MINERALS: THE WEALTH ON EARTH

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ABSTRACT

The land, water and minerals are invaluable treasures of the earth. Without them, we cannot think of industrialization and development of our economy. In many countries, they are the main source of national income. The social and economic development of a nation depends on its capacity to exploit & utilize its natural resources, avoiding its wasteful use to the extent possible.

If we look at mineral wise break up it has been found that fuel minerals (coal, petroleum, natural gas and lignite) accounted for about 77%, metallic minerals for about 10% and non-metallic minerals for about 3% of total value of minerals produced.

Earth takes millions of years for the formation of minerals. Most important characteristics of the energy minerals e.g. non-renewable resources, which have bearing on our present and future well-being is that they are practically lost, once used. Since, the energy mineral resources (coal, oil, and natural gas) are finite and non-renewable, it is necessary that they should be used with conservation.

It is said that among the many causes of the fall of the Roman Empire, the one is the depletion of the mineral deposit and the erosion of soil. In the history of India, before independence, when it was least industrialized, the most of the minerals were exported during British rule. After independence although export continues and mineral production has picked up in consonance with the increasing industrial demands in the country, it is necessary that the exploitation and consumption of them is with due consideration to conservation so that our future generation will not suffer.

In this paper the author has emphasized on points i.e. production, impacts of mining, rehabilitation, resettlements provisions and benefit sharing suggestions on mining of minerals.
CHAPTER 1

INTRODUCTION

A homogenous, naturally occurring substance with definable internal structure is called mineral. The minerals are metallic, non-metallic and energy minerals type. Energy minerals are: Coal, petroleum and natural gas. A mineral is a pure inorganic substance that occurs naturally in the earth’s crust. All of the Earth’s crust, except the rather small proportion of the crust that contains organic material, is made up of minerals. More than two-thousand minerals have been identified and most of these contain inorganic compounds formed by various combinations of the eight elements (O, Si, Al, Fe, Ca, Na, K, and Mg) that make up 98.5% of the Earth’s crust. Industry depends on about 80 of the known minerals.

The origin of fossil fuels and biomass energy in general, starts with photosynthesis. Photosynthesis is the most important chemical reaction to us as human beings. Photosynthesis is the reaction that combines water and carbon dioxide from the Earth and its atmosphere with solar energy to form organic molecules that make up plants and oxygen essential for respiration. Because all life forms depend on plants for nourishment, either directly or indirectly, photosynthesis is the basis for life on Earth.

Earth has bestowed us its wealth in form of minerals which took millions of years to form, is not be consumed by limited people in a limited period but it is to be used economically and with due respect to conservation so that future generation would not suffer.

CHAPTER 2

Minerals in India- Reserves, Employment and Contribution to exchequer

a) Reserves:
Coal: Within fuel minerals, solid fuels (coal and lignite) contributed about 39% of the value while liquid fuels (natural gas and petroleum) contributed 61%. Seven per cent of the world's proven coal reserves are found in India. The production of coal was 537 million tonnes in 2010-11. The value of coal produced in 2010-11 stood at Rs 49,012 crores. At present, more than 70% of the coal produced in India is used in the power sector. Chhattisgarh is the largest coal producing state with a share of 21%, followed by Odisha and Jharkhand with about 20% contribution each.

Bauxite: Bauxite production was 14 million tonnes in 2009-10 and 13.4 million tonnes in 2010-11. Value of bauxite production in 2010-11 was Rs 503 crores. Aluminum industry accounts for more than 85 % of bauxite consumption in the country.
Iron ore: Hematite and magnetite are the most important iron ores in India. The production of iron ore in the country stood at 212.6 million tonnes in 2010-11 with a value of Rs 34,852 crores. Odisha (34%), Karnataka (21%), Goa (15%) and Chhattisgarh (14%) are the leading producers of iron ore. Close to 98% of iron ore consumed domestically is used by the iron and steel (including sponge iron) industry.
Limestone: Limestone production was 240 million tonnes in 2010-11 with a value of Rs 3,220 crore. Limestone is mainly used in the cement industry. Leading producer states of limestone are Andhra Pradesh, Rajasthan, Madhya Pradesh, Gujarat, Tamil Nadu, Chhattisgarh and Karnataka.
Copper: India produced about 3 million tonnes of copper in 2008-09. Rajasthan accounted for half of the production while the other half was accounted for by Madhya Pradesh and Jharkhand.
b) **Employment**

