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Mineral based Industry and their issues – Global prospective – A review of Literatures

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INTRODUCTION

Most of the countries of the world have one or other mineral reserves in varying degree. There are very few countries in the world who do not have any mineral resource of some value. In absence of mineral reserves there may be some natural reserve which can be harnessed to produce some economic activity.

It is also seen that efforts to harness the minerals through various projects face issues/challenges worldwide. In order to understand, the various issues/challenges arising out of mineral sector projects in various countries of the world, a literature review has been done.

The author is a practicing project manager involved in the implementation of Mineral Based Projects in the state of Odisha for the last three decades. It has been a constant endeavour to understand the challenges faced bay mineral based projects during implementation.

In this pursuit, search for literatures analysing issues / challenges faced by projects were accessed. While seeing the articles on India, few articles highlighting the issues faced by the mineral based industry in other parts of the world were also encountered. Pursuing further, good numbers of articles and publications were seen relating to the topic. Hence this attempt to analyse and publish a review of these literatures.

Method:

This paper is a descriptive study based on review of literatures published and available freely on internet. The literature search was carried out on the world wide web using key phrases likes: -

1. Challenges to mineral based industries
2. Mineral based industries and Economy
3. Effect of Mining on Economy
4. Effect of Mining on Environment
5. Issues affecting Mineral based Industries
6. Industrialisation and development

Study of any article also lead to other articles mentioned in the reference list. Accordingly, the articles were down loaded and perused.

Each article was analysed and the key areas of concern/challenges/issues were identified. The similar issues have been grouped together and the outcome is presented in five (5) headings.

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Based on the analysis and grouping, the issues/challenges facing Mineral based industries in various part of the world has been listed in the conclusion section.

This article is limited by the fact that it does not try to probe into the cause of interrelation between the issues/challenges identified. This article only tries to find out the same and leave the analysis open for future research.

Review of Literatures :

Mining/ Mineral Based Industries and Development:

Industrial development has led to the economic growth of countries like China, Korea, Taiwan, and Indonesia. Accelerated growth has also led to reduction in poverty rates in many countries. While some of the countries have managed to achieve equitable growth, in some others the inequality between the wealthy and poor, has remained high (Kniivilä, 2007).

Faster economic growth of China has been due to rapid industrialization, high rate of savings, large investment in infrastructure and productive capacity, an increasingly deregulated labour market and an internationally open and competitive economy. However, this growth has not been able to give equal opportunity throughout China. Coastal China has prospered much more than the hinterland China. Further rural industrialisation has also increased economic disparity between industrial labourers and the people who solely depend on land (Kniivilä, 2007).

In the early 1960s South Korea switched from protectionist import substitution strategy to export orientation. Strong Govt. commitment to export led to economic growth. This policy was further revised in the 1970s to composition of export and investment in heavy industry sectors were made. South Korea has been able to reduce its economic inequality through industrialisation and land reforms. Contrary to China, industrialisation in Korea has seen large chunk of population shifting their dependence from agriculture to industry. The economic inequality has been managed at reasonable level by implementation of social welfare programmes in livelihood and health sector by the Govt. (Kniivilä, 2007).

Like South Korea, Taiwan has also achieved rapid economic growth through industrialisation and export orientation. Here, economic growth has been mainly due to growth of manufacturing. Initially Taiwan focussed on labour-intensive production and later shifted to capital-intensive and high-technology area of production. Like South Korea, Taiwan has managed equality in income through land reforms. In Taiwan economic growth has led to even less income inequality than in Korea (Kniivilä, 2007)

During late 1960s and till 1997, Indonesia saw rapid economic growth. This made the country to move from an agricultural to a more industrialized base. The share of agriculture to GDP reduced from 56 per cent in 1965 to 16 per cent in 1997, and the share of industry rose to 44 from 13 per cent. In case of Indonesia the share of mining and quarrying (including crude oil) in 1980 was 25.7 per cent of GDP. Manufacturing in Indonesia has also started to contribute significantly for economic growth from the mid-1980s. Agriculture remained a very important sector in terms of employment. Growth in Indonesia's economy benefited a large section of the population and poverty fell from more than 70 per cent in the mid-1960s to 11 per cent in 1996 (Kniivilä, 2007).

