

# The Economic Values of Industrial Minerals and Rocks Deposits in Nigeria to the National Economy

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**Abstract**— This work examines industrial minerals deposits in various parts of the country and their economic values to the nation. Firstly, they provide raw materials to many industries such as construction, glass, paper, chemical, ceramics, metallurgical, and agricultural sectors. Secondly, they provide employment and generate income to the individuals and government. In this study it was found that the use of one industrial mineral in a production process often requires the use of several others; the production of cement from limestone often involves the use of gypsum, clay and some other minerals. Also, one mineral can be used as raw material for several industries; silicon can be used for glass, and ceramic manufacturing industries. Therefore, there is a serious need for government to create enabling environment for investors in the exploration, exploitation and marketing of these minerals. The development of this sector remains an important index in the developmental goals of our dear nation.

**Keywords:** Industrial minerals, economic values, raw materials, employment, income, enabling environment, investors, exploration, exploitation, marketing and developmental goal

## I. INTRODUCTION

It has been increasingly necessary to place emphasis on the potential importance of solid minerals to the Nigerian economy. Most researches have shown empirically, the actual relationship between natural resources and economic growth. Whereas, most of the studies have looked at various resources endowment especially oil and metals, just a few have focused on solid minerals. The quest for diversification of the national economy and in particular, the importance attached to breaking the dominance of crude oil in the export structure of the economy, has led to a focus on the sub-sector.

Hence, this study examines industrial minerals deposits in Nigeria and its economic values to the national economy growth and development. It should be recognized that solid mineral extraction has historically been an important contributor to the national economy in the past.

It has been raised that it is not just enough to list the number of minerals which are in Nigeria and which can attract the establishment of various industries, but it is very important to examine whether the scale of production of these minerals can sustain the operation of industries over time. The scale of production of various minerals in Nigeria is still very low. Mineral raw materials exploitation and production is largely in the hands of small-scale miners whose production are still determined mainly by subsistent needs which cannot meet the huge demands of industries. Large-scale production of minerals is being neglected because of various reasons some of which are listed below:

1) High cost of exploration and exploitation

- 2) Inadequate infrastructural facilities
- 3) Lack of appropriate technology
- 4) Problem of manpower
- 5) Lack of finance
- 6) Mineral resource inventory etc.

The Nigerian industrial environment is fraught with problems associated with poor infrastructures and high level of competitions by imported products. Of these problems, poor infrastructures constitute the highest impediment to the smooth operation of industries in Nigeria. Prominent amongst the infrastructural problems is the epileptic supply of power which places operators of industries with the expensive and unprofitable option of using diesel to power production equipment through electric generators. Close to the problem of power, is the poor condition of our roads especially those linking the rural to urban areas where the factories should be rightly located in order to be close to the source of raw materials. Poor road networks and dilapidated nature of existing roads make it impossible for industries to source their raw materials cheaply. At the market front, Nigerian mineral industries also face the challenge of grappling with a market which they cannot control as a result of the crisis (competition) created by the global economic trend called globalization. Globalization is a world economic programme which creates a common global market thereby removing trade barriers between countries. Under this condition, goods are moved between countries without restriction.

This study is important mostly in an economy whose growth is driven by a single product-PETROLEUM. This research project therefore analyzes the contributions of solid mineral sector to the Nigerian economy with the aim being to seek measures towards achieving an orderly development of the country's mineral resources so as to ensure real economic growth and development.

## II. INDUSTRIAL MINERALS ABUNDANCE IN NIGERIA AND THEIR UTILIZATION

According to the Nigeria Extractive Industries and Transparency Initiative (NEITI), minerals found in Nigeria are classified into one or more of these categories:

- 1) Industrial Minerals: these include barite, kaolin, gypsum, feldspar, and limestone.
- 2) Energy minerals: Bitumen, Lignite, Uranium.
- 3) Metallic Ore Minerals: Gold, cassiterite (tin), columbite, iron ore, lead, zinc, and copper.
- 4) Construction minerals: Granite, gravel, laterite, and sand.
- 5) Precious Stones: Sapphire, tourmaline, emerald, topaz, amethyst, garnet, etc.