The mining industry provides direct and indirect employment to people. Due to mechanization this has been decreasing over the years even though production of minerals has increased. The average daily employment of labour engaged in the sector stood at about half a million in 2008-09. Public sector accounted for 81% of this labour force and private sector accounted for 19%. Labour engaged in fuel minerals was 75% of the total, metallic minerals 16% and non-metallic mineral nine per cent. Due to increased mechanization, there has been a shift towards more capital intensive mining forms than labour intensive ones. This means, contrary to popular belief, the industry's potential to generate employment will reduce further.

c) **Contribution to Exchequer**

The mining industry contributes to the government exchequer through royalty, dead rent, cess, sales tax and duties. Royalty is a kind of tax that mining companies pay to the government in return of the right to extract a mineral. It is based on the amount of mineral extracted/consumed at specific rates. In 2009-10, royalty collected from major minerals stood at Rs 3,997 crores. Coal India Limited (CIL) contributed the maximum percentage of its gross sales as royalty, cess and rent, close to 12% for 2009-10. The mining companies in India also pays other taxes like corporate tax, education cess, sales tax and excise duty. If all these are taken into account, then the tax burden ranges between 14 to 34% while the average stands at 22%. SCCL has lowest tax burden ratio of 14% in 2009-10 while NMDC exhibited the highest – 34%.

**CHAPTER 3**

**Impacts of Mining**

Mining activity is important because it feeds to number of industries as raw material. It is imperative that we take into consideration what is mined, where it is mined and how it is mined.

(i) **Forest & Land**

Mining in forests or mountain tops can prove devastating as there are changes in topography, aesthetics and it also triggers impacts on local hydrology. Mining has a huge impact on land and associated natural resources which are a source of livelihood for people. Almost all of the country's minerals are spread in regions that also hold most of its forests, tribal population and major river systems. The average forest cover of the 50 major mineral producing district stands at 28 per cent. The total forest cover in these districts, 1,18,90,400 ha is about 18% of the country's forest cover. Forest land has constantly been getting diverted for the purpose of mining among other developmental projects. Close to 0.1 million ha of land for 1200 mines has been diverted across India during 1980-2005. The diversion affects the ecosystem of the area and also the livelihood of tribals who depend on it for sustenance. Estimates say that states leading in mineral production are also the ones where maximum forest diversion for mining has happened. It is important we recognize that critical ecosystems are important and legislate go and no go areas for mining. The special areas can be identified by taking into account comprehensive and cumulative environment, social, economic and ecological impacts.

(ii) **Water**

Most of India's iron ore reserves are along the courses and watershed of rivers like Indravati, Baitarani, Tungabhadra and Mandovi. Most of the coal reserves of the country are also located within river basins – Damodar, Godavari, Son, Kanhan and Mahanadi-Brahmani.
Water consumption in mining is very large due to the huge amounts of minerals extracted. In addition to using huge quantities of water, mining also depletes groundwater. During mining the breaching of groundwater table is a very common phenomenon which lowers the table. Dewatering during underground mine operations also affects groundwater. Mines release the pumped out water into nearby water-courses causing flooding and water pollution. Mine waste also causes water pollution problems like acid mine drainage, heavy metal pollution, pollution from processing chemicals and erosion and sedimentation.

(iii) Waste

Waste in mining is generated due to extraction, beneficiation and processing of minerals. Overburden and low grade ore are generated in extraction and are components of waste pool. Tailings generated during beneficiation and processing are toxic and in summers these become airborne. In monsoons, tailings are carried on to tank beds. Tailings are a bigger problem if they are of radioactive waste. Mining of some minerals like marble also generates specific wastes like marble slurry which if dumped on land, adversely affects the productivity of land.