Indonesia also adopted economic liberalisation and moved away from the protected- import substitution policy to a more open export-oriented policy with more participation from private sector. Indonesia also moved away from resource-based manufacturing to technology-oriented manufacturing (Kniivilä, 2007).

In Indonesia it is seen that the inequalities between the reach and poor was not much during

the green revolution or during the period of Oil boom. However, during the decade from the late 1980s to late 1990s, with rapid globalization the divide between rich and poor widened as the emphasis shifted to urban-based manufacturing, financial and other sectors and there was a slowdown in agricultural growth (Kniivilä, 2007).

Global Mining Review (GBR) in its E&M Journal September 2014 issue has mentioned that minerals are very important for Indonesia's economy. Till 2009 most of the mineral resources of Indonesia were controlled by MNC's. In January 2009 Indonesia started nationalization of its resources and even tried to substitute the Industry's foreign base with Indonesian enterprises. Indonesia also has been trying to eliminate presence of foreigners while still trying to attract foreign investment.

This review further states that while the 2009 law permitted holding of mining leases by foreign companies through a wholly owned Indonesian subsidiary. However, in practice the Indonesian Government encouraged holding of mining lease by locals and the foreign investor entering into some arrangement with them to extract economic value from the minerals. With a view to encourage local industry, Indonesia has further modified the 2009 law to stipulate that the foreign company must divest 51% of its share in 10 years of operation to local companies. Rules have been laid down for valuation of shares of the company. This was allowed only up to a bench mark level. Similarly, mining lease condition also make it mandatory to develop mineral beneficiation facilities like smelters. Consequent to this condition export of bauxite and nickel from Indonesia has also stopped.

This GBR report states that the move for nationalization of the minerals in Indonesia has its origin in the fact that mining industry has been unpopular with the people as they have experienced only the negative impact of the mining industry unless they are directly employed. Reflecting upon the "Indonesia's xenophobia" under Dutch rule, Indonesians view foreigners as oppressors and are determined not to allow the foreigners to take advantage once again.

It can be stated that the mineral sector industry in Indonesia is facing challenges from the change in law and the gaps in letter and spirit of the law. The MNCs are also facing opposition from people because of their past negative experiences.

World Bank Group (WBG) has been promoting the expansion of mining activities in resource-rich client-countries despite negative noting in the 2003 Extractive Industry Review. This support of mining activities by WBG is because of the economic benefits of the sector in cash strapped countries and ability of mining activities to reduce poverty and maintain environmental sustainability (Hatcher, 2012).

Mining activity is a high-risk enterprise. It is capital-intensive, the project gestation period is often significant. The profits are subjected to the whims of commodity prices, notwithstanding the uncertainties of geological exploration and reserve depletion rates. To counter these risks, WBG stipulates that countries must offer highly competitive settings to draw scarcely available capital into the mining sector (Hatcher, 2012).

This study also states that Philippines with the fifth largest mineral resources in the world, including substantial gold, copper, nickel, and chromite reserves was unable to attract investment because of unfavourable mining framework and over emphasis on local majority holding. Under the guidance of World Bank, Philippines has gone for a new Mineral Policy in 1995 which has remained till date as the most favourable laws to mining investments in the region. Under the recommendation of World Bank, this new act offered various incentives, guaranteed repatriation of earnings, capital and loan payments to foreign entities, mineral agreements of 25 years (renewable

for an additional 25 years) and a host of financial incentives to guarantee return on investments and profitability to mining contractors. However, the investment bench mark was placed at a minimum of US$50 million. The new policy also allowed for 100% foreign ownership of mining properties (Hatcher, 2012).

This study also states that in case of Papua New Guinea (PNG), where the mineral industry has been the main stay of country's economy, World Bank guided the state to reduce the corporate tax to 30% and withholding tax to 10%; increase the loss period carried forward from 7 to 20 years; fiscal stability guarantees for 10-20 years for new projects; abolishing additional profits taxes and allowing a tax deduction of up to 25% of allowable exploration expenses. These changes allowed investment in the mining industry. These changes also ensured that PNG's economy got the required support from mining sector to grow at the desired rate (Hatcher, 2012).

