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India's Mica Mining: Implications for the 2030 United Nations Agenda for Sustainable Development

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ABSTRACT

The present study sought to explore the implications of the mining of mica, a natural mineral commodity, in the Indian mining belt in regard to the 2030 United Nations Sustainable Development Goals. It analyzes the actions of the Indian mica mining industry through local case study reviews and explores the significance of these actions by analyzing them through the lens of the economic, social, and environmental sustainability theory of Andrew Basiago and the 17 UN Sustainable Development Goals (SDGs). Analysis of specific areas such as compensation of labor for miners, child labor, mica mining contractors, gender constructs in mines, and deforestation/waste production, among others, revealed that the actions of the mica mining industry in India are indeed unsustainable in various social contexts, violating various SDGs and forsaking local human capital and habitats. This essay offers a connection between the actions of the present industry in India and the unsustainable developments of the surrounding communities and suggests a transition to synthetic mica and responsible mica mining initiatives in place of current systems.

Introduction

The global mica mining industry has received increased attention in recent years as the need for mica as a mineral commodity grows rapidly. The industry itself is estimated to produce 1.12 million metric tons of mica annually and serves numerous other industries, ranging from beauty to automotive to architecture (Willett). However, the industry's newfound attention has also brought to global focus the means of mica mining employed and its unsustainable nature. In India, one of the world's biggest mica producers, mica is mined using artisanal and small-scale mining (ASM), with cited child labor and environmental consequences ("Mica"). Uncovering these developments in the past decade has caused increased concern for the social weight these actions hold (Bengtsen and Paddison, 2016).

Exploring the mica mining industry in a social context led to this research question: To what extent has the mica mining industry, as seen in India, presented economic and environmental implications by impacting the fulfillment of the 2030 United Nations Sustainable Development Goals in industry-controlled areas? This question addresses the nature of the mica mining industry's contemporary actions, with specific regards to sustainability. Therefore, regional and global data is demonstrated to understand the industry in an area where it has a significant presence and impact: India.

An interdisciplinary approach of economics and environmental systems and societies is necessary to examine the implications of the industry and reflect on a more sustainable answer for the production of mica in the future. Through examining the mica mining industry's actions in both an economic and environmental focus, this essay extends beyond just the production of mica into the relationship between this industry and the local communities it seeks to inhabit and depicts how, in the interest of this relationship, the unsustainable

aspects of mica mining can be addressed and bettered. This essay seeks to demonstrate that the mica mining industry has hindered the fulfillment of UN 2030 Sustainable Goals by maximizing industrial economic profitability through the employment of human rights-violating labor and has presented environmental risks to miners and local communities, thereby presenting significantly negative implications.

Analytical Framework

United Nations Sustainable Development Goals

In 2015, the United Nations (UN) General Assembly drafted the 2030 Agenda on Sustainable Development, which was adopted by all United Nation Member States ("Sustainable Development Goals"). This agenda serves as a blueprint for creating a more sustainable, prosperous world for all, with the intention of being fulfilled by the year 2030. At the heart of this agenda are the 17 United Sustainable Development Goals (SDGS), which are the specific targets of global areas in which sustainability is desired (United Nations, n.d.) (Refer to Appendix). These goals range from eradicating poverty to innovating infrastructure, and each contains its own set of sub-targets, which narrow down the action necessary to achieve the goals and provide indicators for measuring progress.

These goals serve as a suitable framework for analysis both in their interdisciplinary and interlinked nature, as well the significance they hold in the global push for sustainability. The implementation of these goals by the UN is done primarily through different community stakeholders, so understanding the actions of the mica mining industry through the ways in which it interacts with these goals allows for greater understanding of the areas in which the industry is lacking and how it can align with the global ideals of sustainable development. Additionally, being interdisciplinary in nature allows for a more systems-thinking analysis and approach towards the industry's actions.

