

Environmental Issues and the Prospects of Mining in Nigeria

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Abstract

Mining is referred to as the extraction of minerals and other geological materials of economic value from deposits of the earth. It is characteristically a destructive industry as it affects environmental components, such as air and water quality, and destroys the land and habitats, leading to the loss of biodiversity. It also has its toll on the health of people living around mines. Mining activities in Nigeria operate below capacity in the absence of the enforcements of laid down regulations and standards. But mining activities also have a positive impact on the environment and its host communities if sustainable and modern methods are adopted. Recycling, improving legislation and regulations, proper environmental management systems, proper mines closure and site reclamation processes should be adopted as strategies to combat the negative effects of mining activities in the country.

Keywords: Mining, Degradation, Contaminants, Emissions, Health.

1.0 Introduction

Mining is the extraction of minerals and other geological materials of economic value from deposits of the earth. It is characteristically a destructive industry, as the effects of a single mining operation can have a severe impact on the environment. Although there are some regulations in place that are intended to minimize the damage, they are not enough to allow mining and wildlife to exist in harmony, especially in cases where the regulations are difficult to enforce (Pegasus, 2017). For development to be sustainable, the conversion of natural capital should result in the creation of equivalent social and/or economic capital. Mining activities involve scraping away earth and rocks surfaces to get to the deposits buried under or near the surface. In many cases, mountains are literally blasted apart to reach mineral deposits within. This activity tends to leave permanent scars on the landscape (Dontala *et al.* 2015), thus giving rise to adverse environmental issues.

Just over a decade ago, in preparation for the Second Earth Summit in 2002, the international mining industry sponsored the Mining, Minerals and Sustainable Development Project, the stated intention of which was to determine how best the industry could contribute to sustainable development (Daniel, 2015). This paper seeks to review the issues and prospects of solid mineral mining in the Nigerian context.

Nigeria has been marked as one of the countries that have been blessed with abundant solid minerals on the continent. It constitutes some of the largest known deposits of different categories made up of precious metals, stones and industrial minerals like coal, tin, gold,

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marble, limestone and others (Fayemi, 2015; Musa, 2013; EITI, 2015). The core of these mineral deposits scattered across the country remains a major attraction for informal and conventional mining activities even though they are yet to be fully exploited on a large scale (Musa, 2013). Earth scientists have long noted the vast presence of over 40 to 50 different kinds of untouched sub-terrain assets hidden and un-prospected beneath Nigerian soil.

1.1 Forms of Mining Activities

Mining can be divided into three based on the processes involved in the extraction. Open Pit mining is the form where material is excavated from an open pit; it is one of the most common forms of mining for strategic minerals that are available in small deposits (Dontala et al. 2015). Underground Mining involves large-scale movements of waste rock and vegetation. These two forms are believed to have the potential for tunnel collapses and land subsidence (Betournay, 2011). In situ leach (ISL), mining which is done underground, is believed to have environmental and safety advantages over the other two (World Nuclear Association, 2012) because there is no ore dust or direct ore exposure to the environment and a lower consumption of water is needed in the mining process (International Atomic Energy Agency (IAEA), 2005).

1.2 The Environmental Impacts of the Mining Industry

(a) The Positive Impacts of Mining

Sustainable mining activity has enormous positive impacts, such as: providing employment opportunities and support for local businesses and organizations (Mathew, 2017); if a proper mine reclamation plan is applied at the first stage, it improves landscape and increases stability of the area; the sustainable disposal of solid wastes to fill the valley created makes smoother topography (Mathew, 2017); as one of the pioneer industries that use renewable energy, such as wind and solar, mining activities done with such energies reduce carbon footprint and help to have a better climate.

(b) The Negative Impacts of Mining

In some countries, mining companies are expected to adhere to rehabilitation and environmental codes, making sure that the area mined is eventually transformed back into its original or near original form. However, the adverse effects of mining are still encountered in the components of the environment.

Air, land and water bodies are known to serve as habitats to all living things. Mining as an inherent destructive industry exposes these habitats to unrefined materials (Dontala et al. 2015) that pose a great danger to fauna and flora. These particles are composed of toxic materials, such as lead, cadmium and arsenic. These elements have the potentials of adversely affecting the respiratory systems of humans through various forms of contact like the skin, oral ingestion and inhalation. Mining can cause physical destruction to landscapes, causing blots. There is also a high possibility that many of the surface features that were present before mining activities cannot be replaced after the process has ended (Merem *et al.* 2017). Mining is a significant threat to biodiversity, as it leads to large massive habitat losses (Paul and Campbell, 2011).

