



Africa's Mining Industries and China's Involvement: Sierra Leone as a Case Study

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Abstract—The African mining industry is increasingly embracing cleaner production (CP), all be it at a slow pace. This paper investigates how the involvement of China is coming to an increasing rate, by means of involvement in the gold mining sector, diamond mining sector and the likes assisting towards sustainable developments. Mining and sustainable development are not contradictory terms. This paper will examine how the sustainable development principles are applicable within the mining industry. The future of the extractive industry is inseparable from the global pursuit of sustainable development. The mining industry is contributing to sustained growth and prosperity of current and future generations through the integration of economic progress, responsible social development and effective environmental management. Sierra Leone is particularly rich in mineral resources and is one of the leading raw material exporters in the world. Sierra Leone on the other hand, is a water scarce country with mining activities often located in areas with limited water resources. The main challenges faced by the mining industry include proper water and electricity management among others. The implementation of cleaner technologies could be a solution to these challenges. Environmental management accounting and sustainability reporting are tools available to assist the mining industry to successfully achieve sustainable development.

Keywords— Africa's mining industry, China's involvement, Development.

I. INTRODUCTION

The mineral industry of Africa is the largest mineral industries in the world. Africa is the second biggest continent, with 30 million km² of land, which implies large quantities of resources. For many African countries, mineral exploration and production constitute significant parts of their economies and remain keys to economic growth. [1]Africa is richly endowed with mineral reserves and ranks first or second in quantity of world reserves of bauxite, cobalt, industrial diamond, phosphate rock, platinum-group metals (PGM), vermiculite, and zirconium.[2] Gold mining is Africa's main mining resource. The Central African Mining and Exploration Company (CAMEC), one of Africa's primary mining enterprises, is criticized for its unregulated environmental impact and minimal social stewardship. In the spring of 2010, retired British cricket player Phil Edmonds' assets were seized

by the United Kingdom's government due to CAMEC's illicit association with self-appointed Zimbabwean President Robert Mugabe.[3] CAMEC recently sold 95.4% of its shares to the Eurasian Natural Resources Corporation. It is under restructuring and is no longer trading under the CAMEC brand. The mining industry of Sierra Leone accounted for 4.5 percent of the country's GDP in 2007 and minerals made up 89 percent of total export revenue with diamonds accounting for 65 percent of export revenue in 2016. [4]The main minerals mined in Sierra Leone are diamonds, rutile, bauxite, gold, iron and limonite.[5]

Mining in Sierra Leone has been seen as one of the key factors for instability in the country and one of the reasons for the country's recent civil war.[6] Traditionally, benefits from diamond mining have ended up with private companies and corrupt officials rather than the country's government and people. [7]The Ministry of Mineral Resources is responsible for the management of the country's minerals sector and the Mines and Minerals Act 2009. Sierra Leone is a candidate for the Extraction Industries Transparency Initiative (EITI). GoSL publishes data on licenses and payments by mining companies in their Online Repository established by Revenue Development Foundation, the repository was launched in January 2012.[8]

Africa has in the previous decade profited from ceaselessly expanding interest in the mining sector and is turning into a fully fledged player in the planet economy thus of the mining blast.[9] Development sought after for mineral assets originating from rising nations has changed Africa, which beforehand got little consideration from the venture group, into a noteworthy digging goal for mining organizations from Europe, North America, China, and obviously South Africa. Be that as it may, there is open deliberation around what the advantages of mining are and whether African over segments have figured out how to catch a share of mining incomes and whether they will have the capacity to utilize this income to bolster supportable financial and social improvement on the landmass.[10] Africa has offered to ascend to various worldwide mining mammoths, for example, Anglo American (now situated in London), Billiton (now BHP- Billiton) and Anglo Gold Ashanti.

