of its companies, African Barrick Gold (ABG) uses a filtering process called the surficial paste tailings technology, which removes additional water from tailings slurry which is then reused at the plant.

Vedanta uses state-of-the-art technologies for waste disposal. To reduce indirect energy consumption, it undertakes initiatives such as installation of variable frequency drives and optimized lighting efficiency by replacing traditional fittings with metal halide lights.

2. Environment Protection and Biodiversity

With respect to companies' management of environment, four aspects are examined – water management, biodiversity improvement, mine closure & rehabilitation, and waste management.

Anglo American has a policy called “The Environment Way”, comprising of performance standards, to address issues of water management, biodiversity protection, rehabilitation, mine closure, and waste management. The company has developed site-level Water Action Plans (WAPs) and performance targets which lay emphasis on water efficiency improvement. The policy also includes a Biodiversity Performance Standard, which ensures that the company implements actions to mitigate harmful impacts on biodiversity. Managing biodiversity is a legal requisite and the mine sites regularly develop Biodiversity Action Plans (BAPs) and undertake BAP reviews. The company develops the optimal rehabilitation strategy for a given operation and manages waste through optimal design and regular inspections. Moreover, it believes that mine closure planning should be conducted as early in the life of a project as possible and throughout all stages of mine development. High-risk sites are audited every year, while medium-risk and low-risk sites are audited every two and three years, respectively.

BHP Billiton has environmental improvement plans incorporating water reuse and recycling, biodiversity, rehabilitation, and waste management. Water management plans implement controls to minimize water use. Their ratio of water recycled to high-quality water consumed (called the water index) has improved 7 per cent since the year 2007. The company carries out biodiversity management plans that include requirements for impact assessments and execution of controls to mitigate biodiversity impacts. Its waste management programs improve waste disposal practices emphasizing waste minimization, recycling and pollution prevention.

Rio Tinto has the most systematic environmental strategies. Its water management plan includes rainwater harvesting, a water target to improve the efficiency and recycling of used water from the kitchens, bathrooms and the laundry and a water risk review to assess risks and opportunities associated with biodiversity. The aim of its biodiversity strategy is to have a "net positive impact" (NPI) on biodiversity and to assess biodiversity values (operations are ranked as having either very high, high, moderate or low biodiversity values) in order to achieve the goal of NPI. The company has a Closure Standard to ensure optimization of post closure outcomes and closure management plans are reviewed to meet the requirements of the Standard. Progressive rehabilitation is conducted to minimize the residual impact of the operations and to promote recycling and reuse in order to ensure responsible treatment and disposal of the remaining waste.

Vale publishes the Management Plan for Water Resources whose aim is to reduce water consumption per unit of output and to increase the percentage of water that is recycled. In the year 2009, 76% of used water was recycled and reused. The company prepares specific biodiversity management plans for its operating units located in areas with a high level of biodiversity. Vale has established corporate guidelines in its “Mine Decommissioning Guide” to help its employees in the closure process. These guidelines aim to improve the management of mine closure, to ensure that all mine closure plans address social and environmental impacts and to revise these closure plans for all its mining units. Besides, its waste management plans provide for techniques to reuse waste in new applications and treatment prior to final disposal of waste. The company undertakes permanent and temporary

land reclamation.[1] In 2009, there has been an increase in the total amount of area undergoing permanent reclamation.

In 2008, Barrick introduced Water Conservation Standard which requires its operations to set up water conservation criteria, to conduct risk assessments related to water and to execute management review procedures. Barrick recycles and reuses water at most sites for all stages of mining with the aim of no net loss to biodiversity. Barrick's literature states that all its operations have closure and rehabilitation plans in place and at the end of 2010, more than half of the disturbed land was rehabilitated to the agreed post-mining land use. For efficient waste management, the company designs and operates storage facilities, which are subject to risk assessments and review by engineers.

Vedanta's approach for water management is towards reducing fresh water consumption, adopting rainwater-harvesting measures, and increasing recycling and reuse of waste water. Vedanta prepares and implements biodiversity management practices and wildlife management plan. The report does not describe its rehabilitation initiatives and just states that Madras Aluminum Company Ltd. (MALCO), a part of Vedanta Resources Plc, received first prize for reclamation and rehabilitation by Indian Bureau of Mines, for its Yercaud Mine. The company seeks to minimize waste generation and to enhance waste recycling and reuse in industries such as road construction and cement manufacturing.

3. Stakeholder Engagement

Regarding stakeholder engagement, two aspects have been examined; firstly, if the company works with host communities, government organizations and non-governmental organizations (NGOs), whether formally or informally and secondly, if the company has any formal grievance systems through which stakeholders' concerns can be addressed.

Anglo American works continuously with local communities, governments and NGOs through its Socio-Economic Assessment Toolbox (SEAT) programme. It works with the NGO CARE Brazil and a number of other NGOs on issues such as biodiversity, water management, climate change, social development, etc. Anglo American also executes a complaints and grievance mechanism, which is mandatory at all operations. Additionally, stakeholders can use the Anglo American's 'SpeakUp' website to register any grievances relating to infringement of principles of the company.

BHP Billiton interacts with host communities, governments and NGOs through meetings, multi-stakeholder forums and industry initiatives. Its Forum on Corporate Responsibility includes leaders of a range of international NGOs, such as Greening Australia, WWF Australia, Oxfam Australia, International Alert (UK) and Centre for Social Markets (India). Community complaints and queries are investigated and community perception

[1] "Undergoing permanent reclamation" means those areas that will no longer be affected by the company's activities, and "undergoing temporary reclamation" means those areas that are subject to possible new operational activities.

surveys are conducted every three years to determine the effectiveness of stakeholder engagement.

Rio Tinto has built up mature means of engagement that actively involve various stakeholders in making decisions about the issues that concern them. The main philosophy of the company is "to be a good neighbour to the local communities". The company keeps the local communities updated about its operations and their consequences by means of ongoing two-way interactions and agreements to gain land access for exploration and to develop mining operations. Its operations keep track of stakeholder engagement activities, agreements, and responses to complaints through its Communities Standard.

Vale carries out effective and transparent engagement with the affected communities, government bodies and NGOs. The company designed the Vale Fund for Sustainable Development to support actions by NGOs for social and environmental development of communities. Vale has a Reporting channel for receiving and resolving complaints regarding compensation, resettlement, and transparent sharing of information.

Barrick maintains ongoing discussions with communities residing near its operations, governments and NGOs. It addressed stakeholder concerns through its site-level grievance measures, its website and its annual Responsibility Report. To emphasize stakeholder engagement, the company developed a Community Relations Standard in 2010 which forms a basis for the development and improvement of the Community Relations Management System (CRMS). CRMS comprises of a grievance procedure and provides a systematic approach to manage the company's social performance by ensuring that issues are identified and dealt with in a suitable manner.

Vedanta uses the Public-Private-People-Partnership (4P) model, which means most projects involve close association with communities, elected bodies, government and NGOs. The company is also developing Stakeholder Consultation Standards in order to encourage efficient stakeholder engagement, reporting, and grievance mechanism. To ensure transparency and accountability in handling employees' complaints, the company has a "whistleblowing" policy which receives and addresses complaints regarding violations of ethical business practices. For handling community grievances, Vedanta attended 3,973 village meetings in 2010 and traced 266 relevant community issues of which 241 were successfully resolved during the year.

4. Local Community Development

Local Community development is another important focus area where it is studied whether these mining companies employ workers from local communities, whether they develop physical infrastructure in communities where they operate, whether they provide skills training to their workers, and whether they undertake community education and health initiatives.

Anglo American has a Socio-Economic Assessment Toolbox (SEAT) programme which involves local employment, training and capacity development. It provides skills training in fields applicable beyond the mining industry, such as carpentry, plumbing and electrical services. Anglo American has an enterprise development programme called Zimele in Africa to empower black entrepreneurs through establishment and transformation of small-sized and medium-sized enterprises. This initiative provides technical support, business opportunities and funds to emerging black-owned mining enterprises. Apart from imparting training, the company invests in improving infrastructure, and developing healthcare and education programs. Anglo American built six schools in Chile when it was hit by an earthquake and tsunami in February 2010. Also, its operations in South Africa enrolled more than 3,000 illiterate employees and local people in adult basic education programmes in 2010. The company strengthens health care services in rural areas by employing health experts and specialized equipments in municipal hospitals. Anglo American's literature does not throw much light on its employment of workers from local communities.

BHP Billiton develops multi-faceted local development programmes by identifying and assessing health, education and environment quality-of-life indicators and by measuring progress in these indicators every three years. In its operations where considerable safety risks exist, the company ensures that workers receive proper training. BHP Billiton invests in public infrastructure projects – construction of schools, community halls, recreation centre, and wells for potable water. It also undertakes various health programs such as vaccination programs to improve health services. It provides valuable employment opportunities to local people. In 2010, about 41 per cent of its workforce and 24 per cent of management were hired from the local community.

Rio Tinto is committed to provide employment and training opportunities to host communities. In 2010, Rio Tinto supported around 2,900 socio-economic programmes covering health, education, housing, agricultural development, and transport. On the whole, nearly US$ 88 million was directly spent on community programmes. The bulk of this community investment was directed towards education programmes, followed by health and housing. Rio Tinto provides support for girls to complete secondary education, and educates women in local communities about health and sanitation practices. Rio Tinto partners with UNICEF to improve education and nutrition of children and women residing in communities near their project area in Madhya Pradesh, India (detailed note about Rio Tinto's operations in India is given in Annexure 16).

Vale aims to raise the standard of living and quality of life of the communities surrounding its operations, through provision of valuable employment opportunities for local people and workforce training programs in metalwork, carpentry and construction to increase local hiring and to create a qualified local workforce in its operations. Vale invests in developing infrastructure that brings benefits to the local community, for instance, it operates a water treatment plant in one of its operations in Canada and supplies drinking water free of charge to residents in the community. Vale emphasizes community services by way of developing significant programs in education and health, such as Action Education and

Action Health, which seek to contribute towards improving management of public education and health. In Brazil, Vale Centers of Professional Education provides continuous learning opportunities and training classes for its employees on sustainable mining. In 2009, it established "Professional Training Program" to train young people for their first employment in mining operations. It also has an "Inclusion Program for the Disabled" which recruits and trains people with disabilities for operational and administrative tasks of the company.

All of Barrick's activities are guided by providing opportunities at the local level including direct employment and community development projects supporting education and community health. It hires bulk of its employees from local and regional areas near its operations and develops programs for host community members to gain the necessary technical, professional and leadership skills for employment in the mining industry. Barrick also provides health, safety and emergency response training to its employees worldwide. In 2010, Barrick invested, worldwide, around US$ 27 million in infrastructure development and community initiatives. Major areas of infrastructure development include constructing schools, health clinics, roads, water wells and power sources. The company has benefitted thousands of people by undertaking community initiatives, such as conducting adult basic education classes and implementing a Health Impact Assessment process to tackle community health issues.

Vedanta recruits a significant proportion of workforce from the local population residing near its operations. The company executes training, job rotation and abroad visits of its employees to expand their knowledge base. Vedanta also works to contribute towards constructing and improving physical infrastructure including community centres, temples, roads, drainage pipes, water wells and schools. In addition, it undertakes basic education and health initiatives through company-run schools and colleges, supplementary nutrition and health care centres.

5. Transparency and Accountability

Three aspects are examined related to transparency and accountability; firstly, whether the company publishes a GRI report using the third version of the GRI guidelines (G3) guidelines; secondly, whether the company supports the International Council on Mining and Metals (ICMM) sustainable development framework; and thirdly, whether the company participates in the Extractive Industries Transparency Initiative (EITI).

Anglo American prepares and presents sustainability information in accordance with GRI G3, the new version of the guidelines. In 2010, it achieved an A+ reporting Application Level[2], as verified by PricewaterhouseCoopers (PwC). The company is also a member of ICMM sustainable development framework and its activities are aligned with its principles. Anglo American supports the principles of transparency and is a member of the EITI, under which the company voluntarily discloses all major tax payments it makes to government in

[2] An Application Level of A+ shows sophisticated reporting systems based on the GRI Reporting Framework

the countries in which it undertakes mining operations. It was one of the first mining companies to join EITI.

BHP Billiton is an Organizational Stakeholder in the GRI and is a founding member of ICMM. BHP Billiton sustainability reports are aligned to indicators set by GRI G3 Guidelines and ICMM Sustainable Development Framework requirements. It has achieved an A+ GRI reporting Application Level on the basis of its 2009-2010 Sustainability Report. The company is also a supporter of the EITI and implements country-level EITI work plans.

Rio Tinto reports their sustainable development performance in line with the GRI G3 guidelines and the GRI Mining & Metals sector supplement. GRI has checked Rio Tinto's 2010 Annual report and have acknowledged that the report fulfills the requirement of Application Level A+. Rio Tinto is a founding member of ICMM and implements ICMM sustainable development framework. Rio Tinto is committed to maximum transparency and good governance. The company has supported EITI to strengthen governance by improving transparency and accountability. The company has an internal programme called "Speak-OUT" where employees can report their concerns or suggestions about any aspect of the business, bribery or fraud issues or about violations of financial reporting or environmental procedures.

Vale is committed to the principles of the ICMM and supports international commitments and standards such as EITI and GRI and is classified as A+. Its sustainability report consolidates the strategy of transparent and accountable actions. Vale has obtained SOX (Sarbanes-Oxley) Certification, a corporate governance instrument which indicates the implementation of transparency and good governance practices, as required under the US Sarbanes-Oxley Act.

Barrick reports on its economic, environmental and social performance in accordance with GRI G3 Guidelines and aligns its operations and activities with the ICMM Sustainable Development Principles. The company is committed to EITI to strengthen standards of corporate governance in its business practices.

Vedanta attained application level B+ of the GRI G3 sustainability reporting guidelines for its 2011 sustainability report, which provides partial disclosures in response to certain GRI G3 disclosure requirements. Vedanta does not support voluntary self-regulation standards such as ICMM and EITI.

Conclusion

Most international mining companies are taking proactive and collaborative measures in dealing with environmental and social responsibility issues in the mine cycle and incorporating sustainability issues in their operations. It is noteworthy that many international agencies have developed environmental guidelines for mining operations and major mining companies have adopted codes of conduct, and are operating community development programs that in some cases surpass conformity to laws and regulations. The companies are conscious about the environment in which they operate, although the emphasis they give to

these issues and the extent to which they deal with the issues varies from one company to another.

Various dimensions of mining companies' self-reported sustainability performance are put together in the following table.

Table 12.2: Dimensions of sustainability performance of multi-national mining companies

	Anglo American	BHP Billiton	Rio Tinto	Vale	Barrick	Vedanta
Technology advancement	✓	✓	✓	✓	✓	✓
Water management	✓	✓	✓	✓	✓	✓
Biodiversity improvement	✓	✓	✓	✓	✓	✓
Mine closure & rehabilitation	✓	✓	✓	✓	✓	✓
Waste management	✓	✓	✓	✓	✓	✓
Engagement with host communities, governments and NGOs	✓	✓	✓	✓	✓	✓
Complaints and grievance mechanism	✓	✓	✓	✓	✓	✓
Creation of employment opportunities for local people	✓	✓	✓	✓	✓	✓
Physical infrastructure development	✓	✓	✓	✓	✓	✓
Skills training programs	✓	✓	✓	✓	✓	✓
Community education and health initiatives	✓	✓	✓	✓	✓	✓
GRI G3 Reporting	✓	✓	✓	✓	✓	✓
Participation in ICMM	✓	✓	✓	✓	✓	✗
Participation in EITI	✓	✓	✓	✓	✓	✗

Section V
CONCERNS AND CONCLUSIONS

Chapter 13

GOVERNANCE FAILURE: A Major Concern

It has been argued that good and effective governance is the central pre-condition for achieving sustainability in mineral operations. Its absence, therefore, poses a major challenge for attaining sustainable development in the mineral sector in India.

The government at both the central and state levels (and to some extent at the local level) has an important role to play as a key stakeholder in mineral development. There are broadly two aspects of this role. Firstly, there is the regulatory role of granting permits, licenses, and other approvals under various laws governing mining in a fair and transparent manner and monitoring their implementation in order to ensure scientific and sustainable mining. The second important role is to create an enabling environment in which the society's economic, social, human, man-made and environmental capital is expanded or improved through the implementation of socially and environmentally responsible development. The effectiveness of both these roles is dependent upon good governance, a competent and transparent bureaucracy, enforcement of property rights, an independent judicial system and mechanisms to promote dialogue and consultation processes in order to resolve conflicts among various stakeholders.

Regulatory Function

Of all these factors, general good governance (including an independent judiciary) and a competent, honest and transparent bureaucracy with clear-cut responsibilities among various agencies and officials are crucial as these impinge upon the ground-level mineral operations. Besides, in India the main focus of governance in the mineral sector has been on regulation rather than on the developmental aspects of mining. Regulation is done through the command-and-control system, not via economic incentives. Therefore, it is all the more necessary that there is adequate institutional and administrative capacity to manage, control and monitor the activities in the mineral sector as per law. Our analysis of the state of affairs prevailing in some selected mining states shows that there is considerable scope for improvement on this score. Delay and inefficiencies in the grant of different categories of approvals and licenses, prevalence of illegal mining in various mining regions and consequent loss of revenue and benefits, environmental degradation and exploitation of local communities are some of the symptoms of lack of effective and good governance in our mineral sector.

India famously is a country of laws, many of them incorporating international best practices, but unfortunately has a patchy record in enforcing the rule of law. This situation is reflected in the mining sector as well where the governance system designed to implement the plethora of laws, regulations and procedures for ensuring responsible and sustainable

mineral development has been deficient in its assigned task. As has been explained earlier, the sectoral governance for mining is characterized by a duality of control which is the necessary outcome of the constitutional and legal arrangement which vests the ownership of minerals with the States and regulation (in public interest) with the Central Government. As a result a multiplicity of State and Central agencies and their bureaucracies are responsible for monitoring different aspects of the implementation of the regulatory system which naturally creates problems of coordination among them. This also provides a fertile ground for indulging in bureaucratic turf wars and also in blame-games when things go wrong as they often do!

The table (Table 13.1) below indicates the main government agencies (both state and central) responsible for monitoring the enforcement of various laws governing mining.

Table 13.1: State and Central Agencies involved in Major Regulatory Provisions for Mining in India

Regulatory Provisions	Relevant Laws and Rules	Agencies Involved	Remarks
Grant and renewal of mining concessions	MMDR 1957; MCR 1960	Department/Directorate of Mines (State); Ministry of Mines (Central); IBM (Central)	State Departments of Revenue and Forest also involved in giving clearances; Prior approval of central government for concessions relating to specified (scheduled) minerals; IBM inspection of mining areas for giving comments to the Ministry of Mines; MoEF (Environmental clearance)
Mining plans and schemes (including mine closure plans and EMP)	MMDR 1957; MCR 1960; MCDR 1988	IBM (Central)	
Monitoring mining operations	MMDR 1957; MCR 1960; MCDR 1988	State Directorate of Mines (MCR); IBM (MCDR)	Overlapping functions
Illegal mining	MMDR 1957; State rules for preventing illegal mining and transportation; EPA 1986; FCA 1980	State Directorate of Mines; IBM (MCDR and mining plan violations); MoEF (Central); Forest Department (State)	Overlapping functions and blame games; also, district level officials of state government are involved
Mine safety and mine closure	Mines Act 1951; Mines Rules 1955	DGMS (Central)	Mine closure plans also under MMDR 1957 — monitored by IBM
Forest clearance	FCA 1980; FRA 2006	Forest Department (State); MoEF (Central)	
Environment Impact Assessment (EIA) and environment clearance	EPA 1980; FCA 1980; FRA 2006	MoEF (Central)	Inputs from state agencies; Also, EMP under MCDR 1988

Regulatory Provisions	Relevant Laws and Rules	Agencies Involved	Remarks
of new mines, expansions or renewals			(ChV)
Air and water pollution control (consent to establish and operate)	Air Act 1981; Water Act 1974	State Pollution Control Board	IBM also monitors air and water pollution

Note: DGMS: Director General of Mines Safety; IBM: Indian Bureau of Mines; EMP: Environment Management Plan ; FRA 2006: The Forest Rights Act, 2006; EPA 1986: The Environment (Protection) Act, 1986; MCR 1960: The Mineral Concession Rules, 1960; FCA 1980: The Forest (Conservation) Act, 1980; MoEF: Ministry of Environment and Forests; MCDR 1988: The Mineral Conservation and Development Rules, 1988; MMDR 1957: The Mines and Minerals (Development and Regulation) Act, 1957

The Department/Directorate of Mines in the State Government and the Ministry of Mines/the Indian Bureau of Mines (IBM) in the Central Government are the agencies directly concerned with governance in the mineral sector. As a matter of fact, all matters relating to day-to-day mineral administration are handled by the two technical bodies, namely the Directorate of Mines or Mining (by whatever name it is called) in State Governments and the IBM in the Central Government.