2.0 Mining Issues in Nigeria

Nigeria's abundant solid minerals constitute some of the largest known deposits under different categories made up of precious metals, stones and industrial minerals like coal, tin, gold, marble, limestone and others (Fayemi, 2015; Musa, 2013; EITI, 2015). The core of these mineral deposits scattered across the country remains a major attraction for informal and conventional mining activities even though they are yet to be fully exploited on a large scale. Earth scientists have long noted the vast presence of over 40 to 50 different kinds of

untouched sub-terrain assets hidden un-prospected beneath the Nigerian soil. Accordingly, the market worth of Nigeria's solid mineral deposits in these settings stands at hundreds of trillions of dollars spread throughout the nation (Omoh, 2016). Aside from these potentials, without efficient data infrastructure to gauge the viability of the vast deposits of precious metals precisely from gold exploitation only, it has been estimated that Nigeria loses \$50 billion year after year (Omoh, 2016). Lost in all these is the danger of overlooking the environmental externalities based on the human-nature interactions associated with mining, such as lead poisoning, air and water pollution and other risks across Nigeria (Haruna, 2011; Ayantobo, 2014).

These prospects are not new for Nigeria, because over four decades ago, the revenues from solid minerals financed many government programs in the form of infrastructural design, education, health care and the emergence of the petroleum industry under the nation's development plans. However, the discovery of oil and over-dependence on petro-dollars gradually quickened the decline and negligence of the solid mineral industry (Onwuemenyi, 2016). Notwithstanding the negligence in the past decades, the mining sector has been experiencing an ongoing resurgence with growing prospects. The physical inventory for coal estimated at over 639MT in proven reserves, coupled with an additional 2,750MT and an export value of 15 million tons per annum, serves as a testament to the vast potentials of Nigeria's mineral deposits (Musa, 2013). In 2013, the sector produced 60.54 million tons of mineral products and 1,254,200 rural based jobs from 1,710 quarries with accrued monetary benefits (Musa, 2013). With the current dominance of the petroleum industry in the economy, informal miners and companies have become very active in the production of solid minerals in the absence of a clearly defined policy, better standards and reforms. This can be buttressed by the presence of 223 small scale mining operations, 195 mining leases, 845 artisanal mining cooperatives and the 2,048 exploration licenses issued in the country (Musa, 2013). With that came widespread ecological impacts at the expense of adjacent communities.

Seeing the recurrent hazards from thousands of abandoned mines across the country, especially in Jos Plateau, as stated by (Edun, 2013), there are other risks in the sector through inland sand mining and the effects of artisanal mining. The concentration of toxic residues from zinc and geological hazards and the the ecological disturbances of the destruction of flora and fauna are the major challenges from mining (Adedeji, 2014). While ecological problems emanate from the activities of artisanal and small scale mining types, the impacts consist of the toxic pollution of air, the degradation of arable land, habitat loss and the contamination of water resources. Additional impacts involve the invasion of built up areas into the natural environment, the littering of mining wastes and abandoned quarries, radioactive contamination and fatal cases of lead poisonings in an artisanal mining community.

These negative externalities would not have emerged in their lethal forms had there been no interactions between prospectors and the mining sites, hence the ecological mishaps. The ecological anomalies do not operate in a vacuum; they are attributed to a host of socio-economic elements made up of ineffective policy, economic variables, inadequate data infrastructure and the activities of the informal sector. This stems partly from the fact that the mining industry is largely underdeveloped and dominated by informal miners scrubbing minerals to make ends meet with little regulatory oversight to ensure conformance to operational standards. Considering the fact that mining activities in Nigeria operate below capacity in the absence of proper regulations and standards, the cases of human fatalities from lead poisoning prompted by mining remain widespread as well.

Furthermore, the quantities of air pollutants released by the process of solid mineral dispensation involving limestone quarrying and the cement industry along Shagamu and Ewekoro areas of Ogun state constitute serious hazards to the public. While the distress miles away involves public complaints of eye pains and respiratory tract problems and attacks by airborne particulates laden with toxic dust the concentration and impacts of the plumes on flora led to the decline of kola nut production from local plantations (Aigbedon, 2007).