South Africa and Zimbabwe hold the main part of worldwide platinum saves, and the Democratic Republic of Congo has gigantic generally un- tapped mineral riches.[11] It is critical to highlight, in any case, that notwithstanding the continent's huge saves, Africa is additionally turning into a key industry player with nations like Botswana now leading the

world in precious stone creation and deals. Created nations have demonstrated an increased interest in Africa, in light of the fact that the mainland is plainly a noteworthy potential wellspring of crude materials needed to fuel the request originating from blossoming industry. Plainly, it is basic that Africa's mineral riches is taken advantage of in a feasible and socially capable way.[12]

In any case, the contribution that the mining business is making towards improvement is now and again energetically challenged. It is surely genuine that the path in which the division rules certain national economies can here and there frustrate the improvement of different exercises.[2] The mining part needs to manufacture capacities of the up and coming era of mining experts through joint effort between government, industry and the scholarly world. This paper contends for the part of the scholarly community in support of limit working in the mining segment.[13]

II. BACKGROUND OF THE RESEARCH GENERAL SITUATION OF THE AFRICAN MINING INDUSTRY

Mining companies and governments across Africa are at the sharp end of investors coming in, going through labour, mining community and media scrutiny. Over the past 12 months, we have seen mining companies seeking to restructure their African interests either through changes in investment intent or through seeking to ring-fence African assets into separate entities to realise more value in those assets of their broader portfolio.[13] Examples are BHP Billiton and Barrick Resources. Some have even listed major impairments (approximately US\$500 million) on new projects due to the lack of supporting infrastructure, such as Exxaro's Mayoko Iron Ore project in the Republic of the Congo. [10]

In the previous edition of the State of Mining in Africa – Striking a balance, we identified the continent as having the strong potential for variability in terms of governance and consistent application of established civil and tax law, caused by a natural societal tendency to pursue the best possible reward for a country's natural assets. In addition, infrastructure in the form of roads, rail, ports, electricity and communications was under development in most countries, with three to five more years of work required to complete current investment plans. [14]From this, we suggested that investment decisions would be strongly influenced by the quality of the ore body, with higher-grade deposits being pursued and coming into production, and there would be a strong possibility of lower-grade/marginal projects being underdeveloped.[13]

Of all the mineral opportunities identified across the continent, our research puts the Lufilian Arc (extending from the Zambian copper belt to the Katanga region in the Democratic Republic of the Congo) firmly in the spotlight as a high-activity region.[15] In this year's edition of State of Mining in Africa – In the spotlight, we take a further look at, and reflect back on, our observations to see how the broad industry is progressing. We also follow case studies that, in our

view, provide good examples that support our previous observations and suggest the potential for a competitive environment between nations in the development of their natural resource assets.

A. Geology and mineral resources

After a decade of conflict, Sierra Leone is again emerging as a mining frontier with endless potential –most notably from its infamous diamond resources that were once marred with controversy. A London-based investor and the director general of the country's National Minerals Agency discuss the challenges and potential of mining Sierra Leone. In the structure of Sierra Leone belongs to the West African shield area, eastern plateau region.[16]

A few Neiyalong is a part of the large area of exposed Precambrian crystalline rocks. The western coastal plain is covered by alluvial deposits. Sierra Leone is relatively rich in mineral resources, the main diamond, gold, bauxite, Jin Hongshi, iron, ilmenite, and platinum, tin, niobium, tantalum ore, lignite, kaolin, stone, nepheline syenite, asbestos, etc. [17]

B. Diamond

Sierra Leone diamond reserves of more than 9 million 500 thousand carats, mainly in the southeast region, there are a small amount of distribution in the north, covering an area of about 1/4. Production of diamonds in Sierra Leone, 70% of gemstones, industrial diamonds accounted for 30%. There are two types of mineral deposits in the country. [18]One is the primary diamond ore in the Kimberley rock, the other is the secondary enrichment of the diamond deposit formed by the impact of the river among the proved reserves, the primary diamond mainly located in the eastern part of the Koidu and Tongoh two regions. Proven reserves of 6 million 300 thousand and 3 million 200 thousand carats of diamonds, underground depth of about 600 meters. Placer deposits are widely distributed in the East and south, and are distributed in the northern part of the country.[17]

C. Rutile

Sierra Leone is one of the world's largest natural rutile resources, it has been found that the total amount of rutile resources of about 6 tons, titanium dioxide content in the range of 1.5% ~2%. Mainly distributed in the Western Sierra Leone, the formation of an NW rutile ore belt. The current proven rutile ore has 5 main groups, respectively Gbangbama group (which consists of ore deposits proved reserves of 1.5 tons, about 1/2 of the reserves have been mined), Sembahun mine group (6 Kibi, Dodo mine, Benduma, Komende, Makamatipa and Volume of 2.35 tons), Kambia ore group and Kasila group (not yet proven) Body reserves. Of the 5 mines, the first 3 are in the South and the other in the north in the last two.[17], [19]

