

# Geographical Survey of Nigerian Mineral Resources: A Step toward Planned Development

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## Abstract

The geographical survey of Nigerian Mineral resources – A step toward planned development is the determination of mineral resources that are within her territory, and it exploited wisely become useful to man. The minerals are associated with two main types of rocks found in Nigeria. They are the basement rocks and the sedimentary rocks. Nigerian mineral resources have been classified into four main groups of the fossil fuel, metallic, non-metallic and radio-active minerals. Exploitation of these minerals can if properly organized, serve as tourist attraction, where tourist are attracted to such site or environment either for relaxation, recreation or for educational purpose. There are opening for the untapped minerals to be exploited for development of the entire country.

**Key words:** *Geographical survey, Mineral resources, Nigeria, development, Tourism.*

## 1. INTRODUCTION

One responsibility of ideography or earlier geography is to locate what is where. That function remains a vital aspect of geography, but with additional responsibility of explaining why what is where, and how to harness what is where for human benefit. Countries all over the world depend on one another for their successful existence, hence the practice of international trade through which a country purchases those items or goods that cannot be produced locally.

History has shown that there had always been rich and poor nations, strong and weak nations, and developed and developing nations, and that to a relative extent, the wealth of a nation depends on the available mineral resources she has and the level of technological development which enables the exploitation and process of the mineral resources for human consumption and benefit. It is in this regard that a nation carries out geological survey, to determine the mineral resources that are within her territory.

The importance of mineral resources lies on its definition. Oguntoyombo et al, (1978) define it as “any natural concentration of minerals which is useful to man and that can be tapped profitably”. Belloz (2000) said that it “the naturally occurring substances which make up the rocks of the earth’s crust in the form of inorganic substances with definite chemical composition.

The view of this work is that mineral resources are natural endowments which are found in rocks within the earth surface. They are unique resources because they are non-renewable resources. Mineral resources are natural, chemical substances which make up rocks of earth’s crust and they have certain physical and chemical properties that differentiate one from another.

There are over 200 known mineral resources scattered unevenly throughout the earth surface. Some existing in the form of metallic ores (iron, copper, tin), liquid (mercury), fertilizer (potash, phosphate) or organically formed deposit like (coal, petroleum) just to mention a few.

The materials however, are usually restricted to those found in the lithosphere and hydrosphere, from where they are mined. This explains why mineral resources are associated with the type of rocks found in many particular areas. In a broad sense, minerals are those substances which ordinarily will be regarded as rocks, but which have economical values as mentioned above.

Olusegun et al (1999) observed that “there are so many mineral known to man, making it necessary to group them for easy referencing” these include:

- Mineral fuels for power – Coal, petroleum and natural gas.
- Ferrous – Iron ore – used in manufacturing of steel.
- Non-ferrous metals – Copper, Tin, Lead, Aluminum and Zinc.
- Ferro-Alloy Metal: These are metals that are alloyed with iron to produce better steel, like manganese, chromium, nickel, tungsten, cobalt vanadium, and molybdenum.
- Other metallic minerals – Gold, Silver, Platinum, Cadmium antimony, magnesium, beryllium and titanium.
- Some unusual metals – Mercury – Liquid metal, Osmium – heaviest metal, radium – life saving metal plutonium – the metal of tea, uranium – metal of hope.
- Other industrial metals and minerals – graphite, mica, asbestos, pyrites, sulphur, potash, phosphate, borate, diamond, lanolin, gypsum, slate, marble etc.

In Nigeria, we have two types of rocks, the basement complex rocks which comprise both metamorphic and igneous rocks and secondly the sedimentary rocks.

A mineral resource cannot be useful as well as contribute to the wealth of a nation unless exploited and processed, and this is determined by the level of technological advancement of the people and the interest shown, hence North America today is noted for having different types of mineral resources, which is contributing to the wealth of the nation. This has only become useful with the coming of the western European, who colonized the land and its people “the Red Indians”, who are the original inhabitants of the land but do not know of the mineral wealth surrounding them. A similar story is true of the Black Africans who are the original inhabitants of the land of South Africa, who used diamonds as ordinary stones to kill birds and animal, they did not realize the importance of such mineral and other mineral wealth surrounding them until the coming of the Europeans, who exploit and process the mineral resources for the benefit of mankind.