(iv) Dust

Dust emissions from mines, waste dumps and mineral transportation generate a lot of fugitive dust. Fugitive dust is generated in open cast mining from drilling, blasting, hauling, loading and unloading. Mining dust is known to cause problems like silicosis, asbestosis, cataract, pneumoconiosis. In underground mining, methane emissions are a problem which contributes to global warming.

(v) Others

Deaths and accidents occur during mining because of fire, blasting, drilling, flooding and land subsidence. In underground mining, carbon monoxide (CO) poisoning is also a reason for a number of deaths of workers. Large quantities of CO block the hemoglobin in blood and the ability to carry oxygen from lungs to muscles and other tissues in the body. Mine workers are also prone to hearing impairment, skin and eye diseases, metal and radiation poisoning, silicosis, pneumoconiosis, asbestosis, etc. Silicosis is caused by inhalation of silica dust and is associated with mining of sandstone, stone quarrying, granite and grinding of metals. Continuous and long term exposure to silica results in lung cancer. Asbestosis happens due to inhalation of asbestos released during asbestos mining. Coal Worker’s Pneumoconiosis (CWP) is caused due to inhalation of coal dust from coal mines.

Evidently, mining activity affects the environment and the associated people in many ways. It thus becomes important to regulate the industry and make sure the affected people can derive some benefit out of the operations. The major mining districts of the country are not only ecologically devastated and polluted; they are also the poorest and the most backward districts of the country. Consider the following examples:

Odisha State-

i) Keonjhar, where mining for iron ore and manganese started in the 1950s and which currently produces more than one-fifth of India’s iron ore, is ecologically devastated. Its forests have turned into wasteland and its rivers and air have been extensively polluted. Even worse, mining has done nothing for Keonjhar’s economic well being. Keonjhar has more than 60% of its population below poverty line and is ranked 24th out of the 30 districts of Odisha in the Human Development Index (HDI).

ii) Koraput alone produces about 40% of India’s bauxite. Close to 78% of its population lives below poverty line, and the district ranks 27th in Odisha in HDI.
iii) **Jajpur** produces 95% of India’s chromite (most of which is exported) -- the people of Jajpur have got hexavalent chromium pollution in return. Jajpur is ranked 22nd in Odisha in HDI.

**Karnataka State-**

iv) **Bellary** produces about 19% of India’s iron ore (most of which is exported). The majority of its population remains impoverished. Agricultural land has been devastated due to mining and dust levels in the air are leading to large-scale health problems. Bellary is ranked third from bottom in HDI in Karnataka.

v) **Gulbarga** is the biggest limestone producing district of India. It is ranked second from bottom in HDI in Karnataka.

**Rajasthan State-**

vi) **Bhilwara** produces more than 80% of India’s zinc. It is ranked 25th out of the 32 districts of Rajasthan in HDI.

vii) **Udaipur** has the maximum area under mining in **Rajasthan**; it is ranked 27th out of the 29 districts of the state in HDI.

**Tamil Nadu State-**

viii) **Cuddalore** produces three-fourth of India’s lignite. Groundwater near the lignite mines has been depleted, leaving local agriculturists high and dry. More than half of Cuddalore’s population lives below the poverty line and it is ranked 16th out of the 30 districts of Tamil Nadu in HDI.

**Uttar Pradesh State-**

ix) **Sonebhadra** is the most mined district of **Uttar Pradesh**. It produces more than 20 million tonne of coal every year, apart from thousands of tonnes of limestone and dolomite. It is also one of the most backward districts of the state. About 55% of its population lives below the poverty line and its literacy rate is less than 50%.

The phenomenon of ‘resource curse’ puts most of the major mining districts in India in the list of 150 most backward districts in the country. Although royalties are put in place for the extractive industry, this does not ensure financial flows to the affected communities. In addition to all this, these mineral rich areas suffer another problem – naxalism.