D. Bauxite

Sierra Leone is rich in bauxite resources, according to industry insiders estimate the number of resources in the 3 tons. The two areas is mainly distributed in the western part of the

country: one is the northwestern province (Port Loko) and Sheriff; two is the southern province of Mok NJI and Moyamba area Gbonge area. The latter is the traditional bauxite mining area of Sierra Leone. The grade of bauxite 55%~56%. From 1963 to 1995, the Swiss company Alusuisse in Sierra Leone, a wholly owned company SIEROMCO (Sierra Ore and Metal Company) in this area of mining, the highest annual output reached 1 million 500 thousand tons. Stop mining activity. Other major deposits in Sierra Leone include: the Krim-Kpaan deposit in the southern Pojehun region, the Kamakwie and Makumre deposits in the Northern Province.[16], [19]

E. Iron ore

The iron ore resources in Sierra Leone are mainly distributed in the north and northeast of China, and the Sura greenstone belt is the most concentrated in the central part of the country. Among them, the northern province of Don Kerry Lee (Tonkolili) the largest area resource potential, 2010 identified resources 128 tons (including Kasafoni, Marampon, Numbara and Simbili 4 deposit to determine resources, resources and resources that presumption), as one of the world's largest magnetite, the average grade of more than 30%.[19] In the northeast of the potential Marampa and the surrounding area, Marampa is Sierra Leone traditional iron ore mining area, Sierra Leone Development Company British company (DELCO) in the area of continuous mining for 40 years, 1975 bankruptcy liquidation. At Present, some low-grade minerals in the region, according to the Australian Golder Associates company recently completed a preliminary evaluation report, the region's iron ore resources are estimated at 1.97 tons, the average grade 28.5% 9.8 Gold. The gold resources in Sierra Leone are mainly distributed in the central region, and there is also a small amount of distribution in the northern and Eastern regions. The specific distribution in the central part of the Sura Hill (including Sonfon, Maranda and Yirisen Lake area), Kangari (Baomahun Makong, especially in the mountainous area, Nimini and Makele) in Kamakwie-Laminaia and Gori; the north mountain area.[5]

III. DEVELOPMENT CHALLENGES

Sierra Leone is a small country in West Africa, but rich in diamonds, bauxite, rutile and iron ore resources. Especially it is found in recent years a large number of iron ore and bauxite reserves, coupled with the new law issued in recent years, has a great impact on the mining investment environment, has been paid more attention to international mining industry. It's only 71740 square kilometers, and the current population of Sierra Leone is 6,703,938 as of Thursday, April 20, 2017, based on the latest United Nations estimates. Sierra Leone population is equivalent to 0.09% of the total world population.[20] Sierra Leone ranks number 107 in the list of countries (and dependencies) by population. Despite its population, many people still know it from the movie "blood diamonds. As one of the major exporters of diamonds in Africa, with two hundred million dollars in diamonds in Sierra Leone every year, and

during the war, the money falls mostly on the rebel pocket, for the purchase of the weapons of war. [16], [18]

This is also the cause of Sierra Leone years of war. Which happen to be one of the greatest challenges in the country's history? Every diamond here is stuck with the miners or the blood of war victims.[6], [7] So the diamond here is called "blood diamond", in the blood by the drill ignited the flames of war, Sierra Leone has experienced 11 years of suffering, until the end of the civil war in 2002, this vicious cycle is to stop. In fact, Sierra Leone has not only diamonds but also a wealth of bauxite, rutile and iron ore resources. Especially in recent years, a large number of new reserves of iron ore and bauxite have been discovered, which has been paid more attention by the international mining industry.[18]

From a report updating Apr 20, 2017, stating that until the outbreak of Ebola in May 2014, Sierra Leone was seeking to become a transformed nation with middle-income status, but the country still has high youth unemployment, corruption, and weak national cohesion. It continues to face the daunting challenge of transparency in managing its natural resources and its fiscal policy. Problems of poor infrastructure and widespread rural and urban impoverishment persist in spite of progress and reforms.[12]