Economic and Environmental Sustainability

Another important supporting facet in analyzing the actions of the mica mining industry is understanding existent theories of economic and environmental sustainability. A joint exploration of these is done by American lawyer and environmental planning specialist Andrew Basiago who researched and published his detailed examination of economic, social, and environmental sustainability in urban planning and what practices can be implemented moving forward to better achieve these guidelines. Basiago (1999) writes that economic sustainability "implies a system of production that satisfies present consumption levels without compromising future needs" with a focus on growth, development, productivity, and trickle-down economic growth (150). He writes environmental sustainability as involving "ecosystem integrity, carrying capacity and biodiversity" and defines social sustainability as seeking "to preserve the environment through economic growth and the alleviation of poverty" with a focus on equity, empowerment, and institutional stability (Basiago, 1999; 149-150). It is understood, then, that these forms of sustainability are all interlinked, wherein sustainable development, one form of growth cannot be forsaken for the other area of sustainable development. Rather, they must all be coordinated; it can be said then that industries and entities promoting sustainable development are those that fulfill all the aforementioned criteria. To understand whether the actions of the mica mining industry are truly "sustainable", applying these development theories in analysis will aid in furthering our understanding.

Mica Mining Industry in India

Globally, India is one of the top producers of both scrap and flake mica and sheet mica (Schipper and Cowan, 2018). India is a key producer and exporter of muscovite, and experts across the industry fully agree that India is the most important country supplying natural mica in the market due to the quality, large volumes, and low prices of the mica that comes out of the country. The production of sheet mica in India is often done through the means of artisanal and small-scale mining (ASM), where independent human miners mine mica using manual labor ("Mica"). This process has often been cited as quite labor intensive, with difficult working conditions and ASM miners being forced to live in impoverished conditions ("Artisanal and Small-Scale Mining"). The predominant use of ASM in Indian mica mines, then, can be understood to be a key factor in promoting unhealthy implications for the lifestyles of miners and surrounding communities.

Economic Implications

A key resource used in understanding the mica mining industry in India and its particular economic implications is a report published by the Centre for Research on Multinational Corporation (SOMO) and partners Terre des Hommes, the international children's rights organization, which details the Indian mica mining industry and children's human rights violations in the mines. This report, coming from a research-based entity provides crucial and credible data on the industry as a whole.

In the study, authors Irene Schipper and Roberta Cowan (2018) calculate that an estimated 89 percent of mining in the Jharkhand/Bihar mica belt, the main mica belt in India, is illegal, with the average daily wage of an illegal worker in India being 45 percent of the average daily wage of a legal worker in India. This shows how the industry, through significantly low economic compensation, negatively fuels poverty among its workers, leading to unsustainable living.

Compensation and Financial Situations of Miners

In an industry where mica is predominantly mined illegally, it is critical to address the process of wage provision for these miners. Research from Schipper and Cowan (2018) reveals that the price earned per kilogram for collected or illegally mined mica is in the range of 3-5 rupees. In India, however, the official poverty line threshold for rural areas is set at 26 rupees per day (USD $0.43) (Poverty in India). This evidence reveals how little mica miners are paid in relation to the already established poverty threshold in India. A lack of proper economic compensation coupled with already-rural living conditions significantly furthers the poverty faced by individuals in communities surrounding the mica mines. This, then, suggests the mica mining industry is actively forsaking proper wage provision, which directly violates both SDG 8 - Decent Work and Economic Growth and SDG 1 - No Poverty. 60 percent of the scheduled caste and tribes in the main mica mining area in India, Jharkhand/Bihar, are below the poverty line (Singh et. al, 2012). In spite of this, the mica mining industry producing inadequate wages furthers the already impoverished nature of the local area, directly violating SDG 1, which strives to eliminate poverty in all forms as a means of promoting healthier and more sustainable living for laborers. SDG 8 strives to provide "decent" and "sustained" work for all, which can be understood as work that is fairly compensated for a sustainable lifestyle. The active low-wage provision, by this industry, in response to labor, however, violates this goal by creating labor opportunities for individuals that cannot sustain themselves or their families, both based on the risky nature of ASM or the considerably low levels of compensation.

When addressing Basiago's theory of economic sustainability, one can easily understand that this improper labor compensation causes the industry to fail to meet the standards of economic sustainability as the production labor is not being met with equal compensation; rather, production is being prioritized over the financial needs of laborers and their families.