Typically, the State Directorate of Mines is headed by a Director of Mines (usually a mining engineer) who is assisted by joint directors/deputy directors and mining officers/engineer at the headquarters. In the field the mining areas of a State are divided into various administrative zones or circles/districts and the offices there are staffed by joint directors/deputy directors and mining officers and mining inspectors and other field-level technical and general personnel. In many places the field officers work under the general supervision of the District Collector who is supposed to bring about coordination between their activities and those of other relevant field-level agencies like revenue, police and forest departments.

The main functions of State Directorate of Mines and its field formations are the following:-

(i) Administration of major minerals (processing of applications for various categories of mineral concession, granting mining leases and administering various conditions of mineral concessions) as per the provisions of the MMDR Act 1957 and Rules framed under it;
(ii) Administration of minor minerals (sanction of quarry leases for building materials and other minor minerals)
(iii) Collection of royalty on minerals and other mineral revenues;
(iv) Monitoring minerals production and dispatch (from mines) through inspection, physical verification, reporting system, transport permits, check posts, weigh bridges etc.
(v) Prevention (if necessary through preventive and penal action) of illegal mining in term of the existing laws and the Rules framed under Section 23 of MMDR Act, 1957.
(vi) Collection and publication of mineral statistics and other relevant reports.

(vii) Lending services for peripheral development and environmental management in mining areas (not considered core function)
(viii) All allied matters connected with mineral administration.

The Indian Bureau of Mines (IBM), a subordinate office under the Ministry of Mines also plays a significant role in the governance-system in the mineral sector. Basically, a technical advisory body (with headquarters at Nagpur in Maharashtra State), its core competence is in providing consultancy services on various aspects of mining – preparation of mineral inventory, mineral maps and other technical and research-oriented studies on mining, formulate proposals for scientific development of mineral resources of the country and conservation of minerals, ore beneficiation and environmental studies, providing training to technical and non-technical personnel on different aspects of mining and providing advisory services to the Central and State Government agencies on all aspects of mineral industry, trade, legislation, etc.

What appears somewhat incongruence is its add-on role as a technical regulator for the mining industry in the country, over and above the regulatory functions of the State Government agencies in mining. In fact there is a tendency on the part of IBM to consider itself as the "national technical regulator" which will lay down operational and functional guidelines and methodologies for State Governments and the mining industry to follow, somewhat oblivious of the fact that minerals are basically state resources and any Central Government agency operating in the mineral sector must function in an advisory capacity or in partnership-mode with State Governments.

In operational terms, one among its six functional divisions namely the Mines Control and Conservation of Minerals (MCCM) Division, through its three Zonal and twelve regional offices and two sub-regional officers, performs the so-called regulatory functions; essentially it is the field-level regional offices located in the mining States of the country which mainly discharge this responsibility. The core regulatory function of IBM is to enforce the provisions of the Mineral Conservation and Development Rules (MCDR) 1988 framed under MMDR Act 1957 for ensuring scientific mining. Specifically two important responsibilities are assigned to it: (i) the processing and approval of mining plans (required under Section 5(2) (b) of MMDR Act) and schemes for mines and (ii) the implementation of the rules for protection of environment inside the mines. There are also associated responsibilities under the Mineral Concession Rules (MCR) 1960 and the Environmental (Protection) Act 1986 and Rules.

The relevant legal provisions of the MMDR Act 1957 and MCDR 1988 are enforced through inspection of mines by the officials of IBM from time to time and in required cases, by filing prosecution for penal action.

Thus, over the years an unfortunate duality in regulatory control over mining has developed in the country. The State Government agency (Directorate of Mines) mainly deals with issues covered under MCR 1960 (concerning grant and renewal of mineral concessions, survey and demarcating of mining leases, revenue/royalty collection, production and

transportation of mined ores etc.); the Regional Office of IBM, on the other hand, handles matters covered under MCDR (approval of mining plans and schemes and their implementation, mine closure plans, reclamation and rehabilitation of land, environment protection in mines and other issues concerning scientific mining). Whether these two categories of functions can be separated without adversely affecting the quality of mineral administration is a question that needs to be investigated and analyzed. After all minerals are resources of the State and their agencies should be fully accountable for regulating all the relevant aspects of mining operations. Detracting from this obligation can and does erode the sense of responsibility of the State agencies and leads to, what has been called "institutional confusion" (Bhushan and Hazra, 2008) of who is responsible for what in the mining sector. It also creates a situation where State and Central Officials indulge in "blame games" to dilute their responsibility, as has happened in cases relating to 'illegal mining" in Odisha and Karnataka. Also, the experience of Bellary (Karnataka) has shown that blurring of responsibilities among officials may facilitate collusive and corrupt behavior that turns a blind eye to illegal mining operations.

The situation is further compounded by the fact that both the State and Central agencies in the field (mining areas) are grossly under staffed and do not have enough technical manpower and capacity to monitor even large mines, let alone small and medium mines and illegal operations.

A loose structure of coordination committees (such as the State Coordination-cum-Empowered Committees, State Geological Programming Boards and State and District-level Task Forces on Illegal Mining) has been created to bring about coordination between State and Central Bureaucracies but those are inadequate to address the problem of ground-level coordination required on a regular and continuous basis.

The Draft MMDR Bill 2011 also fails to address the problem. On the contrary its provisions creating new State and Central regulatory authorities (comprising retiring and retired officials) to deal with the problem of illegal mining and statutory coordination-cum-empowered committees both at the central and state levels may further worsen the problem of 'institutional confusion' in the mining sector.

Minerals are properties of the States and the total responsibility for governance in the mineral sector, that is administration of MMDR Act 1957, and the Rules framed under it (specifically MCR and MCDR) must remain a State responsibility. In fact there has been over the year a progressive decentralization of powers and responsibilities (for grant of mineral concession, approval of mining plans and schemes and monitoring the implementation of licenses) to the States and this process must continue to make State Government agencies totally responsible for all aspects of mineral administration. This means IBM must function and develop expertise as a full-fledged technical and consultancy agency for the mineral sector on the pattern of CMPDI for the public sector coal industry. It may undertake research studies, prepare manuals, guidelines and methodologies and make them available to state agencies, provide advisory services to State Governments and train their officials but should cease to have any executive or regulatory responsibilities. Its technical experts may

sometimes work in the States but should then be embedded in State agencies rather than function in separate structures (offices) thereby creating problems of coordination. What is envisaged is an IBM-State Government interface on the pattern of relationship between CMPDI and the operational coal companies (subsidiaries) of Coal India Ltd.

It has sometimes been argued that minerals being national assets with the mineral industry of a country having international ramifications and impact, its administration and regulation should be under the control of the national or central government. This argument has no validity as in countries like Australia and Canada, where the provinces have much greater powers and responsibilities in mineral development than their respective national or federal governments and their countries have fairly advanced mining industries without adversely affecting their national interests. Since minerals are located in the States and state government agencies are closer to the ground, it is advisable to give them total responsibility for mineral administration, while at the same time maintaining a common legal framework as the national mining law (MMDR Act 1957) does.

All this would require strengthening and modernizing the structures and technical and administrative capacities of state agencies (Directorate of Mining) through technical and financial assistance, possibly from the Central Government. Of particular importance is strengthening the mineral administration at the field or the district level which has the primary responsibility of monitoring the implementation of the regulatory system. The present field formations in State Governments in mining are very weak and ineffective. These have no adequate budgetary support neither do they have adequate technical and inspecting personnel. Its status and influence in the government structure at the district level is not very high. Besides poor availability of technical facilities like weigh bridges, inadequate physical infrastructure and fragile law and order situation with ineffective police presence in the mining-cum-tribal areas complicate the problem. Monitoring also needs close coordination with other agencies like police, forest and revenue officials as well as environmental regulators. Normally the District Collector is expected to bring about this coordination, but in most districts these senior officials are too busy to attend to this responsibility. In these circumstances, the well-intentioned guidelines and orders of both State and Central Government mostly remain on paper.

In view of the growing importance of mining and increasing cases of violation of the relevant legal provisions, it is essential that the problems faced in the governance-system in the mining areas are gone into in depth in order to evolve a satisfactory solution. At least in each of the major mining districts of the country (to be identified on the basis of objective criteria) in the mineral rich States an effective governance-structure for mining should be developed. While details can be worked out at an appropriate forum, each such district should be provided with a dedicated multi-disciplinary standing team under the leadership of a senior officer of the mining department and comprising officials from the police, revenue, forest and other related agencies in order to provide constant and continuous vigilance of the mining operations in the district. They should be trained and equipped to use modern technical methods and technological tools for discharging their responsibilities in a professional manner. It may be appropriate for the Central Government to provide a common

blueprint for such a structure and extend financial and technical assistance for establishing such a structure. Simultaneously, the limited areas in which IBM would operate in order to provide technical advice and counseling to State Governments' operational agencies in the field should be identified.

Also, in the field of environmental governance relating to the mineral sector there is considerable overlapping of functions among various agencies. The EIA process under the Environment Protection Act results in the formulation of an EMP that a mining project has to implement. The implementation is monitored by the regional offices of MoEF located in States. On the other hand MCDR has as many as 11 rules (Chapter V) concerning and IBM requires an "environment plan" along with mining and mine closure plans. It also seeks to monitor air and water pollution within mines where as the relevant environmental laws give this responsibility to the State Pollution Control Boards (SPCB). SPCB itself has an elaborate system of granting consent to establish (CTE) and consent to operate (CTO) and monitoring their implementation is done through its field offices. (It is another matter that CTE is mostly granted on the satisfaction that a mining enterprise has obtained all other clearances including mining lease and forest clearance). Added to all this is the monitoring of violation of the Forest Conservation Act (FCA) 1980 which is done by both State and Central forest bureaucracies. It is essential to streamline the procedures and arrangements for environmental governance in order to eliminate duplication and overlap.

For, an administrative arrangement that comprises multiple state and central bureaucracies with overlapping functions and blurring of responsibilities provides a fertile ground for political interference and institutional graft. This has come out in many enquiry reports the most recent being those on illegal mining in Bellary (Karnataka). The laws give considerable powers to officials but there is a reluctance to use these powers to discipline violators including those who damage the environment. Political interference, lack of will to confront entrenched mining and commercial interests, corruption at both political and bureaucratic levels and lack of budgetary support (a consequence of multiplicity of organizations) are some of the major causes of slack performance of enforcement agencies (Divan and Rosencranz, 2001).

This situation has led to judicial activism in matters concerning sustainable mineral development. The high-profile cases where the higher judiciary has intervened and given directions to protect environmental and social integrity include the Samatha judgment[1], the Kudremukh case[2], the Lafarge case[3] and numerous orders passed on the cases relating to illegal mining in Bellary (Karnataka) on the basis of the recommendations of CEC (Central Empowered Committee) appointed by the Supreme Court. This new pattern of judge-driven implementation has both public and political support to a considerable extent and often bureaucrats are also willing to let the judiciary "bell the cat" when it comes to challenging

[1] *Samatha* Vs. *State of A.P. & Ors*, JT 1997 (6) S.C. 449
[2] Kudremukh Iron and Ore Company Ltd., *T.N. Godavarman Thirumulpad* Vs. *Union of India (UOI) and Ors*, JT2007(2)SC270
[3] Lafarge Umiam Mining Pvt. Ltd., *T.N. Godavarman Thirumulpad* Vs. *Union of India & Ors*, JT 2011 (7) SC 346, *Judgements Today*, 2011 (7) 5.

influential interests (Divan and Rosencranz, 2001). But this cannot be a sustainable solution to the problems of mineral administration as judiciary cannot substitute the executive in governing the country or be arbiter of economic and development policies in the economy. There is, therefore, a pressing need for streamlining and reforming the governance structures and procedures in the mineral sector so as to create a congenial framework for achieving sustainable mineral development.

Forest and environmental clearances of mineral projects have a significant bearing on mineral administration. Forest clearance is regulated under the provisions of FCA (the Forest Conservation Act 1980) and environmental clearance is given in terms of the provisions of the Environment (Protection) Act 1986 which involves the environment impact assessment (EIA) process. Both these laws as far as mining projects are concerned, are administered by the Central Government in the Ministry of Environment and Forests (MoEF). There has been a concern that the time taken for giving clearance in respect of a project can be unduly long. For example, from the information obtained, through RTI (Right to Information), on forest clearance for mining projects with greater than or equal to 50 hectares of mining lease area in the states of Odisha and Goa during the years 2006 to 2010, it is noticed that the time taken for granting forest clearance ranged from about 2 to 15 years[4] and from about 7 months to 7 years[5] in Odisha and Goa respectively. Besides, although the same Ministry (MoEF) handles both these clearances these are done in parallel streams presumably because these two (separate) clearances are dealt with by two sister-bureaucracies under the Ministry. It is worth examining if these two clearances in respect of mining projects can be combined into one composite process so as to ensure expeditious disposal. Other countries have undertaken more drastic reorganization in the interest of efficiency of administrative. As has been mentioned in an earlier chapter, South Africa, in 2008, amended its environment and mining laws in order to make the Ministry of Minerals and Energy competent authority to implement the environmental legislation and regulations in respect of mining projects in order to avoid duplication in the approval-process.

Due to lack of coordination between various permitting processes, mining enterprises sometimes face avoidable difficulties as a result of mismatch between the tenure of different types of licenses. For example, Rio Tinto (in respect of the Bunder Diamond Project in Madhya Pradesh) were constrained with having the prospecting license while not having the forest clearance and by the time it obtained forest clearance, the time for prospecting license had lapsed (Economic Times, 2012).

The Environment Impact Assessment process has also been subjected to considerable criticism in many quarters. These criticisms include:-

- The EIA process is too centralized and causes avoidable delay in project approval. In many developed countries the EIA process is undertaken at provincial and local

[4] Information received from the State Forest Headquarters, Odisha, Office of Principal Chief Conservator of Forests, in response to RTI application dated 19.12.2011

[5] Information received from the Government of Goa, Office of Addl. Principal Chief Conservator of Forests, in response to RTI application dated 14.09.2011

levels which are closer to the ground and therefore, can assess environmental impact more accurately.

- In view of centralized decision-making at Ministerial level, there is a tendency to operate the environmental clearance system in an arbitrary manner reminiscent of the old industrial licensing systems. Unlike the old system, environmental clearance procedures are not about approving or rejecting a proposal; these are concerned with balancing the needs of development with those of conservation. The primary purpose is to anticipate and avoid and mitigate environmental consequences of development projects and bring about a project outcome that balances developmental needs with environmental integrity rather than issue 'show cause' and stop work' notices to project developers.
- Typically, the full range of alternatives is not considered. This may result in yes/no/conditional decisions by government rather than identification of optimal outcomes.
- Preparation of Environmental Impact Studies by private consultants (engaged by project proponents) many times results in biased reports, often favoring the project proponent's point of view. In a number of cases the reports are in the nature of "copy-and-paste" documents that has led MoEF itself to announce that environmental clearance given in respect of a project would be withdrawn if its report is found subsequently to be copied for other EIA reports (Notification No. J-11013/41/2006-IA II (I) dated 5 October 2011 of MoEF, Government of India).
- The public hearing process under EIA also suffers from a number of drawbacks. In backward mining areas, it is many times stage-managed by either project proponent or its opponent or by both. Sometimes local politicians and goons can create disturbance in meetings with a view to blackmailing project proponents for irregular payment. Public hearings in some mining areas have been postponed or abandoned due to public disturbances and threat to law and order.

These issues must be addressed in order to improve the efficiency of the environment clearance process.

Development Function

It has been mentioned earlier that besides regulation, the government also has an important role in creating an enabling environment for socially and environmentally responsible development in mining areas. An important aspect of this role is to ensure that mining enterprises, as a part of their environmental and social responsibility, incur expenditure on creating alternate (man-made or constructed) assets in their respective mining project areas in order to replace the natural capital (mineral resources) damaged by mining operations. In India, the government has not taken this responsibility seriously, neither does the current mining law (MMDR Act 1957) provides for any legal requirement on the subject. In the Draft Mining Bill (MMDR Bill 2011), there are a few provisions concerning mining enterprises' obligation to undertake socio-economic development work in mining areas. One

of the provisions, namely the requirement that each mining company should attach a CSR (Corporate Social Responsibility) document to its mining plan and indicate its annual expenditure on CSR activities in its Annual Report, is weak and amenable to lax administration. For, CSR by its very nature is optional and voluntary and it is usually considered a prerogative of a mine owner to determine and undertake local development works as part of the so-called CSR activity. Socio-economic development in a mining project area should instead be seen as a corporate business obligation (CBO) to be fulfilled by a mining enterprise as a mandatory legal requirement.

The second provision on socio-economic development relates to the proposal (in the Draft Mining Bill) for the constitution of a District Mineral Fund (DMF) in each mining district to which all mining leaseholders would make contribution according to a prescribed formula. The proposal as formulated in the proposed law is vulnerable to atleast three pitfalls.

Firstly, it is mentioned that the funds in DMF would be utilized (i) for distributing "monetary benefit" to persons or families affected by mining and (ii) to undertake "such other activities…..including creation, management and maintenance of such local infrastructure for socio-economic purposes in areas affected by mining related operations and facilitating the implementation of the Sustainable Development Framework". It is clear that while the objective to distribute 'monetary benefits' has been clearly stated, that relating to 'infrastructure for socio-economic purposes' is couched in somewhat general language. In any case, given the preference for populist measures in the States, the most likely mechanism would be cash distribution to individuals and families affected by mining. Identification of beneficiaries in a fair and transparent manner (essential for a cash distribution scheme) is virtually impossible in the Indian conditions as it is bound to be bedeviled by political manipulation and corruption. Besides, experience in other countries (such as Papua New Guinea and Australia) has shown that simply doling out cash to local communities is not a sustainable solution as these are mostly spent on current consumption including expenditure on liquor. The objective instead should be to create alternate capital assets that will benefit both the present and future generations.

Secondly, pooling of resources of all the miners in the district into a common fund (DMF) is likely to lead to misallocation and misutilization of these funds. While royalty collected by the State Government in a mining state can be used for development work in the state or in a mining district as a whole, the additional funds to be allocated by mining companies for socio-economic development works must be spent in their respective mining project-affected areas. When the funds are pooled together in a common district fund, it is natural for the decision-making authority (in this case, the Governing Council for DMF) to distribute the funds equitably throughout the entire district. Additionally, the allocations may be determined by political considerations as the Governing Council will be dominated by district-level officials and local government (panchayat raj) functionaries. This means that the funds in DMF could go to even non-mining areas in a mining district. In any case, a large proportion of the funds will go for administrative overhead and bureaucratic infrastructure

under the Governing Council, rather than on creating assets in the form of social and physical infrastructure.

Thirdly, the experience in many developing countries has shown that lack of capacity at local government levels prevents effective delivery of services to the affected people. In India also, lack of capacity and commitments on the part of district level agencies has been cited as one of the main reasons for lack of development in the tribal areas which has led to the rise of resistance (Naxalite) movements in large tracts of the country. Inefficiency, political manipulation, misuse of power and graft are likely to mar the efforts to undertake local development work through an agency (DMF) dominated by district level officials who these days can easily be influenced by local politicians. On the other hand, mining enterprises are already executing local development work as part of their CSR activity and their executives are present in the remote (mining) areas which are rarely visited by government officials. Besides, mining companies have an interest in executing development works in their project areas in order to earn community acceptance. From all these angles, it would be logistically convenient and more beneficial and effective if mining enterprises rather that government or semi-government agencies are given the responsibility to plan and execute local development projects in their respective mining project areas, preferably through partnership arrangements (with local communities, among others) in the form of "trusts", "foundations" or consortia/ associations of mines (in case of small miners) as it happens in many mining nations. These can then be monitored or audited by appropriate government agencies.

Conclusion

Governance failure in mineral administration poses a threat to achieving sustainable development in the mineral sector. Duality of control and multiplicity of state and central agencies with inadequate budget and staff appear to be the major reason for governance failure in India's mining areas. Political interference and institutional graft further muddy the water. The problem needs to be addressed through appropriate administrative reforms which should aim at making State Government agencies fully responsible for mineral administration in their respective states. The field-level arrangement should receive special attention. IBM, under the reformed arrangement should function as a technical consultancy and advisory body assisting the state governments and the mining industry in their (technical) tasks. This is in conformity with the federal set up under India's constitution. Also the procedures for various approvals and monitoring including those for forest and environmental clearances need to be streamlined in order to improve the efficiency and effectiveness of the system. The Central Government should, in public interest, provide assistance to the States in preparing and implementing suitable reform proposals. Improvement in the governance system must be achieved as good governance is an essential pre-condition for achieving sustainable development in the mineral sector.

Also the proposal to undertake socio-economic development work in mining areas through contributions (by mining lease holders) to a common District Mineral Fund (DMF)

in each mining district is fraught with difficulties. Instead of creating capital assets for the benefit of project-affected communities, the funds are likely to be misutilized or misallocated for non-productive purposes. Given pervasive government failure in the mining sector, the better alternative will be to put legal obligation on mining rights holder to undertake socio-economic development works in their project-affected area. These can then be monitored by appropriate government agencies.