Contrary to Philippines and PNG, the mining industry in Laos is only starting to undertake the large scale development. The country has substantial reserves which are not completely mapped. Thus, in this country World Bank has played a role in drafting the laws and framework right from the beginning. This early involvement of the World Bank in the regulation process has led to strong emphasis on Social Development Model (SDM) mechanism (Hatcher, 2012).

The case of Sierra Leone is just the opposite to the experience in the above countries. Boosts in mineral exports have failed to significantly reduce poverty, making Sierra Leone a classic example of "resource curse". Most of the people in the country have seen little or no tangible benefit from seventy years of mining in rich mineral resources like diamonds, rutile, bauxite, iron ore and gold. Even though World Bank has intervened to devise the mining frame work, the mining industry has not helped in the economic growth of this country. This has happened as the Central Government had to agree for the mining lease conditions of the investors, without much option, because of the balance of payment crisis and poor economic conditions. The central govt. also could not pass on all the benefits to the masses, as the local chiefs welded enormous power over the land and the people. This allowed the local chiefs to amass the benefit for themselves only, leaving most of the masses to languish in poor conditions (Zulu and Wilson, 2012).

In Sierra Leone the development in mineral sector have largely failed to produce the expected improvements in material deprivation, education and health, vulnerability and risk, and helplessness/ voicelessness. Rural poverty remained virtually unchanged and health and education indicators generally poor. Alongwith incomes and environmental degradation (and associated agricultural, health and livelihood impacts), these poverty-dimension indicators were worse in mining than non-mining areas (Zulu and Wilson, 2012).

The example of Sierra Leone brings out the fact that even with the intervention of World Bank in developing the mining frame work, the mining industry has not given the required results as regards to the development of the masses largely due to power asymmetries; in particular the failure to recognize the importance, or to significantly alter or replace, entrenched, unequal power relations that favoured elites in allocating mineral rights and benefits (Zulu and Wilson, 2012).

Mineral industry in Peru, which is the back bone of economy, is also facing challenges in implementing mining projects due to environmental activists. While some of the mineral projects like Rio Blanco, Conga or Tia Maria are facing oppositions from the locals, other mining projects are getting completed at the same time. This is happening as Peru has very good deposits, electrical power at competitive cost, less labor costs and a strong pool of service providers. As per the GBR report published in E&MJ July 2015 edition, Peru will continue to be one of the top mining destinations because of the above facilities and the only thing the mining operators and developers need to do is

to identify and address social issues in their area of mining, before these issues turn into conflicts.

E&MJ journal in its October 2013 issue points out that, due to slowdown in world economy, investment in mineral sectors, specifically in mineral exploration has been badly hit. The Scandinavian countries of Norway, Finland, Sweden and Greenland have also seen drop in investment in mineral exploration in recent years, even though these countries are known for their world class (and relatively untapped) geological reserves coupled with 'wholesome reputation for stability, probity and administrative transparency'. In these countries the Governments have progressively liberalized exploration and mining and have allowed private sector investment. Thus, in this case the mineral industry is facing fund crunch and is unable to make progress even though the administrative atmosphere is conducive.

World Bank has continued supporting the extractive industry in spite of the acknowledgement that these industries may aggravate or cause serious environmental, health, and social problems, including conflict and war. To maintain a presence in the sector, the Bank has gone for financing using SDM. The SDM gives emphasis on poverty reduction as a central objective of all the Bank's actions within the sector, as well as a novel emphasis on social and environmental concerns. The SDM has led to engagement of local stakeholders into participatory schemes, new ''partnership'' initiatives between the private sector and civil society, as well as new responsibilities being assigned to the state, the private sector and, indeed, citizens (Hatcher, 2012).