IV. CHINA'S INVOLVEMENT IN SIERRA LEONE MINING

There is no doubt that mining in Sierra Leone has been attractive to Chinese investors. Under the former President Ernest Koroma, Chinese involvement in Sierra Leone has significantly expanded. Under Koroma's headship, Chinese resources have been poured into a new freeway system, a hospital, and a \$318 million airport.[14] It is the last of these investments that has received particularly sharp criticism. Both the World Bank and the IMF have criticized the project, suggesting that this hugely expensive project is a poor use of resources when Sierra Leone is still recovering from a devastating Ebola outbreak. It is projects like this that informed Tillerson's criticism of China's "predatory loan practices" in Sierra Leone. [21] According to statistics from the Ministry of Commerce, the National Bureau of Statistics of the, and the State Administration of Foreign Exchange, in 2013, mining of oil and gas and non-oil and gas minerals attracted approximately 24.7% of China's total direct investment in Africa in that year, and Sierra Leone being a top producer and as of the end of 2013, the accumulated direct investment from China in mining in Africa reached as a whole reached US\$6.92 billion, amounting to 26.4% of China's accumulated direct investment in Africa.[14]

In order to overcome shortages of essential mineral commodities, as well as to secure long-term sustainable supplies for its ambitious economic development strategy, the Government of China empowered and encouraged a number of domestic state-owned and private companies to actively pursue mining deals throughout the world especially in Sierra Leone. Since this strategy, also known as "Two Resources, Two

Markets”, launched in 2006, Africa quickly became the most desirable region for China and Hong Kong based companies hunting for mining deals globally.[14], [15], [22]

The scale of China’s expansion in Sierra Leone is just a mind blowing. In less than 10 years since Chinese authorities called for mineral resources diversification globally, the number of major mining/ mineral processing assets in the country with Chinese headquartered companies interest, increased tremendously.

A wide variety of corporate entities have contributed to this formidable expansion, including mining, mineral processing, metallurgical, manufacturing, power generation, infrastructure development companies, as well as investment banks, research institutes and even individuals. The forms of mining deals that China employs in Sierra Leone are also very diverse and involve direct investments in mining projects, infrastructure investments-to-mineral resources “trade-in” deals, joint ventures, indirect investments, off-take agreements, options and a variety of other structures.

1) Chinese Enterprises and Mining Industry in Sierra Leone as Prospects for Development.

The People's Republic of China and the Republic of Sierra Leone established diplomatic relations on July 29, 1971. Since the establishment of diplomatic relations, bilateral relations have developed smoothly. In 1971, the Cypriot Trade payment agreement. 1989, the two countries signed a trade agreement. In 2001, the two countries signed an agreement on investment promotion and protection. April 2009, the two countries set up a joint economic and Trade Commission and held the first meeting in Sierra Leone. [14]2010, the bilateral trade volume was \$109 million, an increase of 67.4%, of which China exports 98 million 350 thousand US dollars, US \$10 million 770 thousand.

Officially, China provided eight types of foreign aid in the Mining Sectors in Sierra Leone: Complete projects, goods and materials for miners including mining equipments, technical cooperation, human resource development cooperation providing logistics and mining necessities which miners can't go without, medical assistance, emergency humanitarian aid in other sectors of life and creating volunteer program teaching on hygiene and debt relief. China's aid to Africa covers a wide array of fields, such as agriculture, education, transportation, energy, communications, and health. According to Chinese scholars, since 1956, China has provided almost 900 aid projects to African countries, including assistance supporting textile factories, hydropower stations, stadiums, hospitals, and schools. [23] But the involvement in mining is so far on the rise, and Sierra Leone has been benefiting greatly since the involvement of China. Despite commodity prices falling dramatically between 2011 and 2015 and in between the Ebola outbreak. China has remained a dominant investor in the Sierra Leone Mining Industry break, as the continent has enough mineral resources to meet the resource-hungry

nation's development needs, as well as other developing African Countries. Sierra Leone China signed a mining co-operation agreement last month due to the recent 813-carat diamond which was sold at closed auction in London last month for £51m. This agreement has enabled the two countries to collaborate on exploration and the creation of the two country's geo scientific knowledge, reciprocal investments skills development, environmental issues, research and development, and clean-mining technology. China is committed to mining in Sierra Leone apparent from all the deals it is making across the continent. Only last November Chinese state-owned company Shandon Iron and Steel revealed it will invest heavily in Sierra Leone Mining Industry.[14], [22], [23]