The economic potentials of industrial minerals can be better appreciated if we take a look at their abundance and their geographical spread. We attempt to present some

of the naturally endowed minerals present in commercial volume. It is worth to note that the author is experienced in industrial minerals in terms of exploration, extraction, processing and marketing. He was the quarry and marketing of BEES industries Ltd, Ikpeshi, Edo State (A solid mineral processing and marketing company). According to classification due to utilization industrial minerals are mainly barite; kaolin; gypsum; feldspar and limestone. However, our discussion we include special other minerals due to their industrial applications and their significant contributions to the Nigerian economy. These are as follows:

#### A. Limestone:

Limestone deposit is majorly found in Cross River and Ebonyi states but can also be found in commercial deposit in Abia, Akwa Ibom, Anambra, Bauchi, Bayelsa, Benue, Borno, Edo, Enugu, Imo, Ogun, Ondo, and Sokoto, making Nigeria the most richly deposited West African country when it comes to Limestone. The chemical formula is  $\text{CaCO}_3$ . Both Local and international companies are involved in the mining and processing of this minerals, although on a low scale. Some of the companies include some but not limited to Crushed Rock industries Ltd, Stonehill Nigeria Limited, BEES industries Ltd, Freedom Development Company Ltd Goopex Nigeria Ltd, SOMAK Nigeria Ltd and a host of others.

The uses of limestone include the following: a major raw material in cement production; a crushed stone for railroad ballast and road base; raw material in glass manufacturing; raw material for the production of lime and a chemical feedstock; used in blast furnaces for iron purification, with quicklime and slaked lime used to neutralize excess acidity; etc.

#### B. Dolomite:

Dolomite deposit is found in Edo (Ikpeshi, Akoko, and Okpella), Abuja, Kogi, Nasarawa, Kwara, Yobe and Oyo. The chemical formula of dolomite is  $\text{CaMg}(\text{CO}_3)_2$ . Almost all the companies involved in limestone mining in Nigeria are also into dolomite mining. The uses of limestone includes as a raw material in the production of magnesium using pidgeon process; with dolomitic limestone is used in horticulture being added to the soil in order to buffer the soil pH of the water and also as a magnesium source; used in steel industry as a sintering agent especially in the processing of iron ore; used for refractory furnace (building materials, source of carbon dioxide, terrazzo tiles, floor and walls); in flux form it's used in the production of steel; used in the chemical industry to produce magnesia ( $\text{MgO}$ ); used as an ornamental stone; it's a soil conditional and a feed additive for livestock; used in the production of glass and ceramics.

#### C. Iron Ore:

Nigeria has commercial deposits of iron ore which can be found in Agbaja and Itakpe areas of Kogi state with Itakpe deposit being the purest. It can also be found in Abia, Anambra, Bauchi, Benue, Kwara, Plateau and Nasarawa states. Depending on the geology and mineralogy of iron ore deposits it exists in four forms which are: magnetite;

titanomagnetite; hematite and pisolitic ironstone. The two most important iron mineral deposits are the hematite ( $\text{Fe}_2\text{O}_3$ ) and magnetite ( $\text{Fe}_3\text{O}_4$ ).

Iron is the third widely used metal in African and the world as a whole. The uses include: raw material in steel making for automobiles, ships, beams used in building and roads construction, paper clips, furniture, tools and others too numerous to mention; widely used in blast furnaces to make pig iron.

#### D. Tin (Cassiterite):

Tin ore ( $\text{SnO}_2$ ) was discovered in Nigeria as far back as 1884. It is deposited in Abuja, Plateau and Bauchi states. The estimated reserve is believed and expected to help in the promotion of the country's economy even without the exploitation of crude oil which has captivated the mind of the government. In the early 90's Nigeria was well known in tin mining and was the second tin producing country in the world, with Russia been at the lead but because of some much distractions by crude oil, Nigeria is currently in the 13<sup>th</sup> position globally and in Africa, is ranked 3<sup>rd</sup> with an estimation of 570 metric tons after Congo DR and Rwanda respectively.

Uses in include its use to prevent rusting/corrosion by simply using it to coat other metals such as tin can. It is also used to form many useful alloys such as soft solder, pewter, bronze and phosphor bronze.