In East Africa, the vegetation resources have an additional dimension, which is tourism. The savanna animals are generating so much money for East African countries, with Kenya having the greatest share. Abegunde et al (1990) noted that as at 1972, Kenya alone received over 328,000 tourists due to its rich vegetable resources, and this has increased yearly.

In like manner, the varied mineral resources can also serve as potential tools for rapid development in Nigeria. Hence, the rapid technological advancement and interaction with other countries not only informed people of the resources within their environmental but could also transform the country from an export of raw material to exporter of finished industrial goods.

A common saying among university of Port Harcourt Geography Undergraduates is “To know the world be a geographer”. This mean that knowledge of geography will help locate important resources in the world and in Nigeria in particular. However, it is not enough to locate a mineral resource, but to know well the environment and the kind of people inhabiting the area.

A town like Jos is experiencing tourism attraction due to availability of tin and columbite mines. Though these activities are now shadows of its old self, but the abandoned mining sites have turned into man-made lakes with beautiful sceneries as well as the added advantage of temperate type of climate within a tropical region. The city of Port Harcourt is also experiencing lot of tourist attraction due to petroleum exploration, exploitation and processing.

### 1.1 NIGERIA'S MINERAL RESOURCES

Nigeria's considerable mineral resources fall into four main groups: fossil fuels, metallic, non-metallic and radio-active mineral (Barbour et al, 1982). Mineral resources contribute about 90% of Nigeria's export by value and aid her industrial development. The location of these minerals depends entirely on the nature of the rocks and on past geological history. Thus we have those associated with basement complex rocks and those that go with sedimentary rocks.

The ability to identify the locations of the various minerals and the terrain of the area is vital for rapid development. Many persons, including foreign partners are not even aware of where these resources are located, apart from crude oil and natural gas and some other minerals like tin, columbite, coal, iron ore and limestone.

This work intends to review to developers areas where various minerals are located, and we believe that following the global standard of mining, this will lead to development and employment of Nigerians.

- **Fossil Fuels:** These are minerals associated with sedimentary rocks. It comprises of crude oil and natural gas, coal, bitumen and lignite. These are found mainly in the area occupied by the Niger Delta, where considerable amounts of hydrocarbons have accumulated – “The River of liquid diamond”. The oil sector in 2000 accounted for 98% of Nigerian export earning and about 83% of the federal government revenue. Nigeria's proven oil reserves are estimated to be 35 billion barrels ( $5.6 \times 10^9 \text{m}^3$ ).
- **Mineral Oil:** It is presently produced in the Niger Delta Region – Abia, Akwa Ibom, Bayelsa, Cross River, Delta, Edo, Imo and Rivers State. The oil sector in 2000 accounted for 98% of Nigerian export earnings and about 83% of federal government revenue. Nigeria's proven oil reserves are estimated to 35 billion barrels ( $3.5 \times 10^9 \text{m}^3$ ). An online source shows that over the last ten years, proven reserves of crude oil have increased from about 25 billion barrels to 37 billion barrels. With greater investment in exploration through new incentives, new fields especially in the Gulf of Guinea are being discovered. The target is to move reserves from their current level to 40 billion barrels, and a production capacity of 3 million barrels per day (MBPD) up from the current 2.5 MBPD by 2015.
- **Mineral Gas:** Gas is certainly more in abundance in Nigeria than oil. Today, about 40% of the associated gas in oil drilling is flared. With an estimated 176 trillion cubic feet, gas will be the cardinal revenue earner for Nigeria in the next five years.

It is associated with the oil fields there are large reserves in Nigeria, leading to the building of a

liquidification plant at Finima in Rivers State. As at 1975, Nigeria produced 661 million cubic meters of Natural gas. (Rediscover Nigeria, 2015) Online source put Nigerian's daily Natural gas production at 1.681 billion scf as at 2014.