**CHAPTER 4**

**Displacement, Resettlement and Rehabilitation**

The most common problem associated with mining activity is that of involuntary displacement. It is forced upon people for acquiring their mineral rich land and in the name of rehabilitation people end up being worse off than before. Other risks associated with involuntary displacement are livelihood losses, employment problems and socio-cultural loss. Although there are no reliable estimates available for the number of people displaced, mining is estimated to have displaced close to two million people between 1950-91. Not even one fourth of these displaced people have been resettled. The number is a gross under estimation as it only includes the number of people moved out of their lands, not the ones that depended on the land for their livelihoods or those whose lands were destroyed due to waste dumping, etc. Tribal population is affected by mining the most especially since they have hardly any legal right of their lands. More than 40% of all the displaced people were tribals while in the case of mining, more than 50 per cent of the displaced belonged to the tribal population. Displacement raises the issue of equity and social injustice as a
segment of the population enjoys the benefits from/of these developmental activities while others suffer.

The mechanisms that have been used for compensating the displaced people are cash compensation, land for land, employment and self-employment. Cash compensation doesn’t include people who don’t own the land but lose their livelihoods. Inadequate compensations, delays in compensation and one time payments have meant that cash payments have not been converted into durable livelihood assets. Land for land involves replacing lost land with new at some other location. It is not a common norm in India because of scarcity of land. In most of the cases where it is tried, the new land is of inferior quality or not suitably located or of small size. Employment as a compensation option has always been very attractive to the displaced communities. Companies’ especially public sector ones were opting for this form of compensation by providing employment to at least one member of every displaced family. But the trend is now changing and companies are shying away because mining is becoming less and less labour intensive and also most of the displaced people are unskilled labour. Self-employment in India is not seen as dependable source of livelihood and hence not a preferred compensation option.

Most rehabilitation exercise in India has failed because of poor understanding of rehabilitation challenges. Development induced involuntary displacement and resettlement usually ends up making the population worse off. Key cause of failure of resettlement is financial - flawed compensation and under-financing. The reason for under financing can be attributed to wrong estimation of resettlement costs. The distinction between compensation cost for lost assets and cost for resettlement components has either been flawed or has not been taken into account while designing for resettlement. Thus, the finances earmarked for resettlement often fall short of what is needed.

**Global & Indian Scenario**

A study was carried out in 1994 by World Bank and it brought out an important relationship between resettlement financing and implementation performance. The study looked at 31 projects across 15 countries. It was based on an economic indicator – the ratio between resettlement budgets to per capita GDP for every project. The study showed that projects with this ratio above 3.5, seldom faced any resettlement difficulties while those with ratio less than 2, face major implementation issues. At the top of the list were 10 projects with resettlement resource allocation ratio were between 4-10.5. At the bottom, there were 10 projects with ratio between 0.5-2 and six of these projects were in India.

In India, there are no accurate numbers on how many people have been displaced involuntarily from all developmental activities. Some estimates peg it at about 20 million people were displaced during four decades. What is even more surprising is that only one fourth of those displaced have been resettled and the rest have lost their livelihoods and become impoverished. In order to avoid or reduce such impoverishment, it is important to have procedures that allow equity in bearing the burden of development and also to ensure distribution of benefits to all. This can be done through benefit/profit sharing. Benefit or profit sharing can act as one of the risk insurance measures, especially in case of mining which causes large displacement. Increasing financing for growth-oriented resettlement would benefit resettlers and overall project outcomes would result in preventing losses to project that occur because of delays.
CHAPTER 5