Chapter 14

INDUSTRY BEHAVIOUR AND OTHER CONCERNS

Our analysis has shown that along with good governance, the attitude, behavior and values of mining enterprises play a crucial role in achieving sustainable mineral development. In one sense, the performance of the industry, being the direct player in mining, is relatively more important than that of government which basically has a supportive role.

Mining enterprises of course are in business to make profits. At the same time, they have an obligation to adopt ethical business practices within the prescribed legal system in order to earn socially acceptable, risk-adjusted return on investments. Besides, for accessing and exploiting mineral resources in remote regions inhabited by relatively backward and marginalized communities, they must function in an environmentally and socially responsible manner in order to maintain a welcome status for their business and investments. Since sustainability implies mining to be viewed as the transformation of a finite natural resource into other forms of (constructed or manufactured) capital, expenditures on creating such assets (as part of their environmental and social responsibility) in mineral project areas must become a component of doing business before calculating profit. A similar approach is reflected in the prescription of the Ten Principles of ICMM for the world mining industry to which a reference was made in an earlier chapter.

The performance of the mining industry in India on this score has, however, been a mixed one and leaves considerable scope for improvement. While some of the larger or major mining companies are now openly dealing with aspects (mostly environmental dimensions) of sustainability at the operational and corporate levels, many others seem to restrict themselves to meeting the prescribed legal requirements under the mining and environment laws. There are some others who comply with these requirements in form rather than in substance or indulge in plain violations as in the cases of illegal mining.

Responsible behavior on the part of the industry for attaining sustainability requires both self-regulation (mostly in areas defined by law) and proactive involvement in bringing about environmentally and socially desirable development in mining areas. In view of the persistent government failure (due to incompetence, political manipulation and corruption), the pressure from the society is now on business to self-regulate in areas that affect communities. But as the cases of illegal mining in Karnataka, Odisha and other states have shown, many mining enterprises (both large and small) have failed to restrain their greed in the face of rising mineral prices. Their behavior has harmed the environment and the society. Naturally this creates negative perceptions, leading to a loss of social license to operate.

Allied to this issue is the concept of ‘limits’ (of an economic activity) which is an important aspect of sustainable development. Mineral development in a region should be carried out within its available social and environmental “carrying capacity” at a given point

of time. In Keonjhar (Odisha) and Bellary (Karnataka), it was seen that the physical environment and infrastructure were strained considerably due to the sudden increase in the production and transportation of iron ore in order to meet the rising world demand of the commodity. Neither did the government regulate nor the industry self-regulate. It is advisable, as part of the permitting process, to determine the production levels of minerals (for specified periods) for a region on the basis of an assessment of the sustainable 'carrying capacity' of the environment, roads and other infrastructure and then determine the maximum production levels of individual mines for that period, as has been suggested by the Supreme Court-appointed CEC (Central Coordination Committee) in its report on illegal mining in Bellary. Perhaps an environmental impact assessment for a region (as distinguished from that for a project) and consequent preparation of an environmental management plan can help in making this assessment.

Traditionally mining enterprises have concentrated on the principle of maximum extraction of minerals lying underground along with minimum expenditure on non-mining activities such as protection of environment and community welfare. The motivation has been to reduce costs and maximize profits. The onset of the 'environment era', public resentment against damage to environment due to mining and consequent developments of mining and environmental laws prescribing formulation of mining plans and schemes, environment impact assessment and pollution control measures have compelled miners to adopt and improve site-specific environmental measures. Even here there is a difference between the practices followed by different categories of mining enterprises in the country. Major mining companies with long-term interest in mineral development prescribe environment policies at the corporate level, adopt comprehensive environment protection measures, sensitize their executives on sustainability issues and progressively try to improve their environmental performance. To that extent, they go beyond the requirements of law to create an environmentally sound business. There are other enterprises, large, medium and small, whose environmental obligation consists in strictly and somewhat narrowly conforming to the prescribed legal provisions. There are still others, mostly small mines, who tend to conform to the provisions of law more in form than in substance. Differences in the levels of technology used also determine the quality of their behavior with mining companies using advanced technologies contributing significantly to scientific mining and efficient utilization of resources.

It has been mentioned earlier that mine closure and associated reclamation and rehabilitation of mined out land are important elements of sustainable development. The performance of the Indian mining industry (with a few notable exceptions such as Sesa Goa's Sanquelin mines) in this area falls short of the standards and practices followed in other leading mining countries. In Australia and Canada, for example, the process of mine closure is initiated early in the mining cycle, even at feasibility and mine planning stage and continues throughout the project life. This enables the mine to anticipate and adopt environmental measures during mining operations keeping the ultimate mine closure and its costs in perspective and spread these costs throughout the project life. Local communities are closely associated with different stages of the process. In the USA, there is a separate law

governing mine closure, namely the Surface Mining Control and Reclamation Act 1977 that obliges all mining operations when finished with mining in an area, to return the land to approximately same contour and make the land useful and also undergo regular inspections that reclamation was taking place. The provisions of the law are implemented strictly.

In India, there is no separate legislation on mine closure; the legal provisions on the subject are contained in the Mines Conservation and Development Rules (MCDR) 1988. These require a mining lease holder to submit progressive and final mine closure plans for his mine and make him responsible for reclamation and rehabilitation measures. There are even provisions for financial assurance to be given by the leaseholder. In practice, however, the implementation of the provisions is weak and the preparation of mine closure plans is reduced to a technical formality. Mine lease holders do not act on these plans till the total exhaustion of mineral deposits in a leasehold property and the financial security provided is not adequate to meet the costs of closure in case of default. Local communities are not involved in the preparation, review and implementation (if any) of mine closure plans which often do not cover socio-economic and livelihood concerns. It is, therefore necessary to review the situation critically, formulate a specific legislation on mine closure on the basis of best international practices and arrange for strict implementation of its provisions in the interest of sustainable mineral development.

Site-specific environmental concerns are but only one aspect of sustainable development; other important dimensions include stakeholder engagement and community relations, local area (socio-economic) development and transparency in communications. It has already been mentioned in an earlier chapter that since about the 1990s the world mining industry in general and multinational mining companies in particular, have come to accept a more comprehensive approach to sustainable development that includes all these elements besides environmental concerns. Legislative developments in many advanced mining countries have also kept pace with this trend. In India, on the other hand, there is a tendency to interpret sustainability mainly in terms of environmental protection and management and the mining industry has not yet accepted its full obligations to local communities in mining areas; neither has legislation kept pace with the global trend.

Mining and forest laws in India have since the colonial days excluded citizens from decision-making processes even when these affected their lives. The national bureaucracies have always considered minerals to be the nation's wealth to be exploited mainly keeping in view the overall national interests (such as earning foreign exchange through mineral exports) somewhat ignoring the interests of local communities and their environment. The mining industry similarly considered itself and government as the only two direct stakeholders who would determine the terms of mining operations and viewed local communities in their project areas in a donor-recipient model, adopting somewhat paternalistic attitude towards them, especially if they happened to be tribal communities. As a result, mining enterprises in India, as the accounts in respect of the selected mining states show, have very limited interaction with local communities in their project areas in what they call as "technical" matters which in reality covers all aspects of mine development, operations and even closure. The only tangible interaction that they have with these communities is during public

consultations under the environment clearance process which is conducted prior to the start of mining operations and during the initiation of local development works. These consultations, however, do not cover issues connected with mining that have significant impact on community life.

This is in sharp contrast with the situation prevailing in other leading mining countries where interactive relationships between mining companies and local communities (in mining areas) are a prominent feature of the mining scenario, as our description of the situation in Canada, Australia, South Africa and Papua New Guinea in an earlier chapter shows. Over the years local communities in mining areas have emerged as direct stakeholders in mining and in order to earn community acceptance and counter negative perceptions, mining companies have developed formal and informal mechanisms to involve them in decision-making processes in all phases of the mining cycle, from exploration and planning through mining operations to closure. This principle has been recognized in the mining and environmental laws of these countries which prescribe elaborate procedures for citizens' consultations, litigation and public hearing. A classic example is that of Papua New Guinea (PNG) where the mining law provides for the setting up of a Mineral Development Fund (MDF) which functions as a venue for consultations among stakeholders about the scope and impact of a mining project ultimately leading to agreements between them on benefits to be derived by the local community from the project.

In India, on the other hand, both the industry and government have been slow to respond to this requirement of sustainability. Formal mechanisms for involving local communities in decision-making relating to mineral development do not exist. The mining law does not require much consultation and under the environment law, public consultation takes place only once at the time of environment impact assessment exercise and that too can be stage-managed in remote tribal areas. Political manipulation and corruption at various levels can vitiate the process. Even the proposed (new) mining law (the Mines and Minerals (Development and Regulation) MMDR Bill 2011) contains no provision requiring mining enterprises to engage in consultations with local communities in various stages of mineral development and operation that affect their lives. The only consultation envisaged is for deciding the amount of compensation for land and that too can be fixed by government in case of disagreement between landowner and mining leaseholder. Most consultations envisaged under the proposed law is between state government and local government or between state government and panchayat raj institutions as pre-requisites for government action in the permitting process for grant of mineral concessions. Even in the area of mine closure, the Bill does not require that mining enterprises or companies to prepare closure plans in consultation with affected land communities. It only has provisions for public inspection of these plans and consultation between government and panchayat raj institutions before acceding government approval for these plans. This is in sharp contrast with the practices in other mining nations where close and continuous consultation between mining companies and local communities takes place throughout the mine life cycle, from exploration and mine planning through development, operations, mine closure and post-closure activities. It must be emphasized that preparation and implementation of mine closure

plans through continuous interaction between local community and mining enterprise has to be a vital ingredient of sustainable mineral development.

However, more than government, the mining industry and its associations/chambers of commerce must find ways and develop initiatives for enhancing stakeholder engagement including continuous dialogue with local communities in order to earn the social license to operate in mining areas and counter negative perception about the industry. This requires an attitudinal change that would treat local communities as partners in development (rather than recipients of favours) whose views would be treated with respect and acted upon.

It is sometimes assumed that the interests of local communities are adequately represented if local governing institutions such as 'gram panchayats' and 'panchayat samitis' are involved in the consultation-process. In practice, this often turns out not to be the case. Firstly, the area inhabited by the local community directly affected by a mining project may not correspond to that of a Gram Panchayat or Panchayat Samiti whose jurisdiction often covers a larger area. The tendency of the elected body then would be to divert a part of the resources to non-project areas (falling in its jurisdiction) rather than concentrate the entire resources on the local community. Secondly, interests of local communities are seldom clear and homogenous as groups within the community may have different interests depending on their occupation and economic interests. It then becomes difficult for an elected local government body to repressing their interest adequately. Besides, in India, local government bodies are highly politicized and its members prone to corruption and partisan behavior. In these circumstances, it is advisable for mining companies to use consultative mechanisms outside the political (or local government) system, such as broad-based, local residents' groups (including representative from local non-government organizations) or even village meetings to solicit the views of local communities on a regular and continuous basis.

It has already been argued that undertaking socio-economic development work in their respective mining project areas in a business obligation of mining enterprises. However, there is as yet no legal clarity on this issue in India where the track-record of mining enterprises on this count is varied. There are large and major mining companies (like Tata Steel, NMDC and Sesa Goa) that have formal institutional arrangements for undertaking local development works through dedicated 'trusts', 'foundations' and 'societies'. In Goa, a few large mining companies have set up a development foundation to undertake infrastructure and development works in the areas of their operation. Relatively smaller enterprises also execute development works in their respective areas where as very small mines neither have the resources or motivation to undertake any such projects.

These mining enterprises – large, medium and small – carry out local area development works as part of their so-called Corporate Social Responsibility (CSR) activity; in many cases these are in the nature of public relations exercise. In any case CSR by its very nature in optional and voluntary and has an element of charity implicit in it. Whether a mining enterprise is devoting its resources on these projects in proportion to the benefits realized or the projects meet the felt needs of the affected people remains a moot question.

CSR is a sense reinforces the donor-recipient model of the relationship between the mining company and local community in a mining area.

It is, therefore, desirable that there is in place mandatory legal provisions for mining enterprises to take up local development works (infrastructure and human and social capital development projects) in their respective project areas. The South African mining law, for example, provides for mining lease holders to prepare and implement a social and labour plan as a condition for operating mining and production rights. In Canada, consultation between mining companies and Aboriginal communities leads to negotiated and legally binding Impact Benefit Agreements (IBA) which among other things, cover issues such as education and social development, sub-contracting opportunities, trust funds for development and guaranteeing employment. The legally mandated Mineral Development Fund (MDF) arrangement in Papua New Guinea results in signing of Memoranda of Agreements (MOAs) between government mining companies and community, outlining their respective responsibilities and the services and benefits that will be provided in the project affected area.

The suggested legal arrangement may identify some of the key steps to be taken prior to undertaking local development works in a mining project area. Since there are opportunities for socio-economic development works at all stages of the mine cycle, planning for community development could start from the exploration and mine planning stages through the preparation of a Socio-Economic Impact Assessment (SEIA) for the local area surrounding a mine. Presently socio-economic impact assessment is undertaken as an adjunct to environment impact assessment that pushes socio-economic study to the back seat. It is advisable to separate these two processes and make socio-economic assessment an integral part of the process of granting mineral concessions. The study then should be followed by the formulation of long-term and short-term area development plans (in coordination with local development plans of other government and non-government bodies) which could be made a part of the permitting process for the grant and administration of mineral concession to a mining enterprise.

It is evident that suitable legal arrangement on the lines outlined above will put India and its mining industry in synergy with the world trend. Ideally the mining industry and government through mutual consultation could bring about this outcome. Since one of the Ten Principles of ICMM (International Council on Mining and Metals) enjoins mining companies to "contribute to the social, economic and institutional development of the communities in which we (mining companies) operate", it should be possible for the mining industry and its national (Federation of Indian Mineral Industries) and regional associations to spear head such an initiative. At the same time, it has been the experience of countries like Canada, Australia and Papua New Guinea that these developments come about primarily as a result of intense community pressure, aggressiveness, agitations and court litigation as mining companies (obsessed as they are with maximizing mineral extraction and profits) are reluctant to undertake responsibilities which entail additional costs.

In mineral development today, issues such as congenial relationships with local communities, benefit-sharing with them and creating infrastructure, human and social capital

in mining areas have acquired some urgency. Mining companies must respond to these challenges as also governments. The regulatory agencies such as the Directorate of Mines in States are not adequately equipped to meet these challenges, staffed as they are only with mining engineers and geologists. They must have sociologists, economists and personnel with skills in communication and public relations in order to monitor activities such as preparation of socio-economic impact studies, preparation and implementation of local development projects and community welfare in mining areas.

Transparency in communication with stakeholders and accountability are also important elements of sustainable development. Multinational mining companies regularly prepare annual sustainability reports and participate in multi-stakeholder international efforts such as Global Reporting Initiative (GRI) and Extractive Industries Transparency Initiative (EITI).

In India, there is no tradition of mining enterprises sharing information with local communities, especially on matters concerning mining operations. However, some of the larger companies like Sesa Goa and Tata Steel publish sustainability reports and similar other documents. Also in Goa, where the population is more enlightened than say that of the mining areas of Odisha and Jharkhand (mostly tribal [population), there is relatively more transparency and accountability in the behavior of mining companies.

The mining industry needs to give greater attention to these issues in order to enhance community acceptance of their operations.

Finally, small mines dotting India's mineral landscape present difficult challenges for sustainable development. It has already been mentioned that nearly 51 percent of total mining leases in the country in 2011 were tiny leases of less than 5 hectare each. These small mines are either in small mineral deposits or as small leases in large mineral deposits. In addition, there are a large number of minor minerals mines/quarries in the country.

Small-sized mines operate under severe technical and financial constraints which limit their ability to adopt modern technology and to take effective corrective measures for mitigating the negative consequences of mining. In the absence of capability for proper geological search of mineral deposits in their leases and absence of qualified technical personnel, they are unable to undertake scientific mining. The result is to take up selective mining of high grade ore, develop improper benches of minerals and wastes and dump waste material in an unplanned manner. Due to limited availability of land in their leases area and also due to inappropriate management practices, small mines are unable to keep top soil, overburden and different grades of ores separately and systematically on their land. Mining is mainly by manual or semi-mechanized methods. Small mines lack financial and technical capability for taking up environment protection measures including plantation in the mining areas, stabilization of overburden dumps and reclamation of mineral out land. They barely have the means or inclination to take effective socio-economic development measures for local communities. The approach is to derive maximum return on their investment while

trying to conform to the minimum requirements under the regulatory mining and environmental laws. In case of illegal mining, even that requirement is not met.

Ideally small leases should not be granted, at least in the areas of large mineral deposits (of bulk minerals like iron ore, manganese, bauxite). However these may be unavoidable under some compelling circumstances; besides, small leases are bound to be there in case of small deposits of minerals. In these circumstances the approach should be to promote clusters of mining leases in a mining area. This will enable the small lease holders to cooperate among themselves and pool their resources to undertake various common operations including adoption of environmental protection, local area development and community welfare measures. Both government and associations of mine owners could develop guidelines to enable small mines to operate in a sustainable manner.

Conclusion

The following suggestions emerge from the discussion in the preceding paragraphs:

- Since sustainable mineral development implies that damaged natural capital (mineral resources) should be substitute by other forms of assets (such as infrastructure, human and small capital), mining enterprises have an obligation to incur expenditure for creating these assets as a part of their business expenditure.
- Presently, the major focus of sustainable development in mining is on environmental management; even there mine closure issues do not receive sufficient attention. Other aspects of sustainability such as stakeholder engagement, execution of socio-economic development works in mining areas and transparency in communication and accountability are neglected by the industry. Just like other mining nations, India also does not have appropriate legal provisions covering these areas. These deficiencies need to be corrected both by government and the mining industry. A separate law on mine closure should be formulated and its provisions should be implemented strictly.
- At present, some mining enterprises undertake local area development in their project areas as part of their CSR activity. Instead there should be mandatory legal provision for them to take up local development works, through processes such as socio-economic impact assessment of mining projects and preparation of long-term and short-term development plans as part of the mining lease permitting procedure.
- Local development work in a mining project area should preferably be executed by mining enterprises rather than by government and semi-government agencies in order to get over the problems of inadequate capacity, political manipulation and corruption.
- Also simply doling out cash to local communities (as the proposed mining law suggests) is not a sustainable solution as it is likely to be spent on consumption expenditure. Instead benefit-sharing should take the form of asset-creating projects in mining areas. This may be done through partnership arrangements

between mining enterprises and local community organizations in the forms of "trusts" and 'foundations'.

- Appropriate state government agencies should monitor mining enterprises' activities in community engagement and execution of local area development projects. They should have qualified personnel, such as sociologists and economists (in addition to geologists and mining engineers) to be able to discharge their functions.
- The mining industry should also take steps to share information with local communities in a transparent manner, treating them as partners in development.
- Small mines present difficult challenges for sustainable mineral development. A partial solution would be to promote clusters of small leases in a mining area in order to make for cooperative arrangements in various operations including environmental management and local area development.

Chapter 15

ELEMENTS OF A SUSTAINABLE DEVELOPMENT FRAMEWORK FOR MINING

The International Council on Mining and Metals (ICMM), the global leadership body for the mining industry, developed its Sustainable development Framework Principles in 2003 based on the issues identified in the Minerals, Mining and Sustainable Development (MMSD) project outcome document, "Breaking New Grounds: Mining, Minerals and Sustainable Development" and various other voluntary principles and standards developed by other international and business organizations. Following this example there has been a move in the government circles in India to develop a framework for sustainable development tailored to the country's mining environment. But whereas the international precedent is in the nature of guidelines developed by industry bodies for voluntary adoption by mining companies, the Indian variant is sought to be developed as a government-sponsored framework for adoption by mining enterprises in the country.

It was the Planning Commission's High-Power (Hoda) committee which first recommended setting up of a government working group for the preparation of an Indian Sustainable Development Framework (SDF) comprising "principles, reporting initiatives and good practice guidelines … that can be made applicable to mining operations in India..." It also suggested a separate (administrative) structure, comprising personnel from the central government mining and environment organizations to be set up "to ensure adherence to such framework", somewhat oblivious of the fact that sustainability framework is closely connected with sustainability reporting (by mining enterprises) for providing disclosures on issues of importance to external stakeholders.

This suggestion has been followed through and the Draft Mining Bill (the Mines and Minerals (Development and Regulation) (MMDR) Bill 2011), introduced in the Lok Sabha in December 2011, provides for the creation of National and State-level Sustainable Development Frameworks for the mining sector through government fiat or rules, placed as the relevant provisions are under a chapter (of the Bill) entitled "Power to issue Directives". The provisions envisage the proposed National Sustainable Development Framework (NSDF) to contain "guidelines" on almost all important aspects of mineral operations — sustainable and scientific mining, mineral conservation, environment protection, reclamation of mined out land, socio-economic development and stakeholder engagement among many others. The guidelines are intended to shape project-level practices of mining enterprises. Though termed as "guidelines' meaning these would be in the nature of advisory to the mining industry, the provisions also make the State Directorate of Mines "responsible for implementation of the Sustainable Development Framework in the State", thereby sowing the seeds for cumbersome regulatory requirements in the future. Besides, some of the issues identified are or should be prescribed as mandatory legal requirements; therefore, there is no

reason as to why government should additionally issue guidelines to the industry on these subjects!