Phillips and Perron (1980) remarked that tin mining was responsible for the bulk (over 95% annually) of the employment in the metallic mining industry. One result of this is that mining employment in Nigeria is heavily concentrated in Jos Plateau. Kogbe and Obialo (1976) also observed the contributions made by tin mining to the Nigerian economy when they noted that export value of tin mining alone far exceeds the export value of all the other solid minerals put together.

#### E. Coal:

Coal is found especially in Enugu state (the coal city), Benue, Kogi, Delta, Kwara, Plateau, Abia, Anambra, Bauchi, Edo, Ondo, Adamawa and Imo. Coal is a fossil fuel and non-renewable. The mining and production of coal was at its peak in the 1950s, but unfortunately, after the civil war, coal production in Nigeria declined drastically and with the diversion to crude oil, the mining of coal has been removed from the Nigerian natural resources limelight.

Aiyedunn (1996) observed that coal has been an important solid mineral in Nigeria's economic development since 1940s. He noted that the first coal mines in Nigeria were opened in the Udi hills, Enugu in the 1940s. Since the 1970s, new mines have been opened in the Okaba area of Benue State and Lafiagi-Obi in Kwara State. Available estimate put Nigerian coal reserves at 800 million metric tonnes out of which only 12,965.5 tonnes was to be mined in 1994. Coal mining is perhaps the only segment of the domestic-oriented mining activities to experience depressed conditions. The major consumers of coal were the Nigerian Railways Corporation (NRC) and the Power Holdings Corporation of Nigeria (PHCN) but have over the years increasingly changed to other energy sources such as diesel, gas, petrol and water. Besides, coal has never been a

popular domestic fuel. Moreover, Nigerian coal has never been suitable for coking until recently when technological advancements made coking possible by which time of course cheaper sources of energy had become available to Nigeria. Coal has been the only mineral that has all along been mined only by the government owned Nigerian Coal Corporation (NCC).

Coal is used as fuel for electricity; it is used in steel and cement industries as a fuel for extraction of iron ore and for cement production; it is also used in paper, brick and limestone processing, while coking coal or metallurgical coal is mainly used in steel production.

#### F. Gypsum:

Gypsum is found in states like Edo, Adamawa, Anambra, Bauchi, Bayelsa, Benue, Borno, Delta, Gombe, Imo, Kogi, Ondo, and Sokoto. It has the chemical formula as  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ . One – third of Nigerian states have been reported to possess gypsum deposits, despite this. Nigeria still imports gypsum. In 3 years, Nigeria imported about twenty billion worth of Gypsum. Uses of Gypsum includes application in manufacturing of chalk, wallboard and plaster of Paris; it is also used in agriculture in the production of fertilizer, in soil conditioning; for cement production is a hardening retarder; gypsum alabaster and satin spar are used for numerous ornamental purposes; in food creams, shampoos, and other hair products. Finally, it is used in the removal of pollutants from contaminated water such as arsenic or lead pollutant.

#### G. Feldspar:

Feldspar is found in Ajaokuta (Kogi state), Abia, Ogun, and Ondo state. It is one of the most abundant minerals found on the earth's crust. The mining of Feldspar is commercially viable because of its numerous uses and there are many companies in Nigeria that engages in the extraction, processing and production of this mineral such as Stonehill Nigeria Limited, Onshore Frontiers Limited, Freedom Development Group of Companies and lots more.

Uses of Feldspar include their application owing to their alkali content and alumina in industries; use also in the production of floor tiles, shower basins and table wares. Thirdly, it is used in the manufacturing of ceramics and glass such as glass for drinking, protection glass and fibre glass for insulation. Finally, it is also used as filler in paint, plastics and rubber.

#### H. Kaolin (China clay):

Kaolin is found in States like Edo, Adamawa, Borno, Abia, Delta, Ekiti, Kaduna, Katsina, Kogi, Ogun, Ondo, Oyo and Plateau state. It is estimated that Nigeria has about 2 billion metric tonnes of the resource. The chemical composition is  $\text{Al}_2\text{Si}_2\text{O}_5$ . Kaolin has many uses and in order to promote the growth of kaolin local industries in Nigeria, the importation of this mineral resource was banned.