Natural Resource Rent and Benefit Sharing

Economic rent or resource rent is defined as 'surplus return over and above the value of invested capital, materials, labour costs and other factors of production employed to exploit natural resources'. Development projects require land, water, natural resources and they may cause displacement. The extractive industry (mining) gains access to mineral rich lands and harvest the opportunity of earning substantial economic rent. This rent is looked at as a 'windfall' that the project developers (miners) gain by exploiting natural resources (minerals). This is what we refer to as 'abnormal' or 'supernormal' profits. Resource rent can be differential or scarcity rent. If there is a difference in quality of a resource at different places, this results in difference in the rent that accrues to them. For example, coal of a higher grade mined in state A will accrue more rent than a lower grade coal mined in state B. Scarcity rent is rent accrued due to shortage in supply as opposed to demand of that resource. To illustrate, uranium extraction will accrue more rent in India, owing to the country's plan to upscale electricity generation using nuclear power, due to relative shortage of uranium in the country. The objective to collect resource rent is to ensure a return to the owner of the resource and to avoid inefficient allocation. Ownership of a resource entitles the owner to derive benefit from the use of resource and the right to earn a return on the resource. Thus the owner of the natural resource is the owner of this rent. So it’s not unfair to say that population that is displaced from mineral-rich lands and those who lose their livelihoods as a result should be the true owners of this economic rent in addition to the resettlement and rehabilitation packages. In order to maximize profit, resources should be allocated to those uses/users that will create the maximum value implying efficient allocation. In addition to ensuring return to resource owner and avoiding inefficient allocation, ethical considerations are also at play that presses towards collecting a resource rent. One argument is to enhance welfare of future generations in the absence of resources that are being used today. Thus it is ethically correct to collect a rent from the use of these resources today to, in a way, compensate future generations for not having these available to them. The Norway Petroleum Fund is a case in point. There are also other ethical considerations like equity, fair and efficient allocations. In Brazil, the economic rent concept is applied to hydropower projects. It is a legal obligation for electric utilities in the country to pay compensation for exploiting hydro resources (water). This law, applicable to plants more than 10 MW, then distributes the collected royalty among the state, municipalities and federal government. Similarly, in India a hydropower project has to give 12 per cent of its electricity generated to the state government as a 'rent' to use the water in the state although it is not named so. It is fair for them to get some additional profit/rent out of this exploitation.

a) Mechanisms for Extracting Resource Rent

In most countries, government is the owner of minerals. Different countries have used different mechanisms to extract resource rent. Resource rent is best based on a negotiation process between the resource owner and the resource user. This can either result in a fixed amount or a combination of fixed amount, royalties, auction, taxes, etc. Which mechanism is to be used depends on individual circumstances. Several options are available to extract rent from natural resources. Some common ones are summarized below:

State owned production – State owned companies are engaged to exploit natural resource in the country.

Fees and auctions – The government may charge a fee for accessing the resource. This maybe a fixed amount, negotiated or maybe based on auctioning the rights of access.
**Tax and royalty** – The government may charge a sum to the company accessing the resource on the basis of the resource being used/withdrawn/extracted. A Resource Rent Tax (RRT) may also be levied. RRT is a tax that is levied on profits above a certain level from the exploitation of minerals. Liability and environmental taxes can also be imposed. These are levied to compensate for the externalities of environmental damage that may accompany these projects.

**Resource rents may also be directly distributed to pre-defined stakeholders.** This may be a fixed amount or may be based on a negotiating process. This ensures direct benefits for citizens and eliminates undesired government use of revenues. Direct cash transfers tend to improve lifestyles immediately and a hedge against impoverishment risk. However, this needs to be accompanied with livelihood generating opportunity.

### b) Benefit Sharing with Affected Communities

Various projects exploiting natural resources need to contribute to the development and welfare of the affected communities in addition to resettlement and rehabilitation. One way to achieve this is to share benefits from the project with these affected communities using monetary or non-monetary options. The latter includes most of the Corporate Social Responsibility (CSR) components like educational/medical facilities set up by the company, employment generated by the project, access to better services, facilities like road, etc. Monetary benefit sharing mechanisms are based on the premise that natural resource exploitation generates significant economic rent as explained above. The various kinds of monetary benefit sharing mechanisms that can be used are: Revenue/profit sharing, Development funds, Equity sharing, Tax sharing with government

### RESOURCE RENT TAX

Royalty is a form of economic rent from natural resources but it does not take into account 'windfall' from mining operations. Also, royalty is a share of the government and not the project affected communities/people. Therefore, a charge/tax is needed to capture this 'windfall' from mining operations for the affected communities. Resource Rent Tax (RRT) is one such tool. RRT is the tax that is levied on profits over a theoretical level defined as an adequate return from a resource project and is considered as the return to the owner.