The formulation is based on the somewhat mistaken assumption that government directives rather than industry initiatives are better suited to solve the problems of sustainability in mineral development. This is in sharp contrast with the experience and practice in other major mining nations where mining industry bodies have taken initiatives in designing and implementing sustainable development frameworks based on ICMM principles. The Mining Association of Canada, as has been mentioned in an earlier chapter, has launched the initiative, "Towards Sustainable Mining (TSM)" which focuses on improving the mining industry's performance in sustainable development. Similarly, the Mineral Council of Australia has launched the initiative, "Enduring Value" which comprises the Australian Mineral Industry Framework for Sustainable Development. In both cases guidance for implementation and reporting arrangements have been prescribed and monitored by the industry associations.

In India, the apex mining industry body, Federation of Indian Mineral Industries (FIMI) has, following the ICMM principles, started the "Sustainable Mining Initiative" and instituted annual environmental and social awareness awards in order to increase the awareness of its members of sustainability issues and improve compliance to the requirements for promoting sustainable development. The fact that in the recent past the mining sector in India has drawn considerable criticism for the adoption of unethical practices and flagrant environmental violations through illegal mining and associated practices shows that the self-regulation mechanism is not functioning properly and requires serious introspection leading to correction of course and behaviour on the part of the industry. However, it also does not mean that proliferating government powers and regulations is the solution as the account of illegal mining in the states has shown that government agencies were also complicit with mining enterprises in illegal and unethical operations. Also, increase in regulatory and discretionary powers of government agencies is often counterproductive as in India this leads to more bureaucracy and corruption. Therefore, the more potent solution is to subject the mining industry's action and behaviour to intense societal scrutiny through media exposure, community agitation, resistance and litigation. The government should encourage this process and also, through continuous dialogue and pressure, persuade the industry to improve its ethical performance and ensure its compliance to the provisions of the relevant laws.

It also needs to be emphasized that a framework basically is a system of laws, rules, principles, practices and values that establish the way something operates in industry, business, politics or society. It is not possible, for example, to establish a 'democratic framework' merely through government directives; there are values, principles, practices and attitudes in addition to laws and regulations that make for such a framework. Similarly, a sustainable development framework for mining may have laws, regulations and rules as important elements but its effective, full form can develop only if these are supplemented by corporate/industry and community norms, codes of conduct, practices and values. In other words, laws and regulations on mining may constitute its legal framework but a holistic

framework for sustainable mineral development must in addition include appropriate industry or corporate attitudes and values that, to quote ICMM principles, "integrate sustainable development considerations within corporate decision-making process" and "implement and maintain ethical business practices and sound systems of corporate governance." The motivation and pressure to self-regulate (i.e. not to do what is not ethical or sustainable, such as illegal mining) and to behave in a sustainable manner must come from within the industry and also from the communities in which mining enterprises operate. In one sense close societal scrutiny of the conduct and behaviour of mining enterprises and intense community pressure (through agitation, litigation, media exposure, etc.) can be more potent than government action (which may involve collusion with industry) in order to force these enterprises to behave in a sustainable manner as otherwise they run the risk of losing their social license to operate in mining. In fact, for attaining sustainability in the mineral sector it may be prudent to establish firmly the concept of "social license to operate" and expose mining enterprises to the principle through community pressure and discipline. A mining enterprise will earn and maintain the needed 'social license' on the basis of good performance on the ground and by earning community trust. Otherwise communities will block projects through legal challenge or even violent agitation and action, even after licenses have been obtained. This is how mining companies have been compelled to behave in a sustainable manner in countries like Canada and Papua New Guinea to which a reference has been made in an earlier chapter.

In other words, what is being argued is that the mining industry should be given space and responsibility to develop, keeping in view the relevant legal requirements and other societal considerations, an appropriate sustainable development framework for the industry; it should also formulate guidance for implementation for its members as also that for monitoring and evaluation of their action through suitable indicators. The framework must include elements that go beyond mere compliance to the provisions of law that may also have some relevance for the issue of sustainability in mining.

The government, on the other hand, should mainly be concerned with the legal framework for mineral development, ensure that major elements of sustainability are covered by appropriate legal provisions and these provisions are implemented fairly and complied with (at the risk of stiff penalty) strictly by mining enterprises. It has also an obligation to provide a supportive legal and policy framework for responsible management of mineral resources and to maintain an environment that allows for sustainable development of these resources for present and future generations. First and foremost it means that there should be efficient and effective permitting procedures and approval requirements for mine development without undue delay (unlike what happens now) and devoid of corruption and political manipulation. It should maintain a fiscal system and business climate that attracts long-term investment in mining with focus on sustainable development and discourage shot-term operators that harm environment and local communities. In other words, the state should provide good governance and itself behave in a sustainable manner. To a great extent that will motivate and even compel mining enterprises to function sustainably. Government initiatives in the legislative and policy spheres then can be supplemented by assistance to the

mining industry to develop best practices on sustainable development and by measures that will encourage local communities to be involved in the decision-making processes affecting their lives and thus expose mining enterprises to the principle of 'social license to operate' through community scrutiny and discipline.

It has earlier been mentioned that there are two main pre-conditions for achieving sustainability in mining — good governance in the mineral sector and prevalence of attitudes and values that make for ethical business practices and self-regulation and bring in sustainability considerations to all operational decisions concerning mining. Unfortunately on both fronts, the track record (in India) has been disappointing and needs considerable improvement. In the absence of such improvement, it would be impossible to attain sustainable mineral development even if a well-structured sustainable development framework is there on paper. Assuming, however, that the intended improvement will come about sooner than later, it is possible to outline the major elements of a sustainable development framework appropriate for the Indian conditions.

On the basis of our initial formulation of the concept of sustainability in mining and the discussion on the challenges faced by the mining industry in India, it would appear that the following major elements best capture/may define the essence of a suitable sustainable development framework (SDF) for the country's mineral sector:

(i) Scientific mining;
(ii) Environment protection and mitigation including minimization of the impacts of mining practices on biodiversity;
(iii) Community stakeholder engagement;
(iv) Local socio-economic development in mining project areas; and
(v) Transparency and accountability

The roles of government, mining industry and communities in shaping the contours of these elements and then operationalizing these components have briefly been described in the following paragraphs.

Scientific mining

Improvement in resource utilization and conservation as well as in environmental performance in mining can be realized mainly by scientific mining and changes in technology, not only in hardware but also in management and operational practices.

Normally the mining law and rules prescribe formulation and implementation of prospecting schemes and mining plans and schemes based on the principles of scientific mining. There are requirements concerning systematic development of mineral deposits and conservation of minerals, separate storage of top soil, overburden, sub-grade and saleable minerals during mining operations, protection of mines environment, plantation in mining areas, discharge of effluents, tailings management, precaution against air, water and noise pollution etc. Mine closure and reclamation and rehabilitation of land often get special attention.

The government's responsibility is to ensure that these legal provisions are enforced faithfully and objectively. Its research and development agencies (such as the Indian Bureau of Mines) can assist the industry by technical advice and by bringing out publications on international best practices.

The industry has not only to ensure observance of legal provisions, it must go beyond compliance to develop new and innovative methods of scientific mining, waste management and disposal through continuous improvements in technology and techniques, by technology transfer from more advanced sources and/or through in-house research and development. Latest developments in mining technology both in machines and computer software can be applied in order to improve efficiency and productivity. The industry associations can disseminate information on international best practices and advances in technology through seminars and conferences and also prescribe reporting guidelines for members. All these require attitudes and values that emphasize long-term gains and sustainability in the use of resources.

Local communities need to have a general awareness of the mining technology and methods used in mining in their areas in order to appreciate its impacts, the mitigation measures being adopted and mining's contribution to their society. They have, however, special interest in and concern for mine closure plans and their progressive implementation as these have significant effect on their lives

Environmental protection and mitigation including minimization of the impact of mining on biodiversity

The environmental dimension of sustainability relates to a mine's impact on living and non-living natural systems including ecosystem, land, air and water.

Both the mining and environmental laws have elaborate provisions for the protection of environment and for minimizing the impacts of mining activities on biodiversity. These include environment impact assessment prior to the start of mining operations, mineral waste management and disposal, control and management of emissions and effluents, compliance with environmental standards and regulatory limits, reclamation and rehabilitation of mined out land, plantations and creation of 'green belts' in mining areas.

The government has the daunting task of enforcing these laws and standards. There are a number of agencies, both at the state and central levels, mandated to ensure implementation of these laws. These comprise the environment and forest bureaucracies and pollution control boards. A major task is to bring about coordination among these agencies so as to ensure timely enforcement of the prescribed legal provisions without fear or favour or graft.

A related issue is the nature of the monitoring mechanism used for minimizing environmental impacts of mining. In India, as in many other countries, command-and-control regulations (buttressed by the precautionary principle) are used instead of market-oriented mechanisms. The command-and-control devices include measures such as mandatory

requirements to conform to environmental standards, control of emissions of various types, dust suppression requirements, and prohibitions of various kinds such as pollution discharge bans.

Market-oriented mechanisms, on the other hand, require no action, but payments and in principle encourage the economically rational polluter to change behaviour by balancing reduced payments (say a pollution tax) against increased costs incurred in reducing pollution charges.

Market-oriented mechanisms are in principle more efficient than command-and-control systems. However, there is limited operational experience using market-based mechanisms in mining activities. Moreover, there is a greater likelihood of administrative errors and higher costs with most market-based mechanisms than with command-and-control systems. Perhaps a compromise solution can be arrived at and it may be explored if a combination of market-oriented and command-and-control regulatory systems can be used to regulate environmental consequences of mining activities.

The approach and environmental behaviour of mining enterprises, especially of medium and small miners, is crucial for managing and mitigating the adverse environmental consequences of mining. Government regulation is not enough though it has an important role. Mere compliance to the prescribed legal provisions is not adequate, especially when this can be compromised or vitiated by unethical conduct (including bribery) as was seen in the recent cases of illegal iron ore mining in Karnataka and other mineral-rich states. Some of the major companies like Tata Steel and Sesa Goa have, however, gone beyond the regulatory requirements to reclaim and rehabilitate mined out land and establish best practices that can be emulated by other companies. Peer and industry pressure through the specification of performance indicators and framework reporting requirements by the relevant industry bodies can play an important role in improving environmental conduct of mining enterprises. Information on good environmental practices can be disseminated through industry seminars and workshops and through the specification of reporting guidelines for monitoring and evaluation.

Local communities are vitally interested in their own environment and would like to know what mitigation measures are being taken to protect it. They have to keep a watchful eye on the activities of the mining enterprises in their area in order to ensure that they are at least taking mitigating measures mandated in the environmental laws. In Goa, for example, vigilant local communities have sought to correct the errant behaviour of mining companies through public agitation, protests, litigation etc.

Community stakeholder engagement

Communities adjacent to mining activities (local communities) constitute a direct stakeholder (the other two being government and mining enterprise) in mining as a mine's operations have direct impact on their land, environment and socio-economic life. Therefore, engagement with them including attending to their grievances and concerns is an inclusive

process that must occur throughout all the phases of the mine life cycle: exploration, construction, operation, closure and post-closure.

The mining law should normally provide for community stakeholder engagement at various stages of permitting process and also during mining activities. Such engagement would include effective consultations with local communities on a continuous basis. As earlier mentioned traditionally the mining law in India has never encouraged citizen-participation in decision-making processes in mining. The proposed new law (the Draft Mining Bill 2011) also does not go very far and provides limited opportunities for engagement. The environment law has a provision for one-time public consultations prior to start of the mining project. The government, through suitable legal provisions, must take steps to widen the scope and frequency of engagement and consultations with local communities in different stages of the mine life cycle on the pattern followed in other mining nations such as Canada, South Africa, Australia and Papua New Guinea.

Mining enterprises and their industry bodies have to play a proactive role in the process of continuous engagement with local communities. This will enable them to secure the social license to undertake mining operations. Engagement and consultation should not merely be a public relations exercise; these must be community-centered, getting their free, prior and informed consent before starting major mining activities, informing them of the benefits as well as the negative consequences of the mining project and explaining the mining enterprise's mitigating plans and socio-economic development programme to meet community concerns and aspirations. Mining companies must have dedicated community liaison teams with professionals and structured mechanisms and procedures for engagement and consultation with local community stakeholders. Performance indicators and reporting requirements will have to be prescribed covering all these areas.

Local communities will have to assert their rights as direct stakeholders in mining operations in their respective areas. They have to demand full disclosure of the relevant information openly and in a form that is accessible to local people, especially if they belong to indigenous or tribal communities. The local civil society organizations, mass media and elected representatives and representative organizations can provide them with assistance and leadership in interactions with mining companies.

Local socio-economic development in mining project areas

Local area socio-economic development is a corporate business obligation (CBO) since only through the creation of alternate forms of capital (such as physical infrastructure and human skills and capital) that mining enterprises can compensate present and future generations (in a mining locality) for the loss of finite natural resources (minerals).

The mining law on this subject is fudgy as no legal obligation has been put on mining enterprises for undertaking local area development works in the areas of their operation. The proposed new law (the Draft Mining Bill 2011) has also no mandatory provisions except requiring mining companies to contribute to a District Mineral Fund (DMF). The amount

available in DMF will mostly be distributed to identified persons and families in mining project areas. There will hardly be any asset-creation. Instead, a robust legal provision should be made for mining enterprises undertaking a socio-economic impact assessment for their project areas followed by formulation of development plans, all as part of the permitting process for mineral concession. They should be legally mandated to provide the required financial resources and implement the development projects during the progress of mine life cycle. Proper monitoring of the implementation of development projects should be ensured.

For mining enterprises, execution of socio-economic development projects in a mining project area is closely connected with the need to obtain 'social license to operate'. Presently most mining enterprises undertake local development works in their project areas as part of their CSR activities. The approach often is based on a donor/recipient model; instead what is needed for sustainability is that formulation and implementation of local development projects should be a mutually beneficial partnership process between local communities and mining companies. There should be structured institutional mechanisms and procedures for assessing the felt needs of a community, for planning and preparing project proposals, their execution, monitoring and evaluation. The community representatives must be involved in these processes through formal arrangements. Performance indicators and reporting requirements also need to be prescribed.

Local communities are vitally interested in and affected by local development programme and projects. The most beneficial and sustainable is the creation of skills and capacities in a local community that will be useful even after minerals are exhausted and mine closed. Local communities have to proactively engaged with mining companies and ask for their 'due', if necessary, through public agitation, protest and litigation. In countries such as Papua New Guinea and Canada, local (indigenous) communities have resorted to protests that included violent action before mining companies agreed to their demands.

Transparency and accountability

Transparency about a mining enterprise's activities is of interest to all stakeholders. Also mining enterprises must always recognize that they are accountable to their stakeholders and they will lose their ability to operate if they do not meet stakeholder concerns. Thus transparency and accountability about economic, environmental and social impacts of a mining project in its area of operation is a fundamental component of effective community relations required for earning social license to operate.

Government regulations in India normally require mining enterprises to submit periodic reports and returns on their activities to various agencies. These are used for regulatory and administrative purposes including revenue collection. What is required is public disclosure of mining enterprises on sustainable issues and a greater transparency in the industry so as to avoid various negative consequences including corruption and provide for more equitable distribution of resource-derived profits.

At the international level, many multinational mining companies have formal disclosure policies and publish annual sustainability reports. It has been noticed that "corporate disclosures on sustainability issues is almost a good indicator of underlying corporate performance on these issues" (Jansen *et al.*, 2006).

In India, only a few major companies publish reports on their activities relating to sustainable development. Since there are a large number of relatively small mining operators and the areas of interaction between mining companies and local communities are limited in the context of a culture of secrecy, most mining enterprises in India are reluctant to share information with community stakeholders. This tradition has to change and the industry and its associations must take a proactive role in bringing about this transformation.

Local communities can work for gradual changes in the prevalent culture through persistent pressure on mining enterprises that would signal reluctance to give community approval to their activities in the absence of transparent behaviour and accountability on the part of mining enterprises.

Sustainability Reporting

Sustainability reporting is an integral part of a sustainable development framework. It has been defined as the "practice of measuring, disclosing and being accountable for organizational performance while working towards the goal of sustainable development" (GRI, 2000-2011).

In an earlier chapter, a reference has been made to the trend among multi-national mining companies to publish annual sustainability reports that contain key elements that are of interest to various external stakeholders. Usually they contain information on corporate sustainable strategies, policies and management approach to development issues and provide information on economic, environmental and social performance of the organization. The areas covered include environmental practices adopted by the company along with technological improvements adopted for enhancing effectiveness of mitigation measures, steps taken in the areas of mineral conservation, climate change and energy utilization, stakeholder management plans that include consultations and activities and plans to address stakeholder needs and concerns, community relations and relations with indigenous groups and socio-economic development plans and activities in mining project areas.

Sustainability indicators provide representative measures of the company performance in various identified areas through quantitative and qualitative information that are both internally relevant (for the company) and externally important (for stakeholders). There have been numerous efforts to develop frameworks of sustainability indicators for mining that often form a part of sustainability reports. In order to promote common understanding and comparability among a variety of reporting formats by mining companies, the Global Reporting Initiative (GRI) has published Sustainability Reporting Guidelines, recommending the structure and contents of sustainability reports, including Standard Disclosures comprising organizational strategy, management approach and performance indicators "that

elicit comparable information on the economic, environmental and social performance of the organization" (GRI, 2000-2011). The Guidelines include a set of genric indicators for industry and also prescribe sector-specific indicators for mining (among others) through a separate Mining and Metals Sector Supplement. Major international mining companies normally pledge commitments to the Guidelines as also to other international norms such as ICMM Principles. These get reflected in their sustainability reports, although each individual company publishes sustainability report using its own format reflecting issues and elements that are most relevant for its sustainability performance and meet the requirements of its stakeholders.

In India, as has been mentioned earlier, only a few major companies publish sustainability reports outlining their activities promoting sustainable mineral development. The practice of sharing information with external stakeholders and general public on mining company performance is yet to develop. Besides, wide differential in the sizes and capabilities of mining enterprises poses a problem. For many mining enterprises, especially small miners, the major concern is to extract as much minerals as possible while complying to the minimum legal and regulatory requirements. Sustainable behaviour, on the other hand, treats legal or regulatory compliance as a baseline activity; industry practices are developed which go beyond regulatory compliance for sustainable development of host communities and their areas. Such an approach also requires value-based, ethical business practices with management, executives and employees working with integrity. These values and practices can only develop overtime primarily through common understanding and action as well as peer and societal pressure, not simply by government fiat.

Earlier in this chapter, five major elements of sustainability most relevant for the Indian (mineral industry) conditions have been identified. Sustainability reports and indicators can be oriented to these elements. A few thrust areas in each of these elements have been suggested below. Possible sustainability indicators can be linked to these (thrust) areas in order to present a holistic account of a mining enterprise's sustainability performance.

I. Scientific Mining

- Mine planning
- Methods of mining
- Level of mechanization
- Technology upgradation
- Availability, depletion and conservation of mineral resources
- Mine closure planning and target-setting
- Progressive implementation of mine closure plan and commitment to rehabilitation

II. Environmental protection and mitigation

- Land use

- Water use and efficiency
- Energy use and efficiency
- Waste minimization
- Tailings management
- Air pollution, liquid effluents and solid wastes
- Dust management
- Noise and vibration control
- Biodiversity loss and mitigation
- Environmental compliance and voluntary activities
- Conformity to environmental management standards (eg. ISO-14001)

III. Community stakeholder engagement

- Policy on and extent of stakeholder involvement in mining operations
- Mechanisms of stakeholder participation/consultations in decision-making
- Procedures for attending to stakeholder grievances and concerns
- Engagement procedures and principles in respect of indigenous people (adivasis)
- Policy on business ethics
- Approach to bribery and competition
- Resettlement of communities affected by mining project

IV. Local socio-economic development in mining project areas

- Policy on and procedure for assessing socio-economic impact of mining operations in a project area
- Mechanisms and procedures for preparing and implementing area development plans and projects
- Plans for generating local community income
- Investments in community and mineral wealth distribution
- Contribution to local employment
- Level of commitment to education, training and skill development
- Contribution to the development of physical infrastructure in mining area

V. Transparency and Accountability

- Policy on and approach to public disclosure of key elements of enterprise performance
- Nature and effectiveness of the reporting system

These are in the nature of broad categories. Specific sustainability indicators have to be formulated to highlight specific and crucial aspect of sustainability performance of a mining enterprise. Most of these will be quantitative in nature, either in the form of absolute values for the reporting period or ratios. Some of these, especially those concerning social

and ethical performance will need to be expressed in qualitative terms. In designing a framework of sustainable indicators, it may be advisable to follow the GRI format in order to ensure comparability among reporting organizations.