Due to mica mining being seasonal and relying on buyer orders for production, there is also irregularity in wages and employment for these Indian miners (Chattopadhyay, 2011). This indicates the low level of financial security and stability provided by the mica industry for its miners, despite miners being engaged in rigorous work during mica mining seasons. One can also understand how this leads to constant structural unemployment within this pool of laborers. Structural unemployment, specifically, is unemployment that is a result of declining industries and shifting demographics/demands, and in this case, it leaves mica miners relying heavily on production seasons/requests for some form of wages.

Furthermore, not only is wage inequality a direct cause of poverty among these miners, it also serves as a social construct for promoting the financial exploitation of these miners by contractors. Research has produced data that shows that Indian mica miners are subject to serious financial debts as a result of loans and associated inflated interest rates, the fees that accompany borrowing a loan (Bengtsen, 2019). Indian mica miners are cited to incur these debts for a number of reasons, including to treat health hazards that occur from mining, funerals, weddings, and more. When taking these loans to finance unexpected causes, miners face annual interest rates over 200 percent. Managers of these loans include contractors in the mica production chain, such as mica traders, mine managers, and merchants and leave miners unable to pay their loans back for months or years after undertaking them. This places mica miners in a cycle of debt deadlock, where they are unable to escape the exorbitant interest rates placed on them by these individuals employed by the mica supply chain. Miners also default, which refers to a failure to pay back debt properly, on their loans quicker through rapidly accrued (accumulated) interest, rendering them virtually unable to even begin to tackle their debt.

This wage inequality creates a social construct of inequality within mines, but also directly violates, among others, SDG 10 - Reduced Inequalities. This SDG, which strives to address a variety of inequalities, primarily looks at income inequality through the Gini Index, an index measuring income inequality across individuals (United Nations, n.d.). Contextually, the aforementioned occurrence reveals that the mica mining industry allows leverage for individuals within its supply chain to manage the interest rates for miners, actively furthering the wage gap between these individuals. Though it may be mentioned that this is localized, what began this inability to pay back loans is the weak wage compensation industry management provides miners, lowering their socioeconomic status (SES) - their measured economic and social position in relation to others.

Child labor is a crucial aspect of mica mining in India, and the reason for this is primarily economic as well. While Indian law does forbid children below the age of 18 from working in mines, “many [Indian] families living in extreme poverty rely on children to boost household income” (Mint, 2016). Aside from this, children are ideal employers for mining contractors because they can be compensated less for their work due to a lower work pace (Van der Wal, 2019). Furthermore, payments are often efficiency wages, based on the number of kilos of mica that children can sort, rather than established base pay that gives miners an initial rate of compensation, which makes it easier for contractors to compensate children less for the same amount of labor.

Gender Income Inequality

Gender-pay gaps are also very prominent within the mica mining industry in India. A peer-reviewed case study useful to my exploration was conducted by Molly Chattopadhyay (2011) on the conditions of women workers in the mica mining industry in the Giridih District of Jharkhand, India. The study drew from 420 mica workers in the district, with the sample containing 210 men and 210 women from four villages in the district where more than 50 percent of the population was employed with the local mica factories. The study accumulated information on the production of mica in the factory, wages, labor divisions, and benefits across both genders, making this a critical, useful, and plentiful source about economic division for my exploration.

The study revealed critical failures in gender parity within the production process. Certain mica mining jobs were deemed as skilled (cutting, electrical testing, die-punching, etc.) and unskilled (picking mica, splitting, packing, etc.) by the Wage Board of the Indian Ministry of Labour and Employment in collaboration with

the mica proprietors of this area (Chattopadhyay, 2011). The pattern in the study revealed that 94 percent of skilled jobs were done by men while 78 percent of the unskilled jobs were done by women, revealing how the industry made an internal, inherent association of women workers as unskilled mica miners.

Chattopadhyay's (2011) exploration also revealed how while the four factories all claimed to pay the minimum wage to all workers regardless of their gender, survey data revealed that female workers were subjected to lower wages across all four factories. Around 7 percent of female workers received less than 15 rupees per day, which was a significantly low minimum wage threshold that no male worker was subjected to and while the majority of women received daily wages around 16 - 20 rupees, the men received an average of 41 - 45 rupees (351). Women were also subjected to worse work benefits than men, where no woman worker was considered a regular worker and was more likely to be terminated. No female workers were covered by the Provident Funding Scheme, which is India's government-managed retirement savings scheme, but 36 percent of men were and while 56 percent of men received medical benefits through the employee's state insurance, no females did.