In a study to analyse the influence of World Bank had on environmental and natural resources policies aiming at poverty alleviation in Armenia, it has come out that the interventions by the World Bank in Armenia aimed at reducing rural poverty by improving natural resources management, has promoted policy and administrative changes. Such changes have largely benefit transnational private companies, while at the same time restricting the access of poor local users to natural resources. This has been achieved by emphasizing that local people are illegally logging and farming the land, which is leading to deforestation. To curb this World Bank advised for deregulation of the forest sector, which in turn promoted privatization of the forestland as well as a reform of the state forest administration. The paper has concluded that the interventions by international organizations, like World Bank, in the name of "common good" weakens the state actors and their capacities. Even though there was severe pollution from the mine and plant operatons (Burns *et al.*, 2016).

The closer of Bunker Hill Works lead to reduction in revenue of the local urban body. This resulted in closer of a school and loss of job for teachers. Some of the workers had to relocate to other places leaving behind their family. Most of the unskilled workers, who did not have a high school certificate, were unable to find a job. They enrolled for high school certificate at old age. Struggling to survive after the closer of the smelter the city council planned to turn itself into a ski resort and attract tourist. In fact, the ski resort was developed by the Company for use by local people. But the research has found that closer of the mines and smelter affected the economy very badly and no other activities could restore the past glory. The study also found that the people involved in the mining industry were proud of their association with the mining activities even though there was severe pollution from the mining activities and the plant operation (Snow, 2012).

Mining and Environment :

Africa has more than 25% of the 4000 and odd recorded mineral along with an array of forest and wildlife assets. Africa has been attracting billion dollars of foreign investment in the early part of 21st century because of these resources. In the first ten years, the investment has jumped from US$ 25.7 to US$ 103.4 billion. The upsurge in mining industry also brings in investment in road,

railways and port. However African governments do not have the wherewithal to regulate this wave and help the countries to achieve poverty alleviation and sustainable development. Africa also has a complex socio-economic context, which makes the implementation of these projects more challenging. These foreign investments, which brings in foreign people also, is leading to bush meat and wild life trade. The development process is also leading to human migration and macro-economic changes. Even though attention is being given to mitigate the local impact in the mining areas, a wholistic approach for sustainable development can only save Africa's rich bio diversity (Edwards *et al.*, 2014)

Seeing the environmental impact of mining and mineral based industry, developed countries and economies are putting stress on the utilisation of these resources on a sustainable basis. Accordingly, European Commission (EU) plans to increase resource productivity so that they can decouple economic growth from resource use and its environmental impact (European Commission, 2011). They have identified various strategies for "transforming the economy onto a resource-efficient path that will bring increased competitiveness and new sources of growth and jobs through cost savings from improved efficiency, commercialization of innovations and better management of resources over their whole life cycle". Some of the strategies are "sustainable consumption and production" and "turning waste into a resource" (European Commission, 2011, p. 7). The above approach of the EU is based on the concept of End of Life (EoL) concept used for recycling of various metals.

Kyrgyzstan is another country; whose economy substantially depends on its mining industry. This country has deposits of Uranium, Antimony, Mercury and Thorium. The mining activities is now posing a direct threat to the environment of Kyrgyzstan and its neighbouring countries like Kazakhstan, Uzbekistan and Tajikistan. These mines are generally located at high elevations in a fragile mountain environment and vast quantity of waste rock is generated. These waste rocks along with the tailings in dumps and impoundments serve as a source of permanent pollution of the biosphere by heavy metals, radioactive materials and cyanides. Moreover, Kyrgyzstan is situated in a geographically sensitive area, prone to natural disasters such as earthquakes, landslides, floods, mudflows, etc. that can lead to spreading of toxic and radioactive materials in a vast area causing disastrous environmental consequences (Djenchuraev, 1999).

In a study of the history of Idaho Panhandle area, home to world's richest silver district and leading Zinc and Lead producer of the USA it is found that the mining activities and related smelters polluted the river and atmosphere of the area severely. The study points out that even after proper management of tailings produced in the mines and thirty years of clean-up efforts, some twenty miles of the Coeur d' Alene River is not able to support a reproducing fish population. For about ten miles of the tributaries does not have any aquatic life. Hillocks around the area are devoid of trees and vegetation because of high level of Sulphur Dioxide in the air. These emissions also affected the human populations living in the area (Snow, 2012).