In India, as has been mentioned, there is no tradition of public accountability or disclosure of mining enterprise performance. Small and even medium-sized mining enterprises neither have the capacity nor inclination to subscribe to sustainability reporting. Therefore, the sustainability framework and reporting system has to be built gradually, from the scratch. These will also vary from one category of enterprises to another depending on their capacities, unique circumstances and requirements. The industry associations and mining enterprises have the primary responsibility to design and operationalize these frameworks/indicators in their quest for achieving social license to operate. However, while government can help, including these provisions in the mining law will, apart from bureaucratizing the process, go against the core ethic of the accountability process.

Conclusion

A sustainable development framework along with a set of sustainability indicators is required to enhance public accountability of mining enterprises in India. The key elements that may define an appropriate sustainability framework comprise the following: scientific mining, environment protection and mitigation, community stakeholder engagement, local socio-economic development in mining project areas and transparency and accountability. Sustainability indicators will have to be defined in order to capture specific quantitative and qualitative aspects of an enterprise's sustainability performance.

Since a sustainable development framework is primarily designed for improving public disclosures and accountability of mining enterprise, the main initiative to design and implement the framework should be that of the mining industry, its members and associations. The government should neither get directly involved nor should it be made a legally binding requirement. While government may assist the industry in this matter, its main responsibility should be to ensure that appropriate legal provisions are in place to ensure sustainable mineral operations and that these are implemented faithfully and objectively.

There is no tradition of public disclosure and accountability on the part of mining enterprises in India. Also, the industry comprises large, medium and small enterprises with varying capacities and interests. Against this background, an evolutionary approach for the development of sustainability frameworks and indicators may be in order. While major companies can develop their own systems, small and medium enterprises may require assistance in designing sustainability frameworks for them. There also has to be accent on the adoption of ethical business practices by the industry. A common understanding has to be built through dialogue among the members of the mining fraternity and the society at large.

Chapter 16

CONCLUSIONS AND RECOMMENDATIONS

A number of conceptual and practical issues concerning sustainable mineral development have been discussed in the report. The analysis has thrown up a few findings and also suggestions for reform. The major conclusions and recommendations have been summarized in this chapter.

The mining industry in India, for its healthy development, must adopt the principles of sustainable development that seek to balance economic, social and environmental well being now and for the future. Aligning government policies, laws and procedures as well as industry behavior and practices to these principles poses a major challenge in the country's mineral sector.

Findings of the field study:

A number of issues have been identified in the field study.

Firstly, although mining has brought about economic benefits, avoidable environmental and social damages continue to occur in the mining areas. A major reason is the ineffective implementation of the existing mining and environmental laws and regulations providing for corrective and mitigation measures (such as compensatory afforestation, land reclamation and prevention of illegal mining).

In some areas mining operations have been taken up and expanded without taking into account the "carrying capacity" of the local environment and available infrastructure facilities. This has caused avoidable discomfort and inconvenience to the local population.

Sustainable development is interpreted primarily in terms of environment protection and management. Site- specific environmental measures are the main focus of action and other dimensions of sustainability such as local stakeholder engagement and consultation, benefit-sharing with local communities, creating infrastructure, human and social capital in mining project areas and transparency in communication and accountability do not receive much attention from mining enterprises.

There is a large variation in the environmental behavior of mining enterprises. While larger mining companies have concerns for scientific mining, environmental protection and limited socio-economic development (through CSR activities), smaller enterprises are focused on maximum extraction of mineral resources from their lease areas.

Mine closure planning and implementation is a relatively neglected area in mining operation. Mine closure plans are prepared by mine lease holders in order to meet the

prescribed legal requirements but in most cases these remain on paper and are not acted upon till the total exhaustion of mineral deposits in a mine. Local communities are not involved in the preparation, review and implementation (if any) of mine closure plans.

Illegal mining operations are prevalent in many mining areas. While industry greed and unethical business practices no doubt play an important role, these have been facilitated by a combination of procedural delays, administrative inefficiency, political interference and institutional graft against the background of rising mineral prices (since 2004).

A large number of small mines (including quarries for extracting minor minerals) operate in most mining states. These present difficult challenges for sustainable development as their financial, technical and managerial limitations restrict their ability to take effective corrective measures against negative consequences of mining.

International mining practices in sustainability:

The study of sustainability practices in a few major mining nations and of some large multinational mining companies was intended to provide a comparative picture that would also assist in the identification of a few initiatives relevant for the Indian conditions.

In developed mining nations, all regulatory mining and environmental laws meant to lessen the impact of mining are strictly enforced and mining companies ensure compliance. In fact reputable, large mining companies take their environmental obligations seriously by adopting good environmental practices, sometimes beyond the prescribed legal obligation. Developing nations, on the other hand, show relatively lax performance due to lack of state capacity and political will as well as the existence of corruption at various levels.

The international mining industry is increasingly taking a comprehensive view of sustainable mineral development that includes apart from environment other important elements such as stakeholder engagement and consultation, local area (socio-economic) development and transparency in communication with stakeholders. Legislative developments in many mining nations have come to reflect this trend. Most international mining companies take a proactive approach in dealing with sustainability issues.

Mining industry bodies in many countries and also internationally have formulated sustainable development strategies, frameworks and sustainability indicators with guidelines for adoption by their member-companies.

In major mining countries consultations with local communities (in mining project areas) during different phases of the mine life cycle is legally mandated.

Similarly, there are legally-binding obligations on mining companies to undertake socio-economic development works among local communities. This ensures benefit-sharing of mineral resources revenue. In many cases multinational mining companies undertake these activities, even beyond the legal requirements in order to earn their “social license to operate”.

Mine closure and associated reclamation and rehabilitation of mined out land receive considerable attention in developed mining nations. The process of mine closure is initiated early in the mining cycle and continues throughout the project life. More importantly, the concept of reclamation of a site after mining operations have ceased has become entrenched in law in the developed countries.

Major recommendations:

The major recommendations for policy review and action flow from the analysis in the report including the findings of the field study and review of the international practices on sustainability.

In the Indian governance system whenever a problem is faced-and ensuring sustainable mineral development does pose a problem – the tendency is to create more bureaucratic structures with additional powers in order to fix the problem. In reality these complicate the issues and create additional problems!

In the 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. Administration of these laws has been stymied by political and administrative structures that need to be streamlined. Duality of central and state control of mineral administration and multiplicity of regulatory bureaucracies with inadequate staff and budget seem to be the major reason for governance failure in mining.

The remedy is not to create more agencies as the Draft MMDR Bill 2011 proposes to do through the creation of more regulatory bodies and new mechanisms for coordination among them. Instead the efforts should be to bring about administrative reforms which will end the present duality and make state government agencies fully responsible and accountable for mineral administrative in their respective jurisdiction. The field-level arrangements should receive special attention. IBM, under the reformed arrangement, should function as a technical consultancy and advisory body assisting the state governments and the mining industry in their technical tasks.

Also the procedures for various approvals and monitoring including those for environmental and forest clearances need to be streamlined in order to improve the efficiency and effectiveness of the system and reduce the time taken to accord (or deny) approvals.

The Central Government should, in public interest, provide assistance to the States in preparing and implementing suitable reform proposals as good governance is an essential pre-condition for achieving sustainable development in the mineral sector.

Both the government and the industry need to take a comprehensive view of sustainability in mining that besides environment should cover other dimensions such as stakeholder engagement and consultations, local area socio-economic development and transparency in communication and accountability.

Mining enterprises must engage in consultation with local community stakeholders at all the stages of mine life cycle. Internationally mining and environmental laws provide for continuous stakeholder engagement in mining operations. The mining law in India does not require much consultation with local communities. Public hearing or consultation takes place only once at the time of environmental impact assessment exercise under the environmental legislation and that too before the start of mining operations. The Draft MMDR Bill 2011 also does not mandate much consultation between mining leaseholders and local communities during various stages of mineral development and operations that would affect their lives. Most consultations are envisaged only between local government (or panchayat raj) institutions and government as prerequisites for government action for grant of mineral concession. The proposed mining law should provide for mineral concession holders to engage in continuous consultation with local communities in their respective mining project areas in all phases of a mine life cycle including mine closure and post-closure activities.

The new law should also lay down a mandatory legal obligation on mining concessionaires (mining enterprises) to undertake socio-economic development projects in their mining project areas. This is the practice in a number of mining nations. Since sustainable development implies that damaged natural capital (mineral resources) should be replaced by other forms of assets (such as infrastructure, human and social capital), mining enterprises have a responsibility to incur expenditure for creating those assets as a part of their corporate business obligation (CBO). The present practice of executing local development works as part of CSR activity is voluntary and optional in nature and reinforces the donor-recipient relationship between mining enterprises and local communities which is not desirable.

Presently socio-economic impact assessment is undertaken as an adjunct to environmental impact assessment that pushes socio-economic study to the back seat. It is advisable to separate these two processes and make socio-economic assessment an integral part of the process of granting mineral concessions. The study then should be followed by the formulation of long-term and short-term area development plans (in coordination with local development plans of other government and non-government bodies) which could be made a part of the permitting (licensing) process for the grant and administration of mineral concession to a mining enterprise.

As regards execution of development works, a mining enterprise rather than a government or semi-government agency, like the Governing Council of the proposed District Mineral Fund (DMF) proposed under the Draft MMDR Bill 2011, should be entrusted with this responsibility. The latter arrangement will suffer from disadvantages such as misallocation and diversion of funds to non-mining areas in a district, political manipulation, corruption and lack of capacity at local government levels for effective delivery of services to the affected people. Also simply doling out cash to affected persons and families (as envisaged under DMF) is not a sustainable solution. On the other hand, it would be logistically convenient and more beneficial and effective if mining enterprises (who have interest in executing these projects in order to earn community goodwill) are given the responsibility to plan and execute local development projects through partnership

arrangements such as “trusts”, “foundations” and consortia/association of mines as it happens in other mining nations. These can then be monitored and audited by government agencies.

Mineral development in a region should be carried out within its available social and environmental “carrying capacity” and infrastructure facilities at a given point of time. It is suggested that production levels of minerals (for specified periods) for a region should first be determined on the basis of an assessment of sustainable “carrying capacity” of the environment, roads and other infrastructural facilities possibly through a regional impact assessment process and then the maximum production levels of individuals mines may be fixed, as part of the permitting (licensing) process.

The present legislative and administrative arrangements relating to mine closure and post-closure activities should be reviewed. It would be desirable to formulate a separate legislation for mine closure on the basis of best international practices. The significant elements that need to be incorporated in the law should include the following: close and continuous community consultations, the concerned mining lease holder’s obligations for land reclamation and rehabilitations and arrangements for strict implementation of its provisions.

In order to alleviate the limitations of small mines in carrying out sustainable development activities, consortia of small mining enterprises in a region should be promoted. Technical advisory services should be made available to them in order to assist them in undertaking scientific mining in their mining lease areas to the best extent possible.

Self-regulation and adoption of ethical business practices by mining enterprises are also essential for achieving sustainable mineral development. The motivation and pressure to self-regulate (i.e. not to do what is not ethical or sustainable) and behave in a sustainable manner must come from within the industry and also from communities in which mining enterprises operate. It is prudent to establish firmly the concept of “social license to operate” and expose mining enterprises to this principle through community pressure and discipline. The legal arrangements for sustainable mineral development should encourage this process.

A sustainable development framework along with a set of sustainability indicators is required to enhance public accountability of mining enterprises in India. The key elements of such a framework should comprise scientific mining, community stakeholder engagement, socio-economic development projects in mining project areas and transparency and accountability on the part of mining enterprises. Contrary to what has been suggested in the Draft MMDR Bill 2011, it is the mineral industry, its members and associations which should take the main initiative to design and implement the proposed sustainable development framework. With sustainability indicators, the framework will function as the reporting format for the general public. It is prudent to establish firmly the concept of “social license to operate” and expose mining enterprises to this principle through community pressure and discipline. The government should encourage this development without itself directly getting involved in the task of designing and implementing a sustainable development framework for the mining industry.

The government's primary concern should be the "legal framework" for sustainable mineral development and it must ensure that the relevant laws are implemented fairly and effectively in order to ensure good governance in the mineral sector.

ANNEXURES & REFERENCES

Annexure 1

India: Estimated Resources of Major Mineral Commodities (2005)

(In thousand metric tonnes unless otherwise specified)

Mineral	Resources
Barite	74203
Bauxite	3289817
Chromite	213063
*Coal	255172000
(coking)	32275000
(non-coking)	222897000
Copper ore	1394427
Dolomite	7533108
Gold, in metal (kilograms)	59000
Graphite	168775
Ilmenite and Rutile	343348
Iron Ore (Hematite)	14630387
Iron Ore (Magnetite)	10619481
Kyamite	102613
Lead and Zinc, in ore	522580
Limestone	175344901
Magnesite	337882
Manganese Ore	378569
Phosphorite/Roch Phosphate	305309
Talc-Steatite-Soapstone	312335
Zircon	4276

*Annual Report 2006-07, Ministry of Coal, Government of India (for coal).

Source: National Mineral Inventory, 2005, Indian Bureau of Mines, Nagpur, 2009 (except coal)

Annexure 2

Contribution and Rank of India in World Production of Principal Minerals and Metals

Commodity	Unit of Quantity	Production		Contribution (%)	India's rank in order of quantum of production
		World	India*		
Mineral Fuels					
Coal & Lignite	Million tonnes	6619	525	7.9	3rd
Petroleum (crude)	Million tonnes	3911	33.5	0.9	25th
Metallic Minerals					
Bauxite	'000 tonnes	212000	15554	7.3	6th
Chromite	'000 tonnes	23300	3980	17.1	2nd
Iron Ore	Million tonnes	2188	215	9.8	4th
Manganese Ore	'000 tonnes	41800	2829	6.7	5th
Industrial Minerals					
Barite	'000 tonnes	9700	1682	17.3	2nd
Kyanite, andalusite & silimanite	'000 tonnes	440**	38	8.6	4th
Magnesite	'000 tonnes	24000	246	1.0	10th
Apatite & rock phosphate	'000 tonnes	166000	1764	1.0	16th
Talc/Steatite/Pyrophylite	'000 tonnes	7600	1067	14.0	2nd
Mica	tonnes	380000	1206	0.3	15th
Metals					
Aluminium	'000 tonnes	39400	1347	3.4	8th
Copper (refined)	'000 tonnes	18000	502	2.8	11th
Steel (crude/liquid)	Million tonnes	1329	54***	4.3	5th
Lead (refined)	'000 tonnes	9400	60	0.6	23rd
Zinc (stab)	'000 tonnes	11700	579	4.9	5th

Notes: *Figures relate to 2008-09
** Mineral Commodity Summaries, 2010, US Geological Survey
*** Annual Report, 2009-10, Ministry of Steel

Source: Annual Report 2010-11, Ministry of Mines, Government of India, 2011

Annexure 3

Value of Production of Selected Minerals in India

(In Rupees Crore)

Period	2006-07	2007-08 (R)	2008-09 (R)	2009-10 (P)	2010-11 (E)
All Minerals	**104490.49**	**121682.47**	**174240.31**	**179384.01**	**200609.38**
Fuel Minerals (of which)	66158.29	70397.31	115371.31	124088.33	135243.81
Coal & Lignite	37462.82	41425.44	49224.81	52960.1	53251.83
Natural Gas	9764.16	9968.70	10107.71	14780.03	18488.83
Petroleum (crude)	18931.32	19003.17	56038.79	56348.20	63503.15
Metallic Minerals (of which)	18285.81	29179.89	36067.76	32274.29	41828.44
Iron Ore	14204.31	23379.04	28544.40	26264.84	34852.37
Chromite	1450.17	2142.19	2263.36	1183.41	2089.76
Manganese Ore	557.37	1206.04	2765.47	1269.54	1482.49
Bauxite	384.78	566.16	470.32	456.36	502.66
Non-Metallic Minerals (of which)	3351.46	3370.85	4066.79	4286.94	4802.69
Phosphorite	218.46	212.57	308.76	312.01	423.21
Barite	94.71	57.01	96.64	234.97	196.45
Limestone	2405.01	2399.95	2921.98	2986.23	3220.21
Kaolin	162.22	29.15	64.17	69.89	56.64
Dolomite	112.57	146.12	155.41	144.79	154.22
Minor Minerals	16694.93	18734.45	18734.45	18734.45	18734.45

(R) Revised, (P) Provisional, (E) Estimated
Source: Annual Report 2010-11, Ministry of Mines, Government of India, 2011

Annexure 4

Quantity of Production of Selected Minerals in India

(In thousand metric tonnes unless otherwise specified)

Mineral	2006-07	2007-08 (R)	2008-09 (R)	2009-10 (P)	2010-11 (E)
Fuel Minerals					
Coal (MT)	431	457	493	532	537
Lignite (MT)	31	34	32	34	38
Natural Gas (MCM)	31747	32417	32849	47510	58982
Petroleum (crude) (MT)	34	34	34	34	38
Metallic Minerals					
Iron Ore	187696	213246	212961	218639	212613
Chromite	5296	4873	4073	3413	3865
Manganese Ore	2116	2697	3620	2440	2901
Bauxite	15733	22462	15460	13952	13363
Non-Metallic Minerals					
Phosphorite	1587	1849	1804	1547	1651
Barite	1681	1076	1686	2138	1774
Dolomite	5172	5852	5504	5182	4724
Kaolin	1460	1350	2084	2578	2488
Limestone (MT)	197	193	222	229	240

(R) Revised, (P) Provisional, (E) Estimated, MT: Million tonnes, MCM: Million cubic metre
Source: Annual Report 2010-11, Ministry of Mines, Government of India, 2011

Annexure 5

Contributions of Principal Minerals to the Mineral Sector's GVA (Gross Value Added) (Share of GDP) at current prices

(In Rupees Crore)

Mineral	2006-07	2007-08	2008-09
All minerals (excluding atomic minerals)	81775.90	94972.74	97214.67 (100)
Fuel Minerals	50255.05	51994.38	52210.86 (53.71)
Coal & Lignite	27388.52	29365.77	29669.97 (30.52)
Natural Gas & Petroleum (crude)	22866.52	22628.61	22540.89 (23.19)
Metallic Minerals	15354.96	25061.97	27080.95 (27.86)
Iron Ore	11993.13	20155.92	21792.08 (22.42)
Non-Metallic Minerals	2405.21	2216.90	2223.38 (2.29)
Minor Minerals	13760.67	15699.47	15699.47 (16.15)

Note: Figures in brackets are percentages
Source: Indian Mineral Year Book (2009), Indian Bureau of Mines, Government of India (Table 7, Pg 8-12).

Annexure 6

Mineral Exports during selected years

(In Rupees Crore)

Mineral	1995-96	2005-06	2009-10	2010-11	Percentage share (%)	
					2009-10	2010-11
Ores and Minerals (of which)	3930.1	27288.3	41097.6	48581.6	4.8	4.2
Iron Ore	1721.0	16828.8	28366.1	21034.6	3.3	1.8
Petroleum Products	1517.8	51532.8	132899.0	190781.1	15.8	16.5
Total Exports	106353.3	456417.9	845533.6	1157474.6	100	100

Source: Handbook of Statistics on Indian Economy 2010-11, Reserve Bank of India, Mumbai, 2011.

Annexure 7

Mineral Imports during selected years

(In Rupees Crore)

Mineral	1995-96	2005-06	2009-10	2010-11	Percentage share (%)	
					2009-10	2010-11
Metalliferous Ores, Metal scrap, etc.	2751.0	17186.1	36449.9	42872.2	2.7	2.7
Coal, Coke and Briquittes	3095.9	17128.1	42511.1	44005.9	3.1	2.7
Petroleum, Crude and Products	25173.8	194640.0	411649.1	482714.3	30.2	42.7
Total Imports	122678.1	660408.9	1363735.5	1605314.6	100	100

Source: Handbook of Statistics on Indian Economy 2010-11, Reserve Bank of India, Mumbai, 2011.

Annexure 8

World Free Market Price Indices of Mineral Ores and Metals, 2000-2010 (Base 2000 = 100)

Year	Price Index
2000	100
2001	89
2002	87
2003	98
2004	137
2005	173
2006	278
2007	313
2008	332
2009	232
2010	310

Source: UnctadStat – Free Market Commodity Price Indices (annual), UNCTAD, Geneva (downloaded from www.unctadstat.unctad.org in November 2011).

Annexure 9

World Free Market Commodity Prices (annual) of iron ore (Brazilian ore to Europe, Vale Itabira SSF, 64.5% Fe content)

(Measure = FOB (c/dmt Fe unit))

Year	Price
2000	27.67
2001	28.92
2002	28.62
2003	31.04
2004	36.45
2005	62.51
2006	74.39
2007	81.46
2008	134.41
2009	96.51
2010	96.51

Source: UnctadStat – Free Market Commodity Price Indices (annual), UNCTAD, Geneva (downloaded from www.unctadstat.unctad.org in November 2011).

Annexure 10

Indices of wholesale prices of minerals and iron ore in India (Base 1993-94 = 100)

Period	Minerals	Iron Ore
2000-01	113.5	122.4
2001-02	119.3	127
2002-03	118.8	127
2003-04	121.6	135.4
2004-05	255.1	448.3
2005-06	322.8	601.5
2006-07	413.6	793.9
2007-08	460.4	901.5
2008-09	631.6	1247.1
2009-10	608.4	1159.4

Source: Office of Economic Adviser, Ministry of Commerce and Industry, Government of India, New Delhi, 2011.