- **Coal:** Geological surveys show that there are proven reserves of more than 600 million metric tonnes of coal and indicated reserves of about 2.6 billion metric tonnes. The surveys show that there are different varieties of this resource found in many parts of the country. These include Lignite, Sub Bituminous and Bituminous Coal found in both underground and open cast mines. Coal is spread over 13 States of Nigeria and is currently not being commercially exploited (Rediscover Nigeria, 2015). Coal is found in commercial in Enugu, Okaba, Inyi, Eziam (Enugu State) Lafia (Nassarawa State), Otukpa, Ogboyoga, Odokpona (Benue State) and Afuze (Edo State). The National reserve is about 1.3 million tones (Bello, 2000). It is used for power generation as well as suitable for chemical industries, especially in the production of tar, plastic and synthetic fertilizer. Nigerian coal has been found suitable for boiler fuel, production of high caloric gas, domestic heating, briquettes, formed coke and the manufacture of a wide range of chemicals including waxes, resins, adhesives and dyes.
- **Lignites:** This occurs at Ogwashiliku, Asaba (Delta State), Oba, Nnewi (Anambra State), Orlu; unu-Ezeala and Umuahia (Abia State). The National reserve stands above 30 million tones. Lignites are brown coal suitable for the production of liquid fuels, chemicals and for raising steam.
- **BITUMEN:** This is also known as Asphalt or tar sand, it is an important product of petroleum occurrence, with deposits in Ondo, Ogun, Edo and Delta State. It is an important mineral in



**Figure 1:** Nigerian Map Showing Location of Mineral Resources.

the construction of road as well as anti-rust on roofs, tanks and vehicles. Currently, the bitumen used in Nigeria is processed from imported heavy crudes, in addition to bitumen imported to supplement local consumption. Heavy and extra heavy crude can be extracted from Nigerian tar sands, and sulphur and phenol can be derived from these crude grades. They are also suitable for production of lubricants for plain and roller bearings. The reserve stands little above 58 billion barrels.

#### 1.1.1 METALLIC MINERALS: They include tin, lead, zinc, gold, silver, copper, iron ore, etc.

- **TIN ORE:** (Cassiterite) occurs mainly in Jos Plateau with minor occurrences in Kano, Bauchi, Zaria, Kabba (Kogi State), Ondo and Calabar. As at 1968 the output was 13.839 tonnes with a reserve of 65,240 tonnes. Other mineral that associates with tin ore in Jos Plateau are columbite, tantalite, Woltraxmite, therite and molybdenite.
- **COLUMBITE:** It occurs in association with tin ore. It has an annual production of about 900 tonnes, and Nigeria account for over 95% of the world's production, used for stainless steels, and high temperature super alloys. Oguntoyinbo et al (1983).
- **TANTALITE:** This has an annual production of about 6 tonnes, and it is recovered from slags of tin melt.
- **MOLYBDENDITE:** It is annual production of about 1 tonne.
- **LEAD AND ZINC:** This occurs in the cretaceous sediment of the Benue Trough, with current production rate of about 230 tonnes per year.
- **SILVER:** Is associated with lead and zinc veins and gold placers. It occurs in such small amounts that Nigeria has never been an exporter of silver but could be used to develop the local industry.
- **GOLD:** It is found in alluvial channels in most areas of the country underlain by basement complex rocks, such as in Ife (Oyo State) and Ilesha (Osun State) Kabba (Kogi State), Niger State, Zaria (Kaduna State), Sokoto (Sokoto State). It has a current production rate of about 170 grammes per year.
- **COPPER:** It is associated with lead and zinc veins.
- **IRON ORE:** This is found in Aladja (Delta State) Itakpe, Itobe, and Shin Lanke (Kogi State) and Nsude (Enugu State). It has a total reserve of over 120 million tonnes.
- **MANGANESE:** This occurs in small amounts in the Oban hills, while ilmerite and rutile are ores of titanium found in alluvial concentrates.  
3 also in Nigeria are radioactive minerals such as uranium, thorite and zircon.
- **URANIUM:** It is found in Jos Plateau and Sokoto.
- **THORITE AND ZIRCON:** They are the by-products of tin and are found in Jos plateau.

#### 1.1.2 NON-METALLIC MINERALS: They are found scattered almost all over the states of the Federation.

- **LIMESTONE:** Some states where it is located are Nkalagu (Enugu), Ewekoro, Shagamu (Ogun State), Ukpilla (Edo State) Ashaka (Bauchi), Sokoko (Sokoto State), Cross River State, Gombe State. It is used for making cement.
- **MARBLE:** This is mined at Jakura (Kwara State), Auchu, Ukpilla (Edo State) Igarra (Kogi State), as well as northern part of Sokoto State.
- **CLAY:** This is found in Oyo, Anambra, Imo, Abia, Delta, Edo, Ogun, Kwara and Rivers State, use for ceramic materials.
- **GLASS SAND:** This is available in some rivers, and is being exploited in Rivers and Delta State for glass productions.
- **KAOLIN:** The mineral is mined at Rop in Plateau State, USU in Abia State, and Osile near Abeokuta in Ogun State, with an average annual production of about 200 tonnes.