### CORPORATE SOCIAL RESPONSIBILITY

Businesses apply social responsibility when they consider the needs and interests of people who will be affected by their business actions. This makes them look beyond their narrow economic interest. The larger the company, the greater this social responsibility becomes. Currently, Corporate Social Responsibility (CSR) practices in India are dictated by guidelines notified by the Ministry of Corporate Affairs issued in December 2009. The fundamental principle of the guidelines is that businesses should formulate their own CSR policy, approved by the company’s board. Under this policy, businesses should allocate specific amounts in their budgets for CSR activities. This amount may be related to profit after tax, cost of planned CSR activities or any other suitable parameter.

### CHAPTER 6

### CONCLUSION

It is now well recognized across the world that wealth generated by the mining sector comes at a substantial development cost, along with environmental damages and economic exclusion of the marginalized. The mechanisms that have to be used for compensating the displaced people are cash
compensation, land for land, employment and self-employment. In fact, the major mining districts of India are among its poorest and most polluted. Considering the negative externalities of the mining sector, new policies and practices are being explored and implemented across the world to ensure that mineral wealth can be converted into sustainable development benefits for local communities. Many mineral rich countries have enacted legislations in which provision of benefit sharing with the local communities is explicitly stipulated. Many of these legislations are built around a comprehensive framework in which compensation, benefit sharing and community development plans are integrated and the roles of local communities, governments and mining companies are clearly delineated. In fact, the famous 1997 Supreme Court judgment on this matter (also referred to as the Samata Judgement) directed that in Schedule V areas, where the state government is undertaking mining, at least 20% of net profits would be set aside as a permanent fund for development needs. This will be in addition to reforestation and maintenance of ecology. The government’s proposal to include a specific provision for sharing 26% of the net profits with local communities is an important step ahead in building an inclusive growth model. This proposal is also in line with the best practices being followed in the world. The principles are not new and many mineral rich countries have been following it for years without impacting the genuine profitability of mining companies.

Learning from the global experience, the money should not be only spent for present consumption/development needs. This money should also be distributed / spent / kept (i) for future which should be kept to revive the economy of the area when mining finishes. (ii) It may be broadly spent under three categories: (a) A part of the money should be used to reduce the present impoverishment risks. This money should be directly given to BPL families directly affected by mining. One part of the money should be used to build the future livelihood of PAPs. This could be used for education, health, livelihood training, loans to establish businesses, etc.

The minerals are limited & not created or produced by human; rather they are gifted by nature for which it has taken millions of years. Hence they need to be mined, distributed economically, lawfully and utilized with due respect to conservation, safety, efficiency for sustainable development of the society as a whole.

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4. Dead rent is a fee charged by the government mining company/individual for the area included in the mine lease area from which no minerals are being extracted. Rates for dead rent are based on area of mining and value of minerals.
5. Effective Tax Rate: Is the amount of taxes collected as a percentage of pre-tax cash flow generated by the project over its expected life time.
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LIST OF ABBREVIATIONS


AUTHOR PROFILE

M.R. Kolhe, received the Bachelor of Engineering degree in Electrical Engineering from Visvesvaraya Regional College of Engineering Nagpur (now: Visvesvaraya National Institute of Technology, Nagpur) and M.B.A. degree from GS College of Commerce, Nagpur in 1974 and 1990, respectively. During 1975-2013, he worked in Western Coalfields Limited (Government of India Undertaking) and retired in 2013 as General Manager (Electrical & Mechanical).