Annexure 11

India: Structure of the Mineral Industry in 2009

(In '000 metric tonnes unless otherwise specified)

Mineral/Metal	Major operating companies and major equity owners	Location of main facilities	Annual Capacity[e]
Alumina	Indian Aluminium Co. Ltd. (Indian interests, 60.4%, and Alcan Aluminium Ltd., 39.6%)	Belgaum Refinery, Karnataka	280
Do.	National Aluminium Co. Ltd (Government, 100%)	Dhamanjodi Refinery, Orissa	1580
Do.	Bharat Aluminium Co. Ltd [Government, 49%. and Sterlite Industries (India) Ltd., 51%]	Korba Refinery, Chhattisgarh	200
Do.	Utkal Alumina Internaiional Ltd. (Hindalco Industries Ltd., 100%)	Koraput Refinery, Orissa	1500[1]
Do.	Madras Aluminium Co. Ltd. [Sterlite Industries (India) Ltd., 80%, and others, 20%]	Mettur Refinery, Tamil Nadu	80
Do.	Indian Aluminium Co. Lid (Indian interests, 60.4%, and Alcan Aluminium Ltd., 39.6%)	Muri Refinery, Jharkhand	88
Do.	Hindalco Industries Ltd. (Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%; financial institutions, 18%)	Renukoot Refinery, UP	450
Aluminum	Indian Aluminium Co. Ltd. (Indian interests, 60.4%, and Alcan Aluminium Ltd., 39.6%)	Alupuram Smelter, Kerala	20
Do.	National Aluminium Co. Ltd. (Government. 100%)	Angul Smelter, Orissa	345
Do.	Indian Aluminium Co. Ltd (Indian interests, 60.4%, and Alcan Aluminium Ltd., 39.6%)	Belgaum Smelter, Karnataka	70
Do.	Hindalco Industries Ltd. (Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%; financial institutions, 18%)	Hirakud Smelter, Orissa	100
Do.	Bharat Aluminium Co. Ltd [Government, 49%. and Sterlite Industries (India) Ltd., 51%]	Korba Smelters, Chhattisgarh	350
Do.	Madras Aluminium Co. Ltd. [Sterlite Industries (India) Ltd., 80%, and others, 20%]	Mettur Smelter, Tamil Nadu	40
Do.	Hindalco Industries Ltd (Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%. financial institutions, 18%)	Renukoot Smelter, UP	275
Barite	Andhra Pradesh Mineral Development Corp. Ltd. (Andhra Pradesh State government, 100%)	Cuddapah District mines, AP	350
Do.	Associated Mineral Corp	Do.	75
Do.	Pragathi Minerals	Do.	50
Do.	Shri CM. Ram nath Reddv	Do.	75
Do.	Vijayaiaxmi Minerals Trading Co	Do.	50
Bauxite	Bharat Aluminium Co. Ltd. [Government, 49%. and Sterlite Industries (India) Ltd., 51%]	Amarkantak Mine, Madhya Pradesh	200
Do.	Indian Aluminium Co Ltd. (Indian interests, 60.4%, and Alcan Aluminium Ltd., 39.6%)	Kolhapur District Mines, Maharashtra	600

Mineral/Metal	Major operating companies and major equity owners	Location of main facilities	Annual Capacity[e]
Do.	Gujarat Mineral Development Corp. (Gujarat State government, 100%)	Kutch and Saurashtra, Mines, Gujarat	500
Do.	Hindalco Aluminium Co. Ltd (Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%; financial institutions, 18%)	Mines in Lohardaga District, Kharkhand	750
Do.	Indian Aluminium Co. Ltd. (Indian interests, 60.4% and Alcan Aluminium Ltd., 39.6%)	Do.	200
Do.	National Aluminium Co. Ltd. (Government, 100%)	Mines in Panchpatmali Hills, Koraput, District, Orissa	4800
Do.	Minerals & Minerals Ltd. (Government. 100%)	Mines in Richuguta, Palamau District, Jharkhand	200
Boron	Borax Morarji Ltd.	Ambernath, Maharashtra	17
Cement	Larsen and Toubro Ltd.	Awarpur Plant, Maharashtra	2300
Do.	Century Cement (Century Textiles and industries Ltd., which is a subsidiary of the Birla Group, 100%)	Baikunth Plant, Madhya Pradesh	1120
Do.	Ambuja Cements Ltd. (Holcim Group, 14.8%)	Plants in 7 States	14000
Cement	Coromandel Fertilizers Ltd. [Chevron Chemical Co. (United States), 23.55%; International Minerals and Chemical Co., 20.89%; Parry and Co., 10.64%; E.I.D Parry (India) Ltd., 6.65%; others, 38.27%]	Chalamkur Plant, AP	1000
Do.	The Associated Cement Cos. Ltd. (Government, 34.86%; and private shareholders, 65.14%)	Gagal Plant, HP	1830
Do.	Raymond Cement Works (a division of Raymond Woolen Mills Ltd. JK Singhania, principal shareholder)	Gopalnagar Plant, West Bengal	1250
Do.	Narmada Cement Co. Ltd. (Chowgule and Co. Ltd., 34%; Gujarat State government, 17.33%; others, 48.67%)	Jafrabad Plant, Gujarat	1000
Do.	Rajashree Cement (a division of Indian Rayon and Industries Ltd., 100%)	Khor Plant, Karnataka	1020
Do.	The Associated Cement Cos. Ltd. (Government. 34.86%; and private shareholders, 65.14%)	Kymore Plant, Madhya Pradesh	1500
Do.	Mangalam Cement Ltd.	Morak Plant, Rajasthan	1000
Do.	Mysore Cements Ltd. (Government institutions and banks, 41.13%; Corporate Trust Holdings, 21.70%; others, 37.17%)	Narasingarh Plant, Haryana	1090
Do.	Cement Corp. of India Ltd. (Government, 100%)	Nayagaon Plant, Madhya Pradesh	1330
Do.	JK Cement Works (which is a division of JK Synthetics Ltd.), 100%	Nimbahera Plant, Rajasthan	1460

Mineral/Metal	Major operating companies and major equity owners	Location of main facilities	Annual Capacity[e]
Do.	OCL India Ltd.	Orissa	1850
Do.	The India Cement Co. Ltd. (Governmen,. 26%; Life Insurance Corp. of India, 24%; others, 50%)	Sankamagar Plant, Tamil Nadu	1000
Do.	Maihar Cement (Century Textiles and Industries Ltd., which is a subsidiary of the Birla Group, 100%)	Satna Plant, Madhya Pradesh	1800
Do.	Jaiprakash Associates Ltd.	Sewagram, Gujarat	2400
Do.	Shree Digvijay Cement Co. Ltd.	Shreeniwas Plant, Maharashtra	1070
Do.	Lakshmi Cement (a division of Straw Products Ltd., JK Singhania, principal shareholder)	Sirohi Plant, Rajasthan	1400
Do.	Lafarge S.A.	Sonadih, Chhattisgarh	1400
Do.	Manikgarth Cement (Century Textiles and Industries Ltd., which is a subsidiary of the Birla Group, 100%)	Tehsil Rajura Plant, Maharashtra	1000
Do.	Vasavadatta Cement (Kesoram Industries Ltd., 100%)	Vasavadatta Plant, Karnataka	1000
Do.	Vikram Cement (Grasim Industries Ltd., which is a subsidiary of Birla Group, 100%)	Vikram Plant, Madhya Pradesh	1000
Do.	Raasi Cement Ltd. (Andhra Pradesh State government, 50%; and Development Co Ltd., 50%)	Vishnupuram Plant, Andhra Pradesh	1000
Do.	The Associated Cement Cos. Ltd. (Government, 34.86%.; and private shareholders, 65.14%)	Wadi Plant, Karnataka	2180
Chromium	Ferro Alloys Corp. Ltd.	Cuttack District, Orissa	120
Do.	Orissa Mining Corp. Ltd. (Orissa Industries Ltd., 100%)	Do.	300
Do.	Tata Steel	Do.	100
Do.	Ferro Alloys Corp. Ltd	Dhenkanal District, Orissa	75
Do.	Orissa Mining Corp. Ltd. (Orissa Industries Ltd. 100%)	Do.	200
Do.	Mysore Minerals Ltd	Hasan District, Karnataka	125
Do.	Ferro Alloys Corp Ltd	Kendujhar District, Orissa	75
Do.	Orisssa Mining Corp Ltd (Orissa Industries Ltd., 100%)	Do.	100
Do.	Ferro Alloys Corp Ltd	Khammam District, AP	100
Coal, bituminous (in MMT)	Bharat Cooking Coal Ltd (a subsidiary of Government-owned Coal India Ltd, 100%)	Bihar and West Bengal	26
Do.	Central Coalfields Ltd (A Subsidiary of Government-owned Coal India Ltd.), 100%	Bihar	27
Do.	Eastern Coalfields Ltd (A Subsidiary of Government-owned Coal India Ltd.), 100%	Bihar and West Bengal	21

Mineral/Metal	Major operating companies and major equity owners	Location of main facilities	Annual Capacity[e]
Do.	Mahanadi Coalfields Ltd. (a subsidiary of Government-owned Coal India Ltd.), 100%	Orissa	21
Do.	North Eastern Coalfields Ltd (a subsidiary of Government-owned Coal India Ltd), 100%	Assam	640
Do.	Northern Coalfields Ltd (a subsidiary of Government-owned Coal India Ltd.). 100%	Madhya Pradesh and Uttar Pradesh	24
Do.	Singareni Collieries Co. Ltd (Andhra Pradesh State government, 50%, and Government, 50%)	Andhra Pradesh	18
Do.	South Eastern Coalfields Ltd. (a subsidiary of Government-owned Coal India Ltd.), 100%	Madhya Pradesh	36
Do.	Western Coalfields Ltd. (a subsidiary of Government-owned Coal India Ltd.), 100%	Madhya Pradesh and Maharashtra	18
Coal, Lignite (in MMT)	Neyveli Lignite Corp Ltd (NLC) (Government, 100%)	Tamil Nadu	17
Copper, Mine	Hindustan Copper Ltd. (HCL) (Government, 100%)	Indian Copper Complex Mines, Ghatsila District, Jharkhand	31
Do.	Do.	Khetri Copper Complex Mines, Khetrinagar, Rajasthan	15
Do.	Do.	Malanjkhand Copper Complex Mines, Balaghar District, Madhya Pradesh	22
Copper, Metal	Hindalco Industries Ltd. (Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%; financial institutions, 18%)	Birla Copper Complex smelter, Dahej, Gujarat	70
Do.	Hindustan Copper Ltd. (HCL) (Government. 100%)	Indian Copper Complex smelter-refinery, Ghatsila District, Jharkhand	20
Do.	Do.	Khetri Copper Complex smelter-refinery, Khetrinagar District, Rajasthan	45
Do.	Sterlite Industries (India) Ltd.	Tuticorin Smelter, Tamil Nadu	400
Do.	Do.	Silvassa Refinery, Gujarat	300
Diamond (carats)	Government, 100%	Mahjgawan Mine	25000
Gold (Kilograms)	Hutti Gold Mines Co.	Hutti Mine, Karnataka	3000

Mineral/Metal	Major operating companies and major equity owners	Location of main facilities	Annual Capacity[e]
Iron and Steel, Crude Steel	Visvesvaraya Iron and Steel Ltd. (Karnataka State government. 60%, and Government-owned Steel Authority of India Ltd , 40%)	Bhadravali steel plant, Karnataka	180
Do.	Steel Authority of India Ltd. (Government, 100%)	Bhilai steel plant, Jharkhand	4930
Do.	Do.	Bokaro steel plant. Jharkhand	4600
Do.	Indian Iron and Steel Co. Ltd. (wholly owned subsidiary of Government-owned Authority of India Ltd.), 100%	Burnpur steel plant, West Bengal	1500
Do.	lspat Industries Ltd.	Dolvi, Maharashtra	3000
Do.	Steel Authority of India Ltd (Government, 100%)	Durgapur Steel Plant, West Bengal	1600
Do.	Tata Steel	Jamshedpur Steel Plant, Jharkhand	6800
Do.	Do.	Jagdalpur, Chhattisgarh	2000
Do.	Do.	Duburi, Orissa	3000
Do.	Steel Authority- of India Ltd. (Government. 100%)	Rourkela Steel Plant, Orissa	1800
Do.	Rashtriya lspat Nigam Ltd.	Visakhapatnam Steel Plant, Andhra Pradesh	3200
Do.	JSW Steel Co. Ltd	Vijayanagar, Karnataka	7800
Do.	Ministeel plants (privately owned)	About 180 Plants located throughout India	4700
Do.	Essar Steel Co. Ltd.	Hazira, Gujarat	3000
Do.	Lloyds Steel Industries Ltd.	Wardha, Maharashtra	500
Do.	MSP Steel and Power Ltd.	Raipur, Chhattisgarh	750
Iron Ore	National Mineral Development Corp. Ltd. (NMDC) (Government, 100%)	Bailadila, Chhaltisgarh	9000
Do.	Steel Authority of India Ltd. (Government, 100%)	Bastar and Dura District, Chhattisgarh	7000
Do.	Kudremukh Iron Ore Co. Ltd. (Government, 100%)	Kudremukh, Chikmagalur District, Karnataka	10300
Do.	National Mineral Development Corp Ltd. (NMDC) (Government, 100%)	Donimalai, Karnataka	9000
Do.	Chowgule and Co. Ltd.	Goa	2500
Do.	Dempo Mining Corp Ltd.	Do.	2500

Mineral/Metal	Major operating companies and major equity owners	Location of main facilities	Annual Capacity[e]
Do.	V.M. Salgaocar & Bros Pvt. Ltd.	Do.	2500
Do.	Sesa Goa Ltd. (Vedanta Resources plc, 51%)	Codli and Sonshi, Goa	NA
Do.	Steel Authority of India Ltd. (Government, 100%)	Kendujhar District, Orissa	3000
Do.	Tata Steel	Do.	2000
Do.	Indian Iron and Steel Co. Ltd. (wholly owned subsidiary of Government-owned Steel Authority of India Ltd.), 100%	Singhbhum District, Bihar	2500
Do.	Steel Authority of India Ltd. (Government, 100%)	Do.	3500
Do.	Tata Steel	Do.	3500
Kyanite	Associated Mining Co.	Bhandara District, Maharashtra	10
Do.	Maharashtra Mineral Corp. Ltd.	Do.	10
Do.	Bihar State Mineral Development Corp. Ltd. (Bihar State Government, 100%	Singhbhum District, Bihar	10
Do.	Hindustan Copper Ltd (HCL) (Government, 100%)	Do.	22
Lead :			
Primary	Hindustan Zinc Ltd (HZL) (Sterlite Opportunities and Ventures Ltd., 64.9%; and Government, 29.5%)	Chanderiya Smelters, Rajasthan	85
Do.	Do.	Tundoo Smelter, Bihar	8
Secondary.	Indian Lead Co.	Thane Refinery, Mumbai, Maharashtra	25
Do.	Do.	Wada, Mumbai, Maharashtra	40
Lead Ore	Hindustan Zinc Ltd (HZL) (Sterlite Opportunities and Ventures Ltd., 64.9%; and Government, 29.5%)	Agnigundala Mine, Andhra Pradesh	72
Do.	Do.	Sargipalli Mine, Orissa	150
Lead-zinc ore	Do.	Rampura-Agucha Mine, Rajasthan	1300
Do	Do.	Zawar Mine Group, Rajasthan	1200
Magnesite	Burn Standard Co. Ltd. (Government, 100%)	Salem, Tamil Nadu	150
Do.	Dalmia Magnestic Corp.	Do.	72
Do.	Tamil Nadu Magnestite Ltd. (Tamil Nadu State Government, 100%)	Do.	150
Manganese ore[2]	Manganese Ore India Ltd. (Government, 100%)	Adilabad, Andhra Pradesh	NA
Do.	Falechand Marsingdas	Andhra Pradesh	NA

Mineral/Metal	Major operating companies and major equity owners	Location of main facilities	Annual Capacity[e]
Do.	Manganese Ore India Ltd. (Government, 100%)	Balaghat. Madhya Pradesh	NA
Do.	J.A. Trivedi Bros.	Do.	NA
Do.	Sandur Manganese and Iron Ores Ltd.	Bellary, Karnataka	NA
Do.	Manganese Ore India Ltd. (Government, 100%)	Bhandara, Maharashtra	NA
Do.	Eastern Mining Co.	North Kanara, Karnataka	NA
Do.	Mysore Minerals Ltd.	Do.	NA
Do.	Manganese Ore India Ltd. (Government, 100%)	Keonjhar, Orissa	NA
Do.	Mangilah, Rungta (Pvt.) Ltd.	Do.	NA
Do.	Orissa Mining Corp. Ltd.	Do.	NA
Do.	Rungta Mines (Pvt.) Ltd	Do.	NA
Do.	Serajuddin & Co.	Do.	NA
Do.	S. Lall & Co.	Do.	NA
Do.	Tata Steel	Keonjhar, Orissa	NA
Do.	Orissa Mineral Development Co. Ltd.	Koraput, Orissa	NA
Do.	Orissa Mining Corp. Ltd.	Do.	NA
Do.	Mysore Minerals Ltd.	Shimoga, Karnataka	NA
Do.	Aryan Mining and Trading Corp.	Sundargarh, Orissa	NA
Do.	Orissa Manganese and Minerals Pvt. Ltd.	Do.	NA
Do.	Tata Steel	Do.	NA
Do.	R.B.S Shreeram Durga Prasad and Falechand Marsingdas	Vizianagaram, Andhra Pradesh	NA
Mica (in metric tonnes)	Micafab India Pvt. Ltd.	Sydapuram Mandal, Andhra Pradesh	4500
Do.	Premier Mica Co.	Rjupalem, Andhra Pradesh	200
Petroleum, refined Products (in thousand 42-gallon barrels per day)	Cochin Refineries Ltd. (Oil and Natural Gas Corp., 55% and private interests, 45%)	Ambalamugal refinery, Kerala	93
Do.	Indian Oil Corp. (Oil and Natural Gas Corp, 91%, and Private Interests, 9%)	Barauni refinery, Bihar	66
Do.	Bongaigaon Refinery and Petrochemicals Ltd. (a subsidiary of Government-owned Oil and Natural Gas Corp), 100%	Bongaigaon refinery, Assam	27

Mineral/Metal	Major operating companies and major equity owners	Location of main facilities	Annual Capacity[e]
Do.	Indian Oil Corp. (Oil and Natural Gas Corp, 91%, and Private Interests, 9%)	Digboi refinery, Assam	12
Do.	Do.	Guwahati refinery, Assam	20
Do.	Do.	Haldia refinery, West Bengal	61
Do.	Reliance Industries Ltd.	Jamnagar refinery, Gujarat	1240
Do.	Do.	Koyali refinery, Gujarat	185
Do.	Madras Refineries Ltd. (Oil and Natural Gas Corp., 52%, and Private Interests, 48%)	Madras refinery, Tamil Nadu	131
Do.	Bharat Petroleum Corp. Ltd. (Oil and Natural Gas Corp, 67% and Private Interests, 33%)	Mahul refinery, Mumbai, Maharashtra	135
Do.	Hindustan Petroleum Corp. Ltd. (Oil and Natural Gas Corp, 51% and Private Interests, 49%)	Do.	110
Do.	Essar Oil Ltd.	Vadinar refinery, Gujarat	240
Do.	Do.	Visakhapatnam refinery, Andhra Pradesh	90
Do.	Indian Oil Corp (Oil and Natural Gas Corp, 91%, and Private Interests, 9%)	Mathura refinery, Uttar Pradesh	156
Do.	Do.	Panipat refinery, Haryana	240
Phosphate Rock[3]	Rajasthan State Mineral Development Corp. Ltd. (Rajasthan State Government, 100%)	Badgaon, Dakankotra, Kanpur, Kharbaria-ka-Guda and Sallopat Mines, Rajasthan	NA
Do.	Pyrites Phosphates and Chemicals Ltd.	Durmala and Maldeota underground mines, Uttar Pradesh	NA
Do.	Madhya Pradesh State Mining Corp. Ltd. (Madhya Pradesh State Government, 100%)	Hirapur and Khatamba Mines, Jharkhand	NA
Do.	Rajasthan State Mines and Minerals Ltd. (Rajasthan State Government, 100%)	Jhamarkotra Mine, Rajasthan	NA
Do.	Hindustan Zinc Ltd (HZL) (Sterlite Opportunities and Ventures Ltd., 64.9% and Government, 29.5%)	Maton Mine, Rajasthan	NA
Titanium, ilmenite-rutile ore	Kerala Minerals and Metals Ltd. (Kerala State Government, 100%)	Chavara, Kerala	100

Mineral/Metal	Major operating companies and major equity owners	Location of main facilities	Annual Capacity[e]
Do.	Indian Rate Earths Ltd (IREL) (Government, 100%)	Do.	250
Do.	Do.	Ganjam, Orissa	220
Do.	Do.	Manavalakurichi, Tamil Nadu	65
Do.	Trimex Industries Ltd.	Chennai, Andhra Pradesh	200
Do.	VV Minerals Ltd.	Kanyakumari, Tamil Nadu	130
Zinc	Binani Zinc Ltd.	Binanipuram Smeller, Kerala	38
Do.	Hindustan Zinc Ltd (HZL) (Sterlite Opportunities and Ventures Ltd., 64.9% and Government, 29.5%)	Chanderiya Sinelier, Rajasthan	340
Do	Do.	Dehari Smeller, Rajasthan	78
Do.	Do.	Visakhapatnam (Vizag) Smeller, Andhra Pradesh	54

Notes: [e] Estimated; Do. Ditto, NA Not available
[1] Scheduled startup is delayed to 2011
[2] Capacity of clusters of surface mines varies extremely, depending on demand. Estimated total capacity is 1.8 million metric tonnes per year (Mt/yr)
[3] Estimated total phosphate rock capacity is 1.2 Mt/yr
Source: USGS 2009 Minerals Yearbook (India), US Geological Survey, US Department of the Interior, February 2011.