At the same time, the study also finds that the mining industry while giving financial gains to investors and shareholders have sustained tens of thousands of workers. It has also supported thousands of residents of Kellogg and other parts of the Silver Valley in Idaho state. The study found that the company, Bunker Hill Works, responsible for all the pollution, spent good amount of money towards health, education and recreation of the local people. The company's predominant role in the economy of the town, along with numerous additional forms of corporate welfare, created a special relationship between the small city and the company (Snow, 2012).

The Bunker Hill smelter was forced to closed in 1981 because of financial issues and the

pressure of regulatory authorities to control emission. The new environmental standard would have forced capital investment, had the company planned to run the smelter. The study has found that after the announcement of closer of the company, the local leaders and people were ready to keep on abeyance the implementation of environmental regulations for five more years for a new promoter to take over the company. Some sections of the workers were even ready for reduction in their pay and perks by any new investor. This shows the dependence of the local economy and people on the industry for their survival (Snow, 2012).

Sustainable Development is defined as "that development which meets the needs of the present without compromising the ability of future generations to meet their own need" by World Commission on Environment and Development 1987. To meet this criteria implementation of Green Supply Chain Management (GrSCM) is crucial. Some of the manganese and phosphate mining industry in South Africa have implemented GrSCM to minimise the environmental risk and achieve acceptable standards. The challenges faced in implementation of GrSCM are operationalisation of environmental issues, lack of collaboration and knowledge sharing, proper application of monitoring and control systems, lack of clear policy and legislative directions, cost of implementing GrSCM practices and the need of strong leadership and management change (Pooe and Mhelembe, 2014).

Stakeholder Management :

Stakeholders' environment builds pressure on the project management and brings in uncertainty. The interest and demands of the wide range of stakeholders around a project needs to be understood and decision must be taken to ensure successful project implementation. Thus, the project managers have to conduct stake holder analysis to know about their interest and demand. However, getting a correct picture about the expectations of the stakeholders is not a straight forward thing and it has been found that there is difference in the "activeness of the stakeholder analysis during the project life-cycle, and in the degree of formality of the actual stakeholder analysis practices" (Aaltonen, 2011).

This study also points out that absence of previous experience in implementing a project in a new country may present difficulty in terms of understanding the legal frame work. Similarly engaging a combination of foreign and local agencies during project implementation may also lead to various issues arising out of cultural differences (Aaltonen, 2011).

A study to identify Critical Success Factor (CSF) for projects in Brazil, it has been found that "involvement and commitment of stake holders contributes to general effectiveness of a project" (Shimoda and Franca, 2014).

In a presentation downloaded from the website of United States Department of the Interior, it is seen that the US Administration has developed a process and mechanism to facilitate energy and mineral projects in the land under the control of Indian tribes through a 'trust' or 'restricted fee rule' of the Federal Govt. In fact, USA Govt. has formed a Bureau of Indian Affairs (BIA) to facilitate mineral assessment. In this presentation it is seen that one of the goals of the department was to "discuss the positive effects of doing business in the Indian Land". The other notable Goals "i) establishing ground rules for energy and mineral proposals and negotiations, ii) providing a neutral environment for both the tribes and companies to interact" (BIA, 2016).

In Australia it is found that even though the social dimensions of the mining industry are acknowledged as critical to business success, yet this remains the least understood aspect. The article shows that the "social" is much more than the idea of 'community'. Social dimensions involve working conditions, functional roles, employment of women and indigenous people etc.

These factors vary from project to project, because of change in geographical locations. To understand the social dimension completely, lot of time and resources are required. However, as always there is a constraint in time and cost, the social research does not get its due in the project implementation process. This under investment could also be attributed to an environment that does not prioritise social issues until they directly impact the business in some negative way. Unfortunately, by that time, the politicisation of issues makes the social research environment much more complex (Solomon *et al.*, 2008).