2) The Growing Influence of China in Sierra Leone

Since July 29, 1971, when President Siaka Stevens marked political ties with the People's Republic of China (PRC), so much water has flown under the extension of that formal relations hip, one that has characterized this longstanding association with frequently clashing interests. The connection amongst China and Sierra Leone are for the most part positive, with China putting cash into Sierra Leone in return for access to some of Sierra Leone's Diamond mines. Sino-Sierra Leone participation of common advantage begun from 1984. The Fujian-Africa Fishing Company of China marked angling collaboration contracts with the Okeye Agent Company of Sierra Leone. The Company of International Cooperation on Agriculture, Husbandry and Fishery of China likewise marked a few contracts of common advantage with Sierra Leone. Sino-Sierra Leone joint endeavours and China-subsidized endeavours have begun their business in Sierra Leone since 1985.[23], [24]

China and Sierra Leone consented to a social arrangement since April 1981 and from that point forward, the social designations from the two nations have traded many visits. China started to acknowledge Sierra Leonean understudies from 1976 by providing scholarships and financial aid in many aspects. And at present, they have introduced Mandarin Chinese Language Studies in Colleges and Universities in Sierra Leone. Especially in the Fourah Bay College of Sierra Leone.[17], [24], [25] Since March 1973 till date, China has sent in hundreds of Medical practitioners to assist in health to Sierra Leone for work. The Chinese restorative groups returned back in view of war-created disorderly circumstance in Sierra Leone. Since December 2002, China has started to re dispatch its restorative group to Sierra Leone. In March 1984, Hefei, the capital city of East China's Anhui Province, set up a sister-city association with Freetown, the capital of Sierra Leone.[26]

3) Chinese Investment Boosts Sierra Leone Mining Outlook

As per Fitch-subsidiary market examiner BMI Research, the proposed venture of US\$700 million in an iron metal handling plant in Sierra Leone by Chinese state-claimed mining organization Shandong Iron and Steel flags the nation's long haul responsibility regarding mining in Africa. Chinese state-

possessed mining organization Shandong Iron and Steel declared on 4 November 2016 that it means to put \$700 million in an iron metal preparing plant in Sierra Leone. The speculation will happen at its Tonkolili mine and will add up to the biggest mechanical interest in the nation's history.[27]

Shandong at first purchased a 25% stake in Tonkolili from UK's African Minerals in 2012 and after that bought the rest of the value at just \$170 million in April 2015 as African Minerals needed to quit working the mine, as per BMI, because of the Ebola emergency and obligation issues. [4]. This takes after a developing pattern of western diggers hauling out of the locale inferable from increasing expenses and obligation burdens being supplanted by hazard tolerant, government-supported Chinese financial specialists. All the more, by and large, the motivator to put resources into the area comes from an extremely positive year for iron mineral, with worldwide costs rising 81% more than 2016, in accordance with BMI's view that China has been giving extra framework boost measures that have propped up costs.[27], [28]

4) Integrations of The Mining Sectors with Corporate Strategies

By and by, there are 30 Chinese organizations working in Sierra Leone. Their essential reason: an enormous business enthusiasm to contribute and extricate Sierra Leone's mineral assets. While African Minerals and London Mining is by all accounts picking up grounds on this huge wander, the Chinese are on a "remain by" holding up to make a monster passage into Sierra Leone's mineral fields. Chinese organizations are on the quick ascent in the nation, playing a technique to vanquish a large portion of these mining fields in the nation. China might hope to grow its hover in the mining business with a gigantic whole of ventures arrangements. [29]