This study clearly reveals how the Indian mica mining industry directly violates SDG 5 - Gender Equality. Through this SDG, the UN specifically looks at preventing women from being forced to do unpaid domestic work while being squeezed out of labor (United Nations, n.d.). The aforementioned study, however, shows women receiving unequal, lower wages and benefits to their male counterparts while only being able to do unskilled work. This puts them at an inherent disadvantage to their male counterparts. By not receiving livable wages and work experiences, these mica mining women are trapped in a cyclical nature of poverty. This reflects a violation of SDG 8 - Decent Work and Economic Growth as well where decent work is not being provided to these female workers. Notably, in Basiago's (1995) interdisciplinary classification of sustainability, he discussed how social sustainability revolves around economic equity as well (149). In failing to ensure equal economic compensation for female workers, the industry's actions are inherently unsustainable, both socially and economically.

Many, including economists, have come to the conclusion that discrimination inherently stems from pay and income, especially within countries where being a part of the labor force shows strength. However, while this study shows gender income inequality among male and female mica miners, it reveals just how poorly all workers are being treated. More than 50 percent of workers in nearly all situations received no working benefits and the highest reported daily wage of 50 rupees is only 28 percent of the national daily minimum wage of India set at 176 rupees. Most critical is the failing role of trade unions, with the industry's crisis preventing mica workers from effectively organizing into trade unions and asking for proper wage provisions (Chattopadhyay, 2011). This level of treatment is unsustainable for the mica mining workforce and devalues human capital, which is the economic value of a worker's abilities and skills.

Profitability of Industry

The mica industry in India is a two-phased industry, so this conversely ensures that profitability of the industry is expanded (Rahaman, 2013). The first phase deals with mica from the mica mines while the second phase deals with the processing of mica and manufacturing. The first phase of mica production is a significant aspect of the mica mining industry in India. The Jharkhand/Bihar mica belt of India represents the world's largest mica mining area, producing approximately 25 percent of the world's total production of mica itself (Schipper and Cowan, 2018). What this results in is increased rates of exports from importers like Japan, China, and Germany. In recent years, mica exports from India have steadily grown, with an estimated 136,000 tons of mica being exported from India abroad in 2015, a 75 percent increase from 2006 (Schipper and Cowan, 2018). Because of a demand for mica globally, earnings from exports are also significant, with the measured total export value of Indian mica in the first half of 2015 being 1,517 million INR. However, while the industry manages to bring in so much income, their significantly low compensation rates of around 3-5 rupees per kilogram of collected mica

for workers shows the industry's standards go beneath the established extreme poverty line and violate SDG 1 - No Poverty by profiting off of their workers' human capital while forcing them into poverty. This, in alignment with Basiago's discussion of economic sustainability, demonstrates how the industry compromises future worker needs in order to capitalize on current production.

Environmental Implications

Beyond just economic implications, however, the mica mining industry has been cited for its negative impact on the environment.

Regulations

In India, there are currently statutory regulations on small-scale mining and the environment in the form of the 1998 Mineral Conservation and Development Rules established by the Indian Bureau of Mines (IBM, 2022). Research from the International Institute for Environment and Development, however, has found that most of these small-scale miners, including mica miners, simply continue to engage in environmentally-negative activities regardless of these regulations and legal codes, which range from deep-hole blasting, which produces toxic gases, to unauthorized extraction of scree, a collection of loose rock pieces in hills (Chakravorty, 2011; IME, 2011). This is an example of the industry's willful negligence for the implications of its actions on the surrounding environment. Regardless of existing government regulations, ASM mica miners engage in environmentally-unsustainable actions, directly violating SDG 12 - Responsible Consumption and Production which strives to ensure sustainable production patterns. Ecosystem integrity, as mentioned in Basiago's discussion of environmental sustainability, relates to maintaining natural states, which, through deep-hole blasting production and such, are disrupted through toxic byproducts, showing that these actions, then, are fundamentally unsustainable for the environment.