Elsewhere in the southern part of the country, communities in several ways have been at the receiving end of the damage caused by abandoned mines. Evidently, the people of Plateau state have reluctantly endured the burden of the risks from abandoned mines in the country over the years. Considering the damage done to the area from past eras, there are now recurrent dangers from radioactive mine tailings scattered all over to people living around mining fields in Jos, Barkin-Ladi, Bukuru, Bossa and Riyom districts. The risks stem from over 1,000 mine ponds spread all over abandoned minefields along Jos Plateau. Edun, 2013; Wapwera, 2005 and Faden, 2015 asserted that many of the mining ponds within major roads, farmlands and human settlements in communities with higher levels of radiation led to mysterious deaths in areas that used high levels of monazite-rich sand for building. The presence of 1,100 to 4,000 tin and columbite mines, abandoned after the mining boom of the 1960s, now poses serious health hazards to close to 2 million residents in Jos. Most of these abandoned mines when flooded become death traps where citizens drown. This has been compounded by their exposure to 325 km² of contaminated land coupled with the presence of carcinogenic radioactive materials and the littering of brain damaging mining wastes in the Jos plateau area (Edun, 2013; Wapwera, 2005; Faden, 2015).

There are other instances of fatalities that occurred as a result of mining in the Madaka Rafi Local government of Niger State in 2015. The outbreak was far more devastating along the Kawo village area near to the lower stream of the River Kaduna tributary known for the mining of gems and gold. The debacle was characterized by a seemingly exploitative patronage by wealthy dealers of poor artisanal miners operating illegally with risky techniques and little considerations for environmental hazards. Under those conditions, sediments from washed gems and gold on nearby streams flowing down Kawo village turned into a nightmare when citizens unknowingly utilized lead poisoned water for domestic needs from the stream. This exposed villages to deadly poisoning that resulted in many fatalities (Nmodu, 2015).

There are instances of health risks associated with the illegal mining of lead that lead to poisoning and the death of 400 children in 2010 in Zamfara state in Northern Nigeria (Katz, 2010) and water contamination threats from coal mines in the Enugu area. Of great danger to the ecosystem are the 2000 dug pits from gold mining in the Igun-Ijesha area of Ogun state and the fact that the menace of illegal mining in Afikpo, Ebonyi state continues to ravage communities in the area (Merem, 2016c).

The improvement in the use of geospatial information systems in tracking the patterns and forms of mining impacts in the country and the challenges from mining activities can be analyzed by taking an indication from other studies where GIS served a vital purpose in pinpointing the spatial dimensions of ecological liabilities (Merem, 2016a).

2.2 Policy and Regulatory Framework

To regulate mining activities and combat the negative externalities in the solid mineral sector in Nigeria, the Federal Government through the federal ministry of solid minerals

formulated laws that govern the sector. The review of critical aspects of Nigeria’s Minerals Prospecting Mining and Quarrying Acts as drafted by Adeoye (2010):

1. Ownership and Control of Minerals
2. Pre-Conditions for Commencement of Development on Mining Lease
3. The submission and approval by the Mines Environmental Compliance Department of all Environmental Impact Assessment Studies and mitigation plans required under applicable environmental laws and regulations; details of the project, conclusion of a Community Development Agreement and evidence of compensation to all users of land within the Mining Lease Areas.
4. Environmental Considerations and Rights of Host Communities.
5. Offences and Penalties for violators.

3.0 SWOT Analysis for the Solid Mineral Mining Sector in Nigeria.

The solid mineral mining sector can be seen as a potential player in the foreseeable future of Nigeria. It offers many opportunities in spite of the unprecedented challenges and threats it faces. Using publicly available information, the major strengths, weaknesses, opportunities and threats were analysed for the sector and summarised in Figure 1.