Annexure 12

An outline of the provisions of the Draft Mines and Minerals (Development and Regulation) (MMDR) Bill 2011

1. Chapter I (Section 1-3): Preliminary

   - Definition of various key terms.

2. Chapter II (Section 4-18): General Restrictions on Mineral Concessions

   - Reconnaissance, prospecting and mining operations to be under license.
   - Four categories of mineral concession: a non-exclusive reconnaissance license (RL), high-technology reconnaissance cum exploration license (HTREL), prospecting license (PL) and mining lease (ML).
   - State Governments to notify the area where reconnaissance has been conducted and mineralization of specified minerals established for grant of prospecting license or mining lease on competitive bidding basis. (Section 13).
   - Consultation with Gram Sabhas/District Councils (Scheduled Areas) and District Panchayat (Non-Scheduled Areas) before inviting application in respect of public lands (Section 13 (10)).
   - Weightage assigned to selection criteria (including establishing downstream industries) in competitive bidding process.
   - Time limit prescribed for disposal of applications for grant of various mineral concessions (3-4 months).
   - Redressal against delays through independent Mining Tribunals at the Central (major minerals) or State (minor minerals) levels.
   - Prior approval of Central Government required by State Government for grant, extension and transfer of mineral concessions only for Coal, Atomic and Beach Sand Minerals (not for any other major mineral).
   - Transfer of mineral concession (including data) allowed for consideration to eligible party (Sections 17 & 18).
   - Approval of State Government only in case of mining lease (Central Government for Coal, Atomic and Beach Minerals) – only intimation in other cases (Section 18).
   - Existing small mines to continue in the new regime irrespective of the lease-size.

3. Chapter III (Sections 19-20): Reconnaissance License

   - Conditions of reconnaissance license and procedures for grant of non-exclusive renaissance license.

4. Chapter IV (Sections 21-23): High Technology Reconnaissance cum Exploration License and Prospecting License

   - Conditions for a HTREL and PL and procedures for grant of these concessions.
   - Requirement of reclamation and restoration of land on completion of exploration or prospecting operations.
   - State Government to grant concessions for exploration (HTREL and PL) on first-in-time basis for areas where existence of minerals unknown.
   - Progression for RL to PL (Section 22(4)) on first-in-time basis.
   - HTREL granted on first-in-time basis only.
   - Direct mining lease not granted on first-in-time basis.
   - Fees on unit area basis prescribed for various licenses.
   - Assured transition from exploration stage to mining lease in case conditions of license are met (Section 22).

5. Chapter V (Sections 24-33): Mining Lease

   - Conditions of mining lease and procedure for grant of mining lease.
   - Conditions include obligation to pay royalty/dead rent, surface rent and water rate as also mining operations within two years of execution of mining lease (Section 24).
   - Seamless transition from HTREL/Prospecting license to grant of mining lease except in cases where mining lease granted on competitive bidding order section 13(5) (Section 25).
   - Mining operations to be in accordance with Mining Plan to which a corporate social responsibility document would be attached (in case of major minerals) (Section 26).
   - Concession for prospecting and mining to be extended by the State Government till exhaustion of deposit (Section 28).
   - Every mining lease to prepare a Mine Closure Plan in terms of a Sustainable Development Framework -- progressive mine closure plans and a final mine closure plan (Section 32).
   - Consultation with the Panchayats having jurisdiction regarding post closure land use (Section 32(8)).

6. Chapter VI (Section 34-36): Mineral Concession in cases where minerals do not vest exclusively with Government.

7. Chapter VII (Section 37–40): Reservations

   - Reservation of areas by Government only for the purposes of conservation of minerals resources (Section 37).

8. Chapter VIII Royalties, Compensation and Cess

- Royalty payable in respect of any mineral removed or consumed by a holder of mining lease from the leased area (Section 41).
- Royalty rates for major minerals specified in the Second Schedule (of the Act) and that for minor minerals to be determined by State Government.
- Rates of royalty not to be enhanced more than once during any period of three years.
- Dead rent payable by the holder of mining lease for all the areas included in the lease.
- Lease holder to pay royalty or dead rent whichever in higher.
- Annual contribution to the District Mineral Foundation by the holder of a mining lease, in the case of major minerals (except coal and lignite) an amount equivalent to the royalty paid during the financial year and in the case of coal and lignite an amount equal to 26 per cent of the profit of the preceding financial year (Section 43(2)).
- Other payments to be made by the holder of a mineral concession: (i) compensation to owner of surface usufruct and traditional rights, (ii) allotment of at least one share to each person of a family affected by mining (in case the holder of mining lease is a company), (iii) provision of employment or other assistance by mining lease holder to any person or family holding occupation or usufruct or traditional rights of surface land over which lease is granted and (iv) compensation for damage to land after termination of a mineral concession.
- Monetary benefits to persons or families (to be identified by State Government) affected by mining operations (Section 43 (10)) levy and collection of cess on major minerals by both Central and State Governments and on minor minerals by State Government (Section 44 and 45).

9. Chapter IX (Section 46-47): Power to Issue Directions

- Power of the Central Government to issue directions and take all steps for the conservation of strategies mineral resources and for scientific mining and sustainable development.
- Development of a National Sustainable Development Framework (by Central Government) and State Sustainable Development Framework (by State Government) containing guidelines relating to scientific mining and mineral conservation, sustainability of mining operations, ensuring minimal adverse impact in local communities, minimizing and mitigating adverse environmental impact on bio-diversity and on ground water, air, ambient noise and land, creating opportunities for socio-economic development, promoting restoration and reclamation of mined out land, consultation with communities, a system of public disclosure on mining related activities etc. (Section 46).

10. Chapter X (Section 50-57): National, State Mineral Fund and District Mineral Foundation

- Constitution of National Mineral Fund and State Mineral Fund primarily by utilizing cess collected by Central and State Governments respectively.
- Objectives include assistance in the development of capacities of the Indian Bureau of Mines and State Directorates of Mining promoting information technology applications in mining, providing financial assistance for seminars and workshops on mining, providing grants to National and State level Mining Regulatory Authority and Mines Tribunals and the like.
- Establishing of a District Mineral Foundation (DMF) by State Government in each mining district for the interest and benefit of persons/families affected by mining related operations in the district.
- Objectives include distribution of monetary benefits to persons or families affected by mining and creation, management and maintenance of local infrastructure in mining areas.
- A Governing Council with District Magistrate as Chairman and representatives of various stake-holders as members to manage and administer the District Mineral Foundation.

11. Chapter XI (Sections 58-74): National Mining Regulatory Authority and State Mining Regulatory Authority

- Establishment (by Central Government) and composition of National Mining Regulatory Authority (NMRA) including qualification of members, their terms of office and procedure of selection (Sections 58-61).
- Powers and functions of NMRA: prescribe standards and quality of technical regulations, reports and information of IBM and State Governments; mediate on jurisdictional issues among State Governments and IBM; advise on matters relating to sustainable development framework and conservation of minerals; review and recommend rates of royalty and dead rent and advise on related matters including profit-sharing, transparency on grant of mineral concessions, and the like (Section 68).
- Establishment (by State Government) of State Mining Regulatory Authority with powers to authorize and prosecute persons indulging in various forms of illegal mining (Section 72).

12. Chapter XII (Sections 75-101): National Mining Tribunal and State Mining Tribunal

- Establishment (by Central Government) of National Mining Tribunal (NMT) including its composition, qualifications of members and procedures for their selection (Sections 75-78).
- NMT (concerned with major minerals) with powers and functions that include : adjudication on government orders on applications and transfer of mineral

concessions, consideration of grievances of affected persons relating to Mining Plans, Mine Closure Plans and Sustainable Development Framework (SDF), consider revision petitions on orders passed by Central and State Government Authorities (Section 85).

- Establishment (by State Government) of State Mining Tribunal (SMT) including composition and qualifications of members and procedures of their selection (Sections 90-92).
- SMT (concerned with minor minerals) with powers and functions that include: adjudication on government orders passed in respect of application to State Government Authorities for grant of mineral concessions and other related issues and grievances of affected persons relating to State Government orders on Mining and Mine Closure Plans, Sustainable Development Framework etc. and consider revision petitions on orders passed by State Government Authorities (Section 99).

13. Chapter XIII (Sections 102-104): Coordination Committees and National Representatives

    - Statutory Coordination-cum-Empowered Committees at Central and State Levels in order to coordinate between various agencies for clearance, improve procedures, ensure implementation of Sustainable Development Frameworks including Mine Closure Plans and prevent illegal mining (Sections 102-103).

14. Chapter XIV (Sections 105 – 109): Special Courts

    - State Governments to set up Special Courts to expedite prosecution of illegal mining (Section 105).

15. Chapter XV (Sections 110-122): Offences and Penalties

16. Chapter XVI (Sections 123-139): Miscellaneous Matters

    First Schedule – Major Minerals
    Second Schedule – Rates of Royalty
    Third Schedule – Rates of Dead Rent

Annexure 13

List of Mines Visited During Field Study

Odisha

1. Khandbandh Iron Ore Mines (366.3 Ha)
   P.O. Khandbandh, Joda
   Keonjhar District, Odisha
   (M/s Odisha Mining Corporation)

2. Joda East Iron Ore Mines (671 Ha)
   Joda, Keonjhar District, Odisha
   (M/s Tata Steel Ltd.)

3. Patabeda Iron Ore Mines (19 + 14 = 33 Ha)
   P.O. Patabeda, Koira
   Sudergarh District (Odisha)
   (M/s MGM Group of Mines)

4. Ganva Iron and Manganese Mines (86.8 Ha)
   P.O. Malda, Sundargarh Dist. (Odisha)
   (Proprietor – P.K. Ahluwalia)

5. Siljora – Pikali Mati Manganese and Iron Ore Mines (715.6 Ha)
   P.O. Siljora, Keonjhar District (Odisha)
   (M/s M.L. Rungta)

6. Jaribahal Iron Ore Mines (99.1 Ha)
   Palasa Village (Ka and Kha)
   Jaribahal, Keonjhar District (Odisha)
   (M/s Patnaik Minerals Pvt. Ltd.)

7. Rudkela Manganese Mines (36.4 Ha)
   P.O. Rudkela, Joda
   Keonjhar District (Odisha)
   (Proprietor – S.N. Das Mohapatra)

8. Daitari Iron Ore Mines (1812.9 Ha)
   P.O. Daitari, Jajpur District (Odisha)
   (M/s Odisha Mining Corporation)

9. South-Kaliapani Chromite Mines (552.9 Ha)
   P.O. Kaliapani, Jajpur District (Odisha)

(M/s Odisha Mining Corporation)

10. Saruabil Chromite Mines (246.8 Ha)
    Saruabil village, P.O. Kansa
    Jajpur District (Odisha)
    (M/s Mishrilal Jain Mines Ltd.)

11. Sukinda and Mahagiri Chromite Mines (116 + 73 = 189 Ha)
    P.O. Sukinda, Jajpur District (Odisha)
    (M/s IMFA Ltd.)

12. Panchpatmali Bauxite Mine
    National Aluminum Company Limited
    Damanjodi Koraput, Odisha

Goa

13. Codli Iron Ore Mines (299 Ha)
    District Codli, P.O. Kirlapale
    South Goa – 403706
    (M/s Sesa Goal Ltd.)

14. Gaval Sanshi Mines (62 Ha)
    Mr. Sonshi, P.O. Honda
    North Goa
    (M/s Sesa Goa Ltd.)

15. Sanquelim group of mines (closed and rehabilitated) where M/s Sesa Goa has done commendable reclamation work

16. Cuddegal Mines (91 Ha)
    Santona village, P.O. Kuruchure
    South Goa – 403706

17. Cudnem Iron Ore Mine (79.53 Ha)
    Cudnem village, North Goa
    (V.M. Salgaokar & Bros. Pvt. Ltd.)

18. Zambliomollacho Suddo Iron Ore Mine (90.5 Ha)
    Muguli and Costi villages
    Sanguem Taluk, South Goa
    (Late Mahabaleswar Gharse leased to another party – Jains)

Karnataka

19. Donimalai Iron Ore Mines (608 Ha)
    Belary District, Karnataka
    (M/s NMDC Ltd.)

20. S.J. Haravi Iron Ore Mines (105 Ha)
    Laxmipur village
    Sandur Taluk, Bellary, Karnataka
    (M/s V.S. Las & Sons, Sandur)

21. Jambunatha Iron Ore and Red Oxide Mine (42.90 Ha)
    NEB Range, Sandur Taluk
    Bellary, Karnataka
    (M/s G.G. & Brothers, Hospet)

22. Iron Ore Mine (13 Ha) of B.R. Yogendranath Singh
    Kakabalu village, Sandur Taluk,
    Bellary District, Karnataka

Jharkand

23. Pipparwar and Asoka Coal Mines(1120.25 + 1255 = 2375 Ha)
    P.O. Bachra, Chatra District, Jharkand
    (M/s Central Coalfields Ltd.)

24. West Bokaro Coal Mines (4300 Ha)
    Ramgarh, Jharkand
    (M/s Tata Steel Ltd.)

25. Bagra Bauxite Mines (43.73 Ha)
    Bagra, P.O. Kisko
    Lohardaga District, Jharkand
    (M/s Hindalco Industries Ltd.)

26. Chapi Bauxite and Latenite Mines (24.39 Ha)
    Chapi village, Lohardaga District, Jharkand
    (Proprietor - Sri Arvind Kumar Singh)

27. Nuamundi Iron Ore Mines (1160.06 Ha)
    P.O. Nuamundi, West Singhbhum District, Jharkand
    (M/s Tata Steel Ltd.)

Annexure 14

Summary of legislative provisions and procedures for sustainable mineral development in Canada, Australia, South Africa and Papua New Guinea (PNG)

I. Canada

Provincial governments are primarily responsible for mining in all its phases – exploration, extraction, development and management of mineral resources as well as reclamation and mine closure. Though both federal and provincial governments have powers for environmental regulation of mining activities (in their respective defined areas), provincial governments have more important powers and responsibilities in mining and its environmental regulation.

The Canadian Environment Assessment Act (CEAA) is the principal federal legislation requiring assessment of potential adverse environmental effects of a project where federal initiatives and funds are involved. Provinces have their own environmental assessment legislation. Ontario (mining province)'s Environmental Assessment Act, for example, requires proponents of public sector and private sector projects designated by regulation to prepare environment assessment reports for their respective projects (Castrilli, 2000).

Similarly, the Canadian Environment Protection Act (CEPA) 1999 and the Fisheries Act are the main federal legislations for pollution control and environmental regulation of mining activities. Provinces have their own legislation. Again, in case of the Ontario province, the Ontario Environmental Protection Act (OEPA) and the Ontario Water Resources Act (OWRA) have major regulatory application for mining activities.

The provincial mining laws (such as Ontario Mining Act) also provide for environmental regulation of mining activities.

The main elements concerning environmental regulations in Canada are indicated below:

Environmental impact assessment and Planning	• Self-assessment requiring a project proponent to assess environmental effects of a project (either through screening or comprehensive study), propose mitigation measures for adverse effects and disclose net results of the mitigation • Comparative evaluation of activities with environmental effects • Requirement of public participation and consultation • Review by independent Environmental Tribunal under Ontario's law • Regulated deadlines for various processes – normally 12 weeks for

	review of terms of reference and 30 weeks to review environmental assessment • Arrangements for coordinating (cooperative agreement) between federal and provisional governments
Environmental regulation and pollution control	• Federal and provincial laws for controlling emissions to air, discharge to water and impact on land due to mining and other industrial activities • Emphasis on pollution prevention rather than management to reduce toxic substances in the environment. Other guiding principles include the "precautionary principle" and "polluter pays principle" (Environment Canada, 2004) • Prohibition of discharge of contaminant into the environment at higher than prescribed levels (Castrilli, 2000) • Use of codes and standards (Castrilli, 2000) • Powers to issue administrative orders including stoppage of work (Castrilli, 2000) • Enforcement mechanisms including orders, prosecutions, fines and penalties (Castrilli, 2000) • Provisions under mining laws for environmentally protective measures in relation to mining operation at exploration, development, reclamation and rehabilitation stages (Castrilli, 2000)
Mine closures and rehabilitation of abandoned mines	• Mine closure planning throughout the mining process including exploration, pre-mining investigation, operations, closure and post-closure • Mine closure plans are an integral part of environmental and social impact assessment and are implemented strictly during mining operations • Requirement under mining law for certified mine closure plan, associated financial assurance and progressive rehabilitation throughout the life of a mine (The Canary Institute, not dated) • Rehabilitation of abandoned mine sites through partnerships among government agencies, mining industry and local communities under the National Orphaned and Abandoned Mines Initiative (NOAMI) and similar provincial initiatives (NOAMI, 2004).
Public participation in environmental protection	• Significant public participation in administrative and judicial processes relating to environmental protection • Provisions under federal and provincial legislations for the public to give views and comments at various stages of environment impact assessment, review, mediation and dispute resolution • Right of a member of a public to complain, request formal

	government investigation and use the courts to protect environment • Use of public resources and also to take class actions for mass harm done to individuals and environment • Towards Sustainable Mining (TSM) focuses on the mining industry performance in sustainable development (initiative of the mining industry)
Stakeholder engagement	• Proactive stakeholder engagement, particularly with the Aboriginal communities in mining areas • Court judgements (including that in the landmark case Delgamuukw vs. the Queen (1997)) and federal and provincial laws require government and mining industry to consult the Aboriginal communities on mineral development (Hipwell *et al.*, 2002) • Initiatives by mining industry (including the Whitehorse Mining Initiative (WMI) Leadership Accord in 1994) and Aboriginal Communities for mutual consultation (Natural Resources Canada, 1994) • Community consultation in different phases of mineral development leading to non-binding Memorandum of Understanding (MOU) and legally binding Impact Benefit Agreements (IBAs) between mining companies and Aboriginal Communities (Hipwell *et al.*, 2002)
Technologically advanced mining practices	• Continuous technological advances in mining machinery, methods and practices • Recent technological advances mostly as a result of application of Information Technologies (IT) to mining methods and machinery (Global Economics Limited, 2001)
Mining industry initiatives	• Special initiatives of the mining industry for community consultations and involvement in overall development of local communities (beyond regulatory requirements). These include the Whitehorse Mining Initiative (WMI) Leadership Accord (1994), the Environmental Excellence in Exploration (e3) initiative of the Prospectors and Developers Association and Towards Sustainable Mining (TSM) of the Mineral Association of Canada.

II. Australia

State and Territory (Provincial) governments are primarily responsible for issuing exploration license and mining lease (except in case of uranium and atomic minerals) to mining companies, according to their own mineral and environmental laws (For example, in Western Australia, the Mining Act 1978 is the relevant legislation that governs mineral

exploration and development). Although the Commonwealth (federal) government has granted Aboriginal people legal rights to land, mineral rights remained with the Crown and mining tenements are issued by the State/Territory governments according to their respective laws.

Both the Commonwealth and State/Territory governments have powers in respect of environmental protection; however, the powers of the Commonwealth Government are relatively limited in nature.

Commonwealth legislations for environment protection include the Environment Protection and Biodiversity Conservation (EPBC) Act 1999, the Native Title Act of 1993, the Aboriginal and Torres Strait Islander Heritage Protection Act 1984 and the Australian Heritage Council Act 1993. Commonwealth legislation applies only where commonwealth decisions are required such as matter of national environmental significance, native title and uranium mines (Industry Commission, 1991).

States and Territories have their own environmental legislation which varies from one state (territory) to another. For example, in Northern Territory, the environment impact assessment (EIA) process is governed by its Environment Assessment Act.