Dust Production

Mica mining production often produces significant amounts of silica dust in the process, specifically during the drilling procedure (Schipper and Cowen, 2016). This dust, which is not visible to the naked eye, contributes to air pollution, which then directly contributes to miners contracting deadly lung diseases from the inhalation of these dusts and powders known as silicosis and pneumoconiosis. The Indian Council of Medical Research released a report in 1999 estimating that 630,000 workers in the Indian glass/mica industry have high silica exposure risk. This significant form of particle pollution leads to respiratory tract irritation and several lung exposures often exceeding the occupational exposure limits set out by governments in these areas (Hulo et. al, 2013). This pollution also hurts miners long-term, as Indian mica miners are reported to incur debts due to having to take up loans in order to finance unexpected costs of around $700-$800 for the medical treatment of their lung problems from the silica pollution (Bengsten, 2021). This not only violates SDG 12 through irresponsible dust production regulation and ecosystem pollution, it also violates SDG 3 - Good Health and Well Being by causing severe health issues for miners through mica production, rendering them unable to function comfortably.

Deforestation and Mica Waste

India's large reserves of mica are mostly found under its central and eastern forests, and because of this, Indian mica mining had a significant effect on the declining forests (Chauhan, 2020). This led to the Indian government

enacting a law in 1980 to limit the industry's deforestation efforts and to protect forests. While the act itself became illegal, Indian mica-related deforestation has not stopped. Large stretches of forest are continuing to be illegally cleared, to extract mica and timber, especially in the region of Koderma. Locals in this area also attest to the loss of wildlife due to mining, stating that elephants and boars were thwarted away from there with mica production. This is quite unsustainable for the environment, and through the violation of SDG 12, shows that continued illegal deforestation leads to both soil erosion and fewer agricultural processes in this area as well as a lack of biodiversity from wildlife. This means of producing mica ultimately depletes natural resources, leaving the local ecosystem unable to self-sustain and produce resources for the future needs of the community.

Mica mining also produces waste soil laced with residual mica, which is said to contaminate local water and is easily susceptible to erosion, leaving dangerous chemical conditions in surrounding areas (Schipper and Cowen, 2018; Ibeh et al., 2020). Because Indian mica mining activities are often illegal, environmental standards of waste disposal and deforestation protocol do not apply and continue to hurt the surrounding environment for future efforts of agricultural development.

Conclusion

The paper explored the prospective economic and environmental implications of the Indian mica mining's industry as it relates to sustainability and its relationship with the 2030 United Nations Sustainable Development Goals. The exploration yielded direct links between the industry's actions and violations of particular Sustainable Development Goals. As the UN Sustainable Development Goals serve as the major global blueprint for sustainable development, analysis of the relationship between Indian mica mining and the targets of these goals revealed that a violation of these goals indeed provided a view of the industry's negative economic and environmental implications for those it employs and the communications it inhabits in the mica mining belt of India.

The industry was revealed to be mindfully paying its workers far below the established poverty line with daily wages 45 percent of the national standard minimum wage, while also mistreating its human capital and gaining more money from exporting mica internationally but giving significantly less to the miners for working compensation. This contributes to the development of poverty in these surrounding communities and places these miners in debt risks. Environmentally, Indian mica mining contributes to deforestation, silica dust pollution, and mica waste, all of which contribute to destroying the surrounding ecosystem. Paired with the UN SDGs and Basiago's Development Theory of Economic, Social, and Environmental Sustainability, these actions are revealed to be inherently unsustainable. Though the industry has a global presence, its actions do not align with global targets of sustainable industrialization.

What is important to note is the limitations of research on mica mining due to regulation protocols and the pervasive nature of illegal mica mining, leading to difficulty undercovering these occurrences. Furthermore, what this essay failed to recognize and where more research is needed is in the area of global mica pricing, which is the root cause of buyer and consumer relationships in the Indian mica mining industry.

Recommendations for the industry include transitioning to synthetic mica and in-lab production, increasing transparency in the supply chain, continuing the global Responsible Mica Initiative to eradicate child labor, and partnering with key stakeholders in furthering industry research. Rather than harming human capital, these actions can promote a more sustainable future for mica mining, both in India and around the world.

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