	Favourable	Unfavourable
Internal	<p>Strengths</p> <ul style="list-style-type: none"> • Economic growth and development across all regions of the country • Diversifies economy • Reduces dependency on crude oil • Provides raw materials for domestic industries and exports. • Employment opportunities 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Capital intensive • Unfavorable government policies • Weak regulations and enforcement • Poor access to international markets • Inadequate technical knowhow
External	<p>Opportunities</p> <ul style="list-style-type: none"> • Harnesses the local content of the nation • Economic diversification and independence • Wealth creation • Prosperous and sustainable communities 	<p>Threats</p> <ul style="list-style-type: none"> • Inadequate political will • Delays in policy making processes • Lack of funding • Insecurity • Bureaucratic bottle necks

Figure1: SWOT Analysis of mining activities in Nigeria (Authors’ survey, 2018)

Strengths: The development of the solid mineral sector implies even development of the entire region of the country, as the nation is endowed with many different types of minerals. This development reduces economic dependency on crude petroleum that is unsustainable, depleting and falling in value. The presence numerous solid minerals in large commercial quantities can be harnessed for economic growth and diversification. The sector offers goods for domestic and international capabilities. Some of the resources in the Nigeria’s solid mineral mining sector include Coal, Lignite, Coke, Gold, Columbite, Wolframite, Tantalite, Bitumen, Iron Ore and Uranium, among others. Proper utilization of the sector provides employment opportunities to even the unskilled and uneducated masses.

Weaknesses: The sector due to its nature is capital intensive, considering the heavy-duty machinery involved in extracting, crushing and transporting the materials. Unfavorable government policies coupled with inadequate political will are major challenges facing the sector. Inadequate legislations and enforcement institutions guiding mining activities in relation to international best practices is another major factor militating against the

development of the sectors. Often, the miners have no direct access to international markets. Hence, the products will have to go through middlemen that pay very low.

Opportunities: The solid mineral mining sector will do well if the policies on existing sustainable practices are reviewed and feasible opportunities and practices researched upon and adopted. Given the opportunity to strengthen, it will encourage the institution to explore the local content in our products. If the sector is fully harnessed, it will reduce the country's over-dependence on oil offering economic diversification, create job opportunities and reduce youth unemployment challenges, thereby providing economic independence. As the sector offers unique capabilities, it offers the opportunity of employing less damaging sustainable practices in harnessing and exploiting resources.

Threats

Delays in policy making processes, the absence of funds for project take-off, bureaucratic bottlenecks in the chain of governmental affairs and loose regulations guiding mining activities are some threats faced by the sector. The current level of insecurity across the nation is another major threat to the growth and development of the sector. These are negatively affecting the sector, resulting in slow growth and development and delaying all the benefits to be enjoyed from this sector. A change and/or review in policies and mining laws where necessary should be adopted. The promotion of public awareness among local dwellers about the disadvantages of unregulated mining activities should be created.

4.0 Solving The Problem

As the sector offers unique capabilities, the following strategies are to be considered in reducing and solving the problems associated with solid mineral mining in Nigeria:

Closing illegal mines and reclaiming sites: The strict and swift closing of illegal or unregulated mining activity will set an environmental precedence within the industry. Reclaiming the land back to its original or near original form should be of utmost priority. The entire reclamation process should include: removing hazardous materials, reshaping land, restoring topsoil and afforestation.

Scrapping mining and recycling: As environmentalists are advocating less use of raw materials like wood, metal, stone, plastic and others by reducing the amount of waste and steering production towards the sole use of sustainable goods that can be easily reused, re-manufactured or recycled, the mining industry can begin to reduce its waste generation.

Better legislation and regulations: The lack of efficient policy frameworks vital in the orderly enforcement of regulatory standards guiding mining activities stands as a key constraint in Nigeria (Merem *et al.* 2017). Standard legislations and flexible policies concerning the efficiency of the industry should be the government's priority.

Improving environmental performance: By systematically examining environmental impacts and adopting measures to mitigate these impacts, it is possible to make mining less destructive to the environment.

Investing in research and development: There is the need for investing in research and where feasible opportunities and practices should be reviewed and adopted. This is needed in order to fit in with the ever-changing paradigm of commitment to sustainability. The solid mineral mining sector will do well if policies on existing sustainable practices are reviewed

5.0 Conclusion

Solid mineral mining is an important economic activity that changes environmental conditions adversely through widespread environmental degradation. Cases of human fatalities prompted by mining remain widespread as well. However, mining operations also have positive impacts on the environment if sustainable and modern methods are adopted. Considering the fact that mining activities in Nigeria are operating below capacity, efforts should be made to review the laws and enforce them to minimize casualties.

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