In any case, taking a gander at China as an infrastructural engineer for Sierra Leone, they have gained huge ground on the Freetown urban scene from the multi-utilize national stadium to Youyi building (pastoral complex). Over the previous decades, they have fabricated scaffolds, control, control transmissions, a dam and a few streets. All the more as of late, the Chinese contractual workers wrapped up another remote service fabricating, extra workplaces for parliament and the 100-bed China-Sierra Leone companionship healing facility at Jui, outside of Freetown. What's more, President Ernest Bai Koroma, right on time in July 2013 marked an arrangement with Chinese Railway International Company to assemble a new airplane terminal and a railroad measuring in the aggregate of \$8 billion. Hence, China has fundamentally supported some level of financial development for Sierra Leone.[23], [24], [27]–[29]

V. DISCUSSIONS

The development of mineral assets can have altogether different ramifications, and outcomes, for groups, governments, the mine designers themselves and even nations and locales in which mining exercises occurring. A relative point of view

uncovers not just the expansive difference in light of a legitimate concern for different partners. However the extensive variety of conditions under which mineral misuse happens, particularly in Africa. [2], [13]

The many contending interests and results recommend the significance of a mutual vision to purposely, and proactively, make the approach space which secures the interests of partners at all levels. In Africa, for a really long time, it has been taken as given that there are dependably washouts and victors in mineral extraction forms. Unquestionably the more extensive interests of a few partners, remarkably groups and maybe even states have been a long way from secure. Africa's large amounts of neediness, its separate infrastructural decits, and its proceeding with the frail voice in arranging mineral improvement contracts are adequate proof of this. The Africa Mining Vision, received by the Heads of State and Government in February 2011, tries to change this. It advocates for "Straightforward, fair and ideal abuse of mineral assets to support wide based maintainable development and financial advancement". [2], [16], [20] At the focal point of the Vision is a formative express that coordinates the mining area into more extensive social and financial formative procedures. This is an endeavour not exclusively to address the sector's confinement from standard social and financial exercises, however, to make win-win results for all partners and outside speculators. [16]

Among the numerous lessons to be learnt from the Nordic nations is that asset-based industrialization is conceivable. Be that as it may, Africa's financial condition is altogether different. Africa confronts various section boundaries and a shortage of limit. However, on a very basic level, Africa needs to move centre from just mineral extraction to considerably more extensive formative objectives in which mineral strategy coordinates with improvement approach. This is the focal thinking in this report - that the continents unlimited mineral assets can assume a transformative part in Africa's improvement just in the event that it assembles suitable social and financial advancement linkages that meet national and local formative targets. Such linkages are obviously various - whether this is concerning enhancing value and straightforwardness in income gathering and appropriation; incorporating little scale mining into provincial economies, consequently enhancing peoples vocations; or connecting mineral extraction to foundation improvement and the making of items that bolster societal necessities.[2], [15] It is in such manner that the Africa Mining Vision is purposely aspiring lately ambitious. This is what is required to change the way and predetermination of Africa's industrialization particle and battle against destitution. The acknowledgement of the Vision relies on solid political will and a pledge to creating solid proficient mineral administration frameworks and foundations; an astute comprehension of Africa's relative points of interest in the worldwide mineral esteem chain, augmenting the advantages of territorial coordination, and building hearty organizations.[1]

CONCLUSION

The African Mining industry has been recorded at a rising productivity performance and it continues to play an important role in the economy of Africa as a whole and Sierra Leone as a case study. This contribution to the economy has, however, compromised the integrity of the environment. This has been due to lack of appropriate environmental legislation, lack of knowledge and the focus on financial benefits. [2] The recent focus on the environment has been brought about by promulgation of environmental legislations, as well as the international emphasis on sustainable development. Both ensure implementation of principles of Integrated Environmental Management (IEM) such as the polluter pays, consideration of alternatives to select the Best Practicable Environmental Option (BPEO), bearing in mind the carrying capacity of resources, the precautionary approach and participatory principles of transparency, democracy and environmental training. A further force driving environmental management is possible resultant criminal or civil liabilities, negative publicity and enormous long term financial burdens to the responsible companies that fail to take reasonable measures to prevent or reduce pollution. [3] In order for the African mining Community to comply with relevant environmental legislation and ensure that they are awarded closure certificate, they need to undertake a baseline investigation to know the status of its environmental performance. It is only when the current status is known that monitoring and remediation can take place. This study serves as that baseline.

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