Uses of kaolin includes: used in the manufacture of ceramics, china and porcelain; used in the manufacture of paper, rubber, paint, and many other products; used in white incandescent light bulbs as a light diffusing material; fourthly, it is used in cosmetics or facial mask or soap; it is also used in modifying the properties of rubber upon

vulcanization; in agriculture it is used to prevent sun scald for apple, and also to prevent insects from crops when used as a spray. It is also used in the treatment of water as adsorbents and finally used in the diagnostic procedure to induce blood clotting.

#### I. Barite:

The states where kaolin is found in Nigeria include Cross River, Benue and Plateau state with vast deposits concentrated in Cross river state in the following areas: Obubra, Yala, Ikom, Biase, Yakurr and Obanliku LGAs. The chemical formula is  $\text{BaSO}_4$ , a mineral primarily composed of barium sulphate. The current mining of the resource just like others is still not well developed as such is still being imported.

The uses of barite include its used as a weighting agent in drilling muds balance; it is also used as a pigment in paints, weighted filler for paper, cloth and rubber. Thirdly, it is used in radiology for x-rays of the digestive system and finally used as a substitute for minerals and organic materials for wood, shells and fossils.

### III. ECONOMIC VALUES OF INDUSTRIAL MINERALS TO THE NIGERIAN ECONOMY

The industrial minerals sector of the economy is the second most viable sector after the oil industry. The importance of the sector cannot be over emphasized in view of its potentials. Some of the economic values include its ability in providing raw materials to many industries such as the building and construction companies. Secondly, it provides gainful employment to our citizens and a means of livelihood to business men and women. Also, industrial minerals sector is a major source of revenue to the government in form of tax and royalties. It is also a source of foreign exchange earnings as most of the products and by – products can be exported, although this area is heavily untapped because of the low processing capacity of our local industries and availability of more quality foreign products from foreign competitors. More so, the sector can be a source of provision of basic social amenities to the host communities in terms of roads, power, schools, market, and pipe born water, scholarship, etc to the rural areas.

Industrial mineral resources development will give a sense and meaning to our political independence by making us more self-reliant and since by their very nature, mineral occurrences are politically neutral, uneven distributed geographically and do in fact straddle national and state boundaries, their systematic and conscious development cannot but enhance national unity. A lot of opportunities exist in mineral development for both the domestic and export markets. Minerals mined in the country are still largely exported with little or no value addition. Where some of those minerals are mined and processed in the country before being sold in the export markets, most of the associated minerals are dumped in waste piles by miners e.g. gemstones, gold, tantalite etc. This is due to the fact that the miners and processors have little or no access to capital to buy processing equipment to beneficiate these minerals into forms acceptable to the relevant industries. Development of mineral resources can

draw many national and international benefits some of which have been highlighted. The federal ministry of mines and steel development rightly noted the following mile stone contributions of the solid minerals industry to the Nigeria economy which include:

- 1) Mining was a significant driver of industrialization and development in Nigeria.
- 2) Coal mining gave birth to the railway industry.
- 3) With tin ore mining and processing came the establishment of the first power plant.
- 4) With the discovery of iron ore came the establishment of steel plants and steel rolling mills.

#### IV. CONCLUSION

The availability of local and international markets for solid minerals in general and industrial minerals in particular is compelling well-meaning nations of the world to shift focus on their naturally endowed industrial minerals. There exist, in the first instance a need for diversification of the nation's economy and on the other hand the potential benefits in coming out of the "stigma" of a monotony economy which has led to a paradigm shift to the development of solid/industrial minerals sub-sector.

The Nigeria industrial minerals sub-sector is and remained an essential segment of the economy with a great promising brighter future. It is expected to contribute to the country's real gross domestic product, rgdp (a measure of nation's economic growth and development), capital accumulation and real exchange rates.

Therefore, the improvement in this sector is a critical factor in our quest for enhanced standard of living and should be a vital desire of the government to leverage on the numerous opportunities.

#### RECOMMENDATION

The current performance of the industrial /solid minerals is grossly unacceptable as the industry is saturated with illegal and small-scale miners without adequate capital for investment in exploration, quarry, processing and marketing. It is therefore recommended that government should invest more on the sector to increase citizens' participation and attract foreign investors into the sector to enable the operators meets global demand of their products.

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