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Making ad Reasonable Business out of Mining under Various Challenges While Keeping Pace with Technology and ESG Requirements

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Abstract

Mining in India since the Stone Age has been beautifully captured by many historians, portraying its magnificence from an archaic art to gradually evolving into scientific extraction methods. Post-independence, with consideration of economic importance, the mining sector is identified as the primary sector. Categorically mining in India is regulated, socially driven by local habitats, pandered by politics, marred by gender discrimination, impacted by climate ignorance and highly labour intensive. As minerals are the source for the genesis of the primary secondary, tertiary, and quaternary evolution of finished goods the importance of mining has been consumed by humans today more than ever. Minerals being non-replenishable, and their occurrence being geographically distributed has created a divide amongst the nations for their economic prosperity. However, subsequent Industrial Revolutions in the 21st century have brought back the importance of sustainable mining with a focus towards creating value in mining activity through technology infusion for mass production, building the safety of man and materials, generating a circular economy in the mining value chain, adapting controlling measures towards environmental impact, bringing social equality, and creating robust governance models.

Keywords: *ESG, Governance, Mining, Decarbonize, HSD*

1.0 Introduction

India's mining sector specifically coal mining has grown exponentially post 2010. In India, with the advent of mineral/coal auctions for the allocation of mineral concessions, along with the allowance of an outsourcing model for mining operations, the working dynamics of the Indian mining sector have gone beyond the archaic mode of being lackadaisical and bureaucratic[1]. The private sector infusion as a mining player or mining contractor brought in technology infusion in mining methods, efficient operation with technology enablement and superior evacuation infrastructure. However, other aspects like the safety of man and materials, manpower handling and environmental management have taken a back seat. This is amidst the extremely competitive landscape where working margins are shrinking, binding contract conditions towards a fall in production, and higher commodity prices of steel, lubricants, and High-Speed Diesel (HSD) causing a nonchalant attitude towards sustainable mining. This further with advances in technology and economic uncertainty, exacerbated

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by the COVID-19 pandemic, has disrupted all the value chains of the Indian mining sector[2].

2.0 Role of ESG in Indian Mining Sector

Mining being a site-specific activity is under the continuous impact of extreme weather conditions, energy supplies to equipment, transportation challenges, social and local issues, and bureaucratic governance as well as multiple stakeholder management. Due to this industry is increasingly addressing the Environmental, Social, and Governance (ESG) issues as a matter of urgency, as the protection of natural resources continues to shape the global business agenda[3]. A mining company needs to be prepared for the transition towards more sustainable practices, with climate change as the primary reason for the last two decades. The unpreparedness on the part of mining companies will not only put their reputation and operations at risk but also jeopardise future performances and investment opportunities. To summarize, viewing sustainability in mining through the lens of ESG alone has serious limitations.

ESG is fundamentally a tool to measure risk. Industry can't solve sustainable development challenges alone[4]. Collaboration is critical in solving the challenges of the mining industry and gaining the trust and support of society. It is inevitable that over time metals and minerals which are mined and produced sustainably will command a premium, so commodities will be increasingly differentiated based on ESG performance[5]. The industry needs to apply a set of minimum standards to it[6]. Below the table 1 provides the various parameters for mining companies.

Measuring ESG parameters across the entire mineral sector value chain i.e., from mineral exploration to transportation is essential to monitor sustainable business practices. This will attract heavy investment in these mineral commodities. The adoption of sustainability measures in mining will give access to the lower cost of capital on a more frequent basis. With ESG the social license to operate has evolved beyond the local approval and cooperation; the multinational nature of extraction,

Table 1. ESG parameters for mining companies

Sl. No.	ESG Factors	Measuring Parameters	Reason
1	Environmental	• Air pollution • Water pollution • Soil pollution • Biodiversity impact • CO_2 emissions • Energy consumption	a) Climate change, decarbonization and pledge towards net zero emission b) Impact of any human activity on nearby flora and fauna c) Promoting consumption of cleaner sources of energy amidst growing concern towards carbon emissions d) Building energy efficiency measures
2	Social	• Labour management policies • Health, safety and wellbeing commitments • Impact on local community • Labour standards for its vendors and suppliers • Equal opportunity • Freedom of association • Human rights and child labour	a) Concern towards the well-being of manpower deployment w.r.t their health, safety and well-being amidst outsourcing of the mining activity b) Concern towards child labour involved in illegal mining c) Emergence of changing roles with the inclusion of women in mining
3	Governance	• Business ethics • Managing compliance • Board independence and transparency • Shareholder democracy • Executive compensation	a) Good governance is often seen to protect against downside risk, but it can also add to competitive advantage b) Human rights obligation amongst mining companies is setting up expectations today that companies share this responsibility