The major sustainability measures adopted in respect of mineral development in Australia are summarized below:

Environmental Impact Assessment (EIA) and Environment Auditing	• Requirement of EIA in respect of development projects to assess potential impacts and identity efficient ways of minimizing damage, before decisions are taken • The Environment Protection Agency (EPA) oversees EIA at federal level and prepares guidelines and policies • Two levels of EIA — Assessment on Proponent Information (API) and Public Environment Review (PER) (EPA, 2010) • Categorization of projects on the degree and extent of environmental impacts • Detailed review and public appraisal and comments at PER level (EPA, 2010) • States and Territories have separate environment impact assessment process and arrangements for coordination and bilateral arrangements to address overlap between federal and state/territory interests and requirements • Use of environmental auditing (on voluntary basis) as an improvement of environmental protection (Environment Australia, 2002)
Other sustainable	• Regulatory laws (both at federal and state/territory levels) for

development and environment protection measures	addressing environmental issues, preventing pollution and protecting environment including land, air and water • Various policies and programmes for sustainable development including the National Strategy for Ecologically Sustainable Development (1992), the National Strategy for Conservation of Australia's Biological Diversity and the Leading Practice Sustainable Development Programme for the Mining Industry (2006)
Mine Closure and Rehabilitation	• Establishment of detailed mine closure requirements and procedures and their enforcement by state/territory governments (ANZMEC and MCA, 2000) • Rehabilitation and mine closure obligations of mining companies and mineral rights holders
Stakeholder Engagement	• Requirement of public participation and consultation in all phases of environmental impact assessment process • Recognition of Native Title and legal rights of indigenous people to traditional land basis for stakeholder participation in decision-making for mineral development (Jeffery, 2005). • Joint management, indigenous land use and cultural heritage agreements between mining companies and Aboriginal groups (AIATSIS, not dated) • Recent developments in mining laws in Australia emphasize the need for consultation with local community throughout the mine life cycle. In 2006, the Victoria State's mining legislation, the Mineral Resources (Sustainable Development) Act 1990 amended to specify that exploration and mining licensees have a duty to consult with their local communities throughout the mine life cycle of their mining projects (Parliament of Victoria, 1990)
Benefit sharing of mineral resources revenue	• Benefit sharing of mineral resources revenue generated from mineral extraction on Aboriginal lands with local communities through suitable legal arrangements under the Federal Government's Aboriginal Land Rights (Northern Territory) Act 1976 (Industry Commission, 1991) • The Aboriginal Benefit Reserve (ABR) established under the Land Rights Act to function as sharing house for payments to Aboriginal stakeholders for infrastructure, institution and capacity building among Aboriginal communities
Private Sector initiatives	• The Minerals Council of Australia (MCA) initiatives: "The Code of Environmental Management" (1996) requiring disclosure of

	environmental performance of mining companies; "The Strategic Framework for Mine Closure" published jointly with ANZMEC (Australian and New Zealand Minerals Energy Council) and the programme "Enduring Value: The Australian Minerals Industry Framework for Sustainable Development" (2006) affirming the Australian Mining Industry's commitment to sustainable development.
Advanced Technology	• Significant contribution of the Australian mining industry and research institution for the development of high quality, efficient and cost-effective mining technologies and machinery (Euro Asia Industry, 2009) • Application of IT (Information Technology) to mining machinery and methods used in different stages of mining operations

III. South Africa

Under the South African constitution, all laws and matters pertaining to minerals and energy affairs come within the purview of the national (federal) government. Regulation of mining through licensing of prospecting and mineral extraction and mine safety is done under the Mineral and Petroleum Resources Development Act of 2002 (MPRDA) and the Mine Health and Safety Act of 1996.

In terms of the South African law, the state is the custodian of all mineral and petroleum resources and control all rights granted under MPRDA. Ownership and other issues relating to title of land do not impede the grant of mineral rights. MPRDA, however, imposes various socio-economic objectives on applicants for rights including "equitable access" to mineral resources and expanding opportunities for historically disadvantaged South Africans (HDSA) to enter and benefit from the mining industry. Sustainable development of mineral resources seem to have received an impetus in South Africa following the changeover from the earlier mining legislation (Minerals Act of 1991) to MPRDA which mandated that "holders of mining and production contribute towards the socio-economic development of the areas in which they operate" (Republic of South Africa, 2002).

An interlocking set of legislations, regulations and notifications seek to ensure integrated environmental management in the mineral sector. These include, apart from MPRDA and regulations framed under it, the National Environmental Management Act of 1998 (NEMA) and the Environmental Impact Assessment Regulations 2010 (EIA Regulations) issued under NEMA.

A summary of the sustainable development measures (in mining) adopted in South Africa is given below:

Environmental Planning and Evaluation	• Requirement of 'environmental authorization' for a prospecting right, mining right and mining permit • Issue of 'environmental authorization' is predicted on a proactive and systematic EIA process • Though there are two assessment processes (simpler 'basic assessment' and more detailed 'scoping and environmental impact reporting'), in practice detailed EIA conducted in respect of reconnaissance, prospecting and mining operations • EIA process managed by independent and professional environmental assessment practitioner • Process includes public participation and sequential preparation of scoping, environmental impact assessment, specialized reports and environmental management programme highlighting proposed management and mitigation measures • Coordinated approach in the administration of environmental and mining laws. MPRDA and NEMA amended in 2008 in order to harmonize processes and authorize the Minister for Minerals and Energy to issue 'environmental authorization' for mining projects under NEMA • Other environmental laws include the Atmospheric Pollution Prevention Act 1965, the Water Services Act 1997 and the Air Quality Act 2004 • Prescribed time limits for various stages of the EIA process: 30 days for decision on a scoping project, 60 days for EIA report and issue of environmental authorization within 45 days of the acceptance of EIA report (Government Gazette, 2010) • "Polluter pays" principle incorporated in the law making an entity responsible for payment of the cost for causing environmental degradation and associated adverse effects on health and environment (Government Gazette, 1998) • Mineral rights holder responsible for rehabilitation of damaged land, financial provisions for mine closure • Black economic empowerment (BEE) providing for ownership of equity in the mining companies by HDSA, preferential procurement from blacks and entities owned by blacks, human resource development, employment equity by increasing the representation of blacks at different levels of management and of critical skills, mine community development through community consultation and collaboration etc. • The Mining Charter of 2002 (as amended in 2010) and the Code of Good Practices for South Africa mining industry (Mining Code) issued in April 2009 establish the ground for implementation of various provisions • Implementation of BEE policy in mineral sector not very

	successful as main focus on ownership change rather than skill development and training (Faurie, 2009) • Financial provision must be made for environmental costs associated with mine closure through cash deposits and bank guarantee • Mineral rights holders exposed to private prosecution on a wide scale, in addition to government action (Republic of South Africa, 1998)
Stakeholder Engagement	• Comprehensive public participation process under MPRDA and NEMA at various stages of licensing, mineral development and environment impact assessment processes • Requirement for submission of a Social and Labour Plan as pre-requisite for granting mining or production right to ensure promotion of local employment and socio-economic development of mining project area (Republic of South Africa, 2004) • Social and Labour plan to include human resources development programme, a local economic development programme and processes pertaining to management of retrenchment and downscaling (Republic of South Africa, 2004)

IV. Papua New Guinea (PNG)

In Papua New Guinea (PNG), all minerals on and below the surface of any level are the property of the state which has the right to allow suitable persons and companies to explore, mine and sell mineral resources. The Mining Act of 1992 and the Mining Safety Act of 1977 (administered by the Department of Mines) are the laws that regulate mining. Four types of tenements are allowed: exploration leases, mining leases, special mining leases for large projects are and alluvial mining leases for small-scale mining.

PNG's constitution has specifically recognized the nation's responsibility to ensure that its environment is protected and its rich national resources are wisely used. There has been, since independence in 1975, a plethora of laws covering areas related to environment and conservation. The country also announced a National Sustainable Development Strategy in 1994. The Environment Act of 2000 is the principal legislation providing the statutory environmental regulation for mining projects. The Department of Environment and Conservation is the nodal national government agency for environmental protection and conservation.

Before a company can develop a large mine in PNG, a Mineral Development Contract (MDC) with the government must be signed. A prerequisite of MDC is that a strict environmental regulation process must be followed and an Environment Permit obtained.

The sustainability measures adopted in respect of mining projects in PNG are summarized below:

Environmental Impact Assessment (EIA)	• Three levels of regulation under the Environment Act 2000: Level 1 activities requiring a minimum level of environmental protection based on standards, codes and regulations; Level 2 activities subject to conditions in environmental permits and licenses and level 3 activities covering large projects with major environmental impacts (Mowbray and Duguman, 2009) • Large mining projects (level 3) subject to detailed EIA – environment inception report by project proponent, environment impact statement after thorough environmental and social studies, public review, consideration by the Environmental Council and approval by the Minister before issue of Environment Permit (Mowbray and Duguman, 2009) • Weak enforcement and ineffective implementation of environmental laws and EIA process (Mowbray and Duguman, 2009) • Problems in Panguana gold and copper mine in Bougainville leading to violent agitation by local communities and closure of the mine in 1989 (Banks, 2008) • Problems in the Ok Tedi mine due to discharge of waste rock and mine tailings into the OK Tedi river system, leading to law suit an agitation against BHP Billiton (1994-96) and its withdrawal from the project (Imbun, 2008) • Disposal of mine wastes and tailings most controversial aspects of mines in PNG (Imbun, 2008) • Lack of capacity in national government agencies for mineral and environment management and administration. Absence of "environment-oriented" non-government and civil society organizations (Mowbray and Duguman, 2009)
Stakeholder Engagement	• Robust engagement of local community stakeholders in mining development projects. Large-scale (97%) community ownership of "customary land" and disillusionment with weak national and provincial governments in bringing about development and job opportunities in remote areas prompt communities to look to large mining companies for bringing economic benefits in mining areas (Armitage, 2002) • Vigorous negotiation with and unrelenting pressure (including violent agitation in some cases) on mining companies to mitigate negative environmental consequences of mining and getting tangible economic benefits from them • Provision under the mining law (Papua New Guinea, The Mining Act 1992 and Regulation, not dated) for the constitution of a Mine

	Development Forum (MDF) for consultation even before grant of special mining lease. MDF acts as venue for consultation among stakeholders. Also, leads to a number of MOAs (Memorandum of Agreements) between government, mining company and communities outlining responsibilities of each party and provision of benefits to project affected area • Benefits include distribution of royalties among provincial and national government and communities, infrastructural development and business development activities in mining areas and preferential treatment in employment opportunities through "preferred area status" • MOAs also provide for establishment of Sustainable Development Foundation/Trusts as cooperative venture between government, developer and community for executing development programmes • Mining Development Contract (MDC) under the mining law (Papua New Guinea, The Mining Act 1992 and Regulation, not dated) between developer and State specifying prescribed infrastructure development, education, health facilities etc. in project-affected areas • Public consultation with local communities for "compensation agreements" between landowners and project developers • Large mining companies and resource developers provide benefits to local communities over and beyond legal requirements, under intense community pressure and to maintain 'project security'
Mine Closure and Rehabilitation	• Uncertainty about overall mine closure policy or legislation • Individual cases of mine closure being addressed under existing legal provisions • For closure of OK Tedi mining (gold and copper) operations in 2013, a Decommissioning Code and a series of closure plans prepared for detailed community consultations

Thus, Papua New Guinea's experience of sustainable development in mining has two contrasting aspects. The first relates to relatively unsatisfactory performance in environmental protection and management, due to poor state capacity and lack of political will. This is similar to the situation in India. On the other hand, in the area of stakeholder engagement, PNG, as a result of strong community pressure, has been able to achieve notable success by creating innovative institutions, mechanisms and procedures which are worthy of emulation.

Annexure 15

A Note on International Experience in Benefit-Sharing of Mineral Resources Revenue[1]

Although most nations prefer all major taxes and levies collected from mining companies and mineral rights holders to flow to the general budget of Central or provincial government, there is new interest among some governments and mining companies to allocate a portion of these fiscal benefits to local communities affected by mining projects in the interest of promoting sustainable development in mining areas. The practices (in respect of benefit-sharing of mineral resources revenue) in some major mining countries are described below:-

Norway: Oil revenues from North Sea oil collected through a system of royalties, taxes and state-owned production flow into Centre Government budget. All fiscal decisions are made through the Central Budgetary process and any budget surplus flows to the Petroleum Fund created in 1990. The goal of the Fund is to provide a reserve for continued expenditure over the long-term. Fund assets are invested in foreign bonds and equity with a view to generating income and diversifying the risk. The beneficiaries of Norway's resource revenue management are the Norwegian society as a whole, through sustainable expansion of government budgets. The Petroleum Fund is structured to benefit future citizens; three quarters of current revenues is saved for high yields and none of the funds are earmarked for particular projects or benefit-sharing. All this is possible due to the existence of high-quality and well-governed institutions which are able to manage natural resources for greater good.

China: Two types of royalty taxes are levied in China. One of the levies is deposited with the national treasury for the fiscus. The second levy called the mineral resources compensation fee is collected by the appropriate level of provincial or local (city) government with 50 per cent of the amount collected remitted to the Central Government and the balance 50 per cent retained by provincial and city governments.

Indonesia: State receipts from natural resources, including mining, are distributed in the ratio of 20 per cent to the Central Government and 80 per cent to the region. The latter is split as 64 per cent for the regencies and 16 per cent to the provincial government.

Philippines: By statute, local government units receive a 40 per cent share of the gross collection from excise taxes on mineral products, that is, royalties from mines in their territorial jurisdiction. This amount is distributed accordingly to following formula: 20 per cent to the province, 45 per cent to the component city and municipality and 35 per cent to the village or district (barangay).

[1] This note draws heavily from the information and analysis presented in "Mining Royalties – A Global Study of their impact on Investors, Government and Civil Society" by James Otto *et al*. (2006) and "International Experience with Benefit-Sharing Instruments for Extractive Resources" by Fischer (2007)

Ghana: In Ghana, 20 per cent of mineral royalties collected are paid into on Mineral Development Fund (MDF). This amount is then shared among the local government authority, landowners and communities that are affected by mining.

Namibia: The Mineral Development Fund (MDF) of the country promotes all aspects of mining and seems to broaden the sector's contribution for the diversification of the national economy. MDF also provides funds for the development of education and training facilities among mining communities.

Botswana: In Botswana, there is no explicit savings fund or allocation scheme for the management of mineral revenue. Instead there is a solid approach to budgetary along with a multiyear planning process, managed through good public institutions. Government income from mining operations is generated through royalty at a moderate level and income from free equity shares in mining operations. Mining revenues have been leveraged for broad-based growth through expanded government services that benefit the entire citizenry through the central budgeting process. There is no earmarking of benefits for special groups or communities.

Argentina: Under Argentina's constitution, ownership of minerals invested in the province where they occur. The power to levy and collect royalty in minerals has been delegated (by the Congress) to the provinces, with a federally imposed upper cap of 3 per cent of the amount collected by the province, 15 per cent is for distribution to municipalities where the mining project is located in order to finance public investment projects, the remaining 85 per cent is utilized to finance provincial projects or public investments in other departments and municipalities.

Brazil: In accordance with the Brazilian constitutions, the statutory law provides that certain proportions of mineral royalty are to be paid to the lower levels of government and other parties. The distribution is done as follows: 23 per cent to the states and federal district, 65 per cent to municipalities, 2 per cent to national fund of scientific and technological development and 10 per cent to the mining and energy ministry which shall give 2 per cent of its share to environmental protection of the mining regions.

Peru: In Peru, mineral royalty is paid to the Central Government and then distributed as follows: 20 per cent to the district municipalities where mineral exploitation takes place of which 50 per cent goes to the communities where the mine is located; 20 per cent to the provincial municipalities where exploitation takes place; 40 per cent to the district and provincial municipalities; 15 per to the regional government; and 5 per cent to the national universities of the region where the mine is located.

Colombia: The Colombia statute on mineral royalty provides for its distribution as follows: 47.5 per cent to producing departments, 12.5 per cent to producing municipalities, 8 per cent to ports and remaining 32 per cent is allocated to the legally constituted National Royalties Fund. The local and regional governments are required to spend the royalty revenues on

investment programmes and on-going government activities according to their development priorities. The National Royalties Fund distributes funds for development projects, environment protection and mining promotion. In addition to local development priorities, some earmarking of funds from the departments, municipalities and the National Royalties Fund in respect of indigenous communities (in the mining areas) is mandated.

In practice, however, the success of decentralized management (in Colombia) has been mixed (Fischer, 2007). A grave challenge for revenue and resource management is corruption, not to mention political violence. Although local royalty revenues can be substantial, much community needs go unmet, with royalties sapped by debt servicing and mismanagement. Community participation in the local government decision making process seems limited. In some instances, communities have actually requested that the mining company intervene in the management of royalties. In response, many companies engage in their own community development projects, either through internal management or a foundation.

Annexure 16

A note on Rio Tinto in India (Bunder, Madhya Pradesh)[2]

Rio Tinto has been in India since the 1930s, when a former subsidiary of Rio Tinto Alcan Group began operating. Today, they have offices in several places around the country. Their Mumbai office is operating since 1989 and plays an integral role in the sales and marketing of diamonds that they mine in Australia, Canada and Zimbabwe.

The company has been exploring for mineral resources in India since 1996. In 2004, it discovered a significant diamond deposit in Chhatarpur district of Madhya Pradesh. This is their most advanced diamond project worldwide. Since then, the company has established an accommodation campus (with health and recreational facilities) and has been staying there with the communities.

Rio Tinto executed the prospecting license (in respect of the Bunder Diamond Project in Madhya Pradesh) in 2006. Although Rio Tinto was able to collect sufficient information to put their mine design in place, the company, during an interview (Economic Times, 2012), revealed that there was a mismatch between the tenure of prospecting license and that of forest clearance and therefore they could not gather much information. The company was constrained with having the prospecting license while not having the forest clearance and by the time it obtained forest clearance, the time for prospecting license had lapsed. The company applied for mining lease, to develop the explored mineral resource into a mining operation, in 2008 and received it from Government of India and State Government in January 2012.

In 2009, a state of the art sample processing plant (with a capacity of 10 tonnes per hour) was established to process the samples which have been collected. The sample processing plant uses minimal water through recycling and rainwater harvesting, does not use chemicals in the processing of the diamonds and is designed in a way that minimizes noise and dust. The company plans to start mining operations in 2014 and to start producing diamonds in 2016.

Philosophy

For the company, sustainable mining means undertaking measures from the very first stage of mining plan. The company has spent about 60 million US dollars in understanding the local communities, in collecting data, in getting the right experts, in carrying out engineering, social and workforce development studies, and in developing environment management plans.

[2] Discussion with Stefanie Loader, Project Director, Bunder Diamond Project, on 23rd February 2012; Rio Tinto "Our Approach", not dated; Rio Tinto "Bunder", not dated

The company links sustainable development with job creation and training, environment protection, care for the local communities, and regular interactions with them. The main philosophy of the company is "to be a good neighbour to the local communities".

Moreover, investing in sustainable mining at the pre-mining phase makes business sense for the company. The company believes that by investing in education, training and jobs of the local people, it is building a capable local workforce for itself; people will not want to migrate and will be there at its doorstep for its future projects. By enhancing the physical environment, natural resources like water and the people (using such resources), who are essential to its business, are protected.

Community development activities

- A waste reuse program includes organic farming and biogas generation. The biogas plant generates sufficient power for a street light.
- Various medicinal plants, citrus trees and vegetables are planted in the Bakswaha block of Chhatarpur district.
- The forested area in which the company is operating is infested with lantana weed. The company has cleared about 120 hectares of the infected area (which took over 16,000 working hours of local employment). It is further working with a skill development centre and found an alternative and valuable use of this weed – lantana furniture fabrication, for which orders have already been placed for chairs and sofa sets.
- Since water is a scarce resource in the Bundelkhand region, rainwater harvesting is carried out at the sample processing plant and the accommodation campus. This water is then used to replenish the groundwater. Also, used water from the kitchens, bathrooms and the laundry is recycled.
- Health and education are given utmost importance. Rio Tinto believes that partnership with specialized civil society organizations is imperative since the company is only capable in providinig capital and not expertise in the field of health and education.

  Rio Tinto has been working with UNICEF since 2008 to improve education and nutrition of children and women residing in nearby communities where the Bunder diamond project is located.

  Primary, middle and high schools (with 10^{th} class board exam coaching programmes) are put up in the vicinity of Rio Tinto's Bunder project. Through UNICEF, the company provides school teachers with capacity building programmes and introduces new idea of "activity-based learning" in 186 primary schools in the Bakswaha block of Chhatarpur district.

  Health care initiatives include improving access to primary medical facilities, nutrition education programmes for women and increasing the rates of immunization, especially amongst children.

- The company has a workforce of over 400, out of which 70% are from local communities surrounding the project area. The company carries out mining-specific skills development for its future workforce – comprising of the job training and training women as drivers. This is a significant step towards increasing the participation of women in the workforce.

Expenditure

Rio Tinto does not have a fixed CSR spending policy since it believes in "strong actions" rather than "fixed CSR budgets". It gives importance to spending time and effort rather than spending huge amounts of money.

Following table gives an account of the company's expenditure on community development, which includes the direct expenditure into the community (including partnerships) and does not include staff and administrative costs, which form a part of business costs.

Table 1: Budget for community development

Financial Year	2009-10	2010-11	2011-12
Annual Profit (in Rs.)	0	0	0
Expenditure on community development (in Rs.)	3841987	5096838	10090222

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