Small Scale Mining and its impact :

Artisan and Small Gold Miners (ASGM) is a major contributor to the informal economic sectors in many American, African and Asian countries, where gold is available. The most commonly cited ASGM-associated environmental hazards include land degradation, mercury emissions/pollution, siltation, erosion and water contamination. However, growth of ASGM leads to associated environmental hazards and adverse health impacts on the worker and the local population. The World Banks Communities, Artisanal and Small-Scale Mining (CASM) initiative elaborates on the economic and social effects of artisanal and small-scale mining work as "… largely a poverty driven activity, typically practiced in the poorest and most remote rural areas of a country by a largely itinerant, poorly educated populace with little other employment alternatives" (WHO, 2016).

Impact of Mining Industry on other sectors :

In an article on the copper mining in Chile, which is the world leader in production and reserve of this mineral, it has been pointed out that to cope up with the ambitious expansion plans the mining industry needs matching services in the supply side. Manpower is one of the factors. Meeting the requirement of trained and skilled manpower is one of the major challenge. With an open economy and presence of other mineral rich states in the neighbourhood has opened the possibility for Chile to get foreign service providers (Tejerina, 2012).

To meet the skilled manpower requirement, Chile has planned to utilise the services of people doing their voluntary military service once they complete their tenure. Simultaneous training of these people in electricity, mechanics, hydraulics, welding and basic handling of explosives have started. Chilean mining authorities have found that this arrangement can give them access to young people having the physical qualifications required to work in the mining industry (such as adaptability to work at altitudes, fitness to get on and off the different machines) and on the other hand are already familiar with skills such as sense of responsibility, discipline and teamwork imparted to them during their tenure with armed forces (Tejerina, 2012).

To further simplify the engagement of people in mining industry Chile has plans to provide IDs to the people who are trained, so that when they change a company or join for the first time no more time is wasted in repeating the training. This repetition of training of already trained people is taking place as different companies and even different mines within the same mining corporation (Tejerina, 2012).

In an article studying the challenges of sustainable development in the mining and metallurgy industry in Poland, it is concluded that the competitive advantage of companies is affected by strategic consideration of CSR activities, as CSR activities strengthens the company's relationships with stakeholders, improves reputation and builds trust among investors there by offering real value for money. The study has also found out that companies following ISO 26000 certification generally can achieve this (Bluszcz and Kijewska, 2015).

The E&MJ journal in its May, 2015 edition's editorial has mentioned that mining is one of the lead industries in doing projects in a new virgin area. Opening of a mine leads to subsequent development. Initially the supply and service companies establish themselves with a local presence, then wider commerce moves in. Logistics requirement for Mining industry is something which must be taken seriously. In addition, the logistic demands for each project vary depending on the stage of the project and the geographical location involved. A logistic system that has to be setup from scratch brings with it much more onerous challenges and commitments. In such type of scenario, it is not difficult to understand why companies that have invested large amounts of capex in new transport links will sometimes fight tooth and nail to ensure that potential competitors cannot subsequently gain access. In completely undeveloped areas, even taking the first step can be daunting.

Conclusion :

From review of the various literatures as mentioned above the following points emerge: -

i) Worldwide, mining is adopted as a means for development,

ii) The mining industry faces various challenges in each of the country which may vary depending on the ground situation,

iii) Mining industry does contribute to pollution due to week laws and regulations,

iv) International financing agencies like World Bank also promote mining and guide the countries for sustainable development,

v) Developing countries try to nationalise resource in the first phase and may open up the mining sector subsequently,

vi) Developed countries adopt an open market policy for mining sector,

vii) For successful execution of mineral sector projects there is a need to understand the social environment and take into consideration the requirement of the local people right at the beginning,

viii) Mineral industries are generally located in interior places and require simultaneous development of infrastructure in the area. Thus, investment in mineral sector project also bring in investment in infrastructure,

ix) Growth in mineral industry does not automatically ensure equitable growth,

x) Countries having good supporting services like logistic services, manpower and maintenance services attract good amount of investment and achieve cheapest cost of production,

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