Table 2. Mineral commodity-wise ESG challenges

Mineral	Environmental	Social	Governance
Dry fuel Coal	• Highly polluting across all the value chains from mining to transportation mainly due to high ash (%), sulphur content, NO_x and SO_x particulates • Coal mining operations and its handling is directly polluting the nearby air and water and thus impacting flora and fauna • With decarbonization at the centre stage coal operations need to comply with high statutory compliances	• Large number of direct and indirect demography is dependent on the coal mine sector • Specific skill sets are being sought to work in coal mines • Involvement of local community and their well-being in terms of facilitating potable drinking water, sanitation, health facilities and education • Unorganized labour in coal mining dampens the spirit of human rights	• Coal, being one of the oldest industries has been highly regulated and with allowance of private players into the coal mining. The governance in terms of illegal mining and transportation of coal, non-adherence to safety measures and scientific method of mining will always be required • Time bound resolution of seamless acquisition of land and Resettlement and Rehabilitation (R and R) along with essential infrastructure facilities remains a challenge in operationalization of coal blocks
Bulk minerals Iron ore, bauxite, manganese and limestone	• Mining of bulk minerals generates high amounts of fines and dust across their entire value chain of mining to mineral beneficiation to storage and transportation • Disposal of rejects, middling and tailings waste during the beneficiation process along with treatment of mine water including surface runoffs and its reuse • Use of battery-operated plant and machinery to decarbonize the mining operations	• In the case of minerals, the development of the entire mineralized zone needs to be taken care of i.e., townships like steel plants, cement plants, alumina and aluminium refinery • Occurrences of bulk minerals enhance the GDP of the entire region and give rise to the employment of local demographics both skilled and unskilled • Robust labour management policies along with creating equal employer opportunities are needed	• Time bound resolution of seamless acquisition of land and Resettlement and Rehabilitation (R and R) along with essential infrastructure facilities remains a challenge in operationalization of the mineral blocks • Strong governance is needed for approval of concurrent clearances of mining and beneficiation capacity is required seamless mining of bulk mineral
Base Metals Lead-zinc and Copper	• Scientific mining of deep-seated mineral deposits to gain maximum recovery • Lowering of groundwater table and polluting of aquifers • Maintenance of tailing ponds with a water treatment plant to create zero-discharge facilities	• Occurrences of non-bulk minerals normally are concentrated in tribal areas. Therefore, protecting the rights of local habitat and the right to employment becomes critical	• Representation of displaced demography to protect the interest of the local community • Building robust governance mechanisms in structured implementation for the recycling of base metals

Table 3. Emissions under the mining sector

Scope	Emissions Under the Mining Sector	Source of Emissions
Scope 1	Emissions from diesel	• Mine operations such as drilling, blasting, loading, and hauling generate emissions due to the use of diesel
Scope 2	Emissions from electricity generation	• Mineral beneficiation processes like crushing, grinding and conveying generate emissions due to the use of non-renewable energy
Scope 3	Emissions from supply chain and transportation	• Transportation and supply of minerals for the end user consumptions uses diesel, natural gas and electricity generates emissions

Table 4. Managing "E" of ESG through decarbonization measures

Sl. No.	New Measures	Applicability	Addressing Emissions	Used Cases
1	Use of sustainable fuels/gases	• Loading • Hauling • Transportation	Scope I and Scope III	• Use of biofuels in dumpers • Use of LNG in excavators, dumpers, dozers, graders and other opencast mining HEMM • Use in long haulage transportation trucks for sustainable sourcing
2	Use of hydrogen as a fuel	• Loading • Hauling • Transportation	Scope I and Scope III	• Hydrogen-powered mining trucks for mine operation • Transportation of bulk minerals to end-user plants for sustainable sourcing
3	Use of renewable energy	• Mineral beneficiation plant Operations • Transportation	Scope II and Scope III	• Solar/ wind renewable energy generation to power the plant operations for mineral beneficiation • Powering conveyors, and drivetrains for material transport with renewable energy
4	Use of battery-powered electricity	• Loading • Hauling • Transportation	Scope I and Scope III	• Battery-powered underground mining equipment for drilling, loading and hauling • Material transportation with battery-operated trucks

transportation and production means that firms must now abide by global standards[7].

3.0 Mineral Commodity Wise Challenges

India is bestowed with an abundance of minerals like coal, iron ore, bauxite, manganese, chromite, lead – zinc and limestone. Protecting natural resources across the planet is essential to building long-term economic stability and prosperity. Global and Indian mining players are heavily invested in the augmentation of these mineral resources through mineral exploration, mining of minerals, refining of minerals, transportation and marketing. The following table 2 is describing the ESG challenges in mineral commodity wise.

4.0 Building Reasonable Business out of Mining Under ESG Requirements

The emissions across the entire mineral value chain starting from drilling and blasting to plant operations to transportation of minerals need to be controlled[8]. Therefore, understanding of emissions source will guide the technology intervention to achieve the decarbonization pathways in short, mid and long terms[9].

These are the various sources of emissions under the mining sector.

Managing "E" of ESG i.e., to decarbonize the entire mining value chain is the need of an hour. For this, the technological innovations aligned with the ESG requirements for the mining sector are at a nascent stage

Table (3-4). Below are the possible routes for sustainable mining. Regarding social and governance parameters i.e., "S" and "G" of ESG a thorough assessment of the implications of noncompliance of these parameters concerning any organization considering stakeholders' perspectives is a must[10].

With the emergence of technology, the global mining sector is transgressing from profit-making business models to sustainable profit-making business models, wherein the interest of all key stakeholders is served[11].

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