#### 1.1.3 THE IMPORTANCE OF MINERALS

Mineral resources are of great importance to the nation. They provide:

- 1) Raw materials for some industries. An example is the oil refinery which provides the by products used in the manufacture of paints insecticides, plastics and drugs. Similarly limestone is used in the cement factories at Ewekoro, Nkalagu and Obajina.
- 2) Minerals from the main source of power in the country. Coal is used for fuel in the factories around Enugu, and in operating trains. Gas provides both domestic and industrial fuel, as well as water used for generating electricity.
- 3) The possession of minerals enriches foreign earning of Nigeria that enhances the standard of living of the people.
- 4) Minerals presence and their exploitation provide employment for many people and also lead to the acquisition of new skill. When the benefited individuals pay tax government earning increases.
- 5) Minerals contribute to the growth of towns, and cities. The development of Enugu, Calabar and Port Harcourt are good examples of minerals driven development.
- 6) Exploring from minerals I done through geological survey, leading to the production of valuable geological maps of Nigeria.

Besides the enumerated importance of minerals, it can also serve as tourist attraction and hospitality centers. Quite a few of the deposit potentials in Nigeria has been exploited, because few of them are mined. The aim of this work "Geographical survey of Nigerian mineral resources – A step toward planned development" is to point

out different areas where these mineral resources occur, and to indicate area of less exploitation, and secondly to bring to notice of real business men of the abundant resources begging for exploitation. They need come and harness these abundant resources. For example think of what Nigeria stand to benefit if our bitumen is mined. The heavy crude importation will stop; such fund will be directed to something new. The local industries will employ people that will impact on their families, this will reduce unemployment and improve standard of living. Oguntoyinbo et al (1983) define tourism as a “leisure activity which necessitate overnight or long distance journey...” while chambers dictionary defines it “as a prolonged journey from place to place for sight seeing”. Deducing from the two definitions, tourism therefore involves changes of environment, either for relaxation, recreation or educational purpose.

Note:- Only places of interest can deserve such journey, thus Nigeria mineral deposit sites can serve such interest if properly utilized.

Mineral resources in their natural state may not serve as point of tourist attraction, except in situations where beautiful scenery are formed like beaches, lakes, exceptional imposing hills and caves.

However, if properly managed, students and researchers from outside will converge to places like plateau to study and see the world largest columbite mine.

Mineral resources are natural occurrences tapped by man for his needs. Few of the deposits as shown in the map are mined to attract any purposeful tourist attraction. Incidentally, this has turned into an advantage, since most of the mining sties attract a lot of tourists for educational purposes; and if properly harnessed Nigeria’s foreign exchange earning will be greatly improved.

Coal, crude oil, tin, columbite, marble and limestone are the major deposits mined in Nigeria, while zinc, lead, gold, silver etc are tapped on a small scale, mostly without the notice of the ministry of solid mineral. The process of extracting minerals can attract a population whose aim may be purely educational and sight seeing.

The mineral deposits that come readily to mind for tourist attractions are coal mining at Enugu, tin and columbite in Jos Plateau, crude oil drilling in Oloibiri, Afam to mention just a few, and its refineries in Alesa – Eleme, and limestone quarrying and processing in Nkalagu, Ewekoro, Sokoto etc. They will offer attractive tourist centres if properly planned and implemented.

The art of mining, identification of mined minerals and some environmental problems can be likely areas of interest. Apart from educational purpose, mineral sties provide relaxation and recreational interest. Some areas labeled “badland” as a result of mining activity are also useful. For instance, some bad lands of Jos Plateau have turned into beautiful lakes. Additional touch by man and the provision of some facilities, such as hotel, hostile accommodation, good access routes, regular supply of water and electricity, will attract much interest.

Also, national museum of all the minerals resources and their antiquities can be established in renowned mining sites for posterity.

Private form should see the map attached with this work and identified most of the untapped resources and come for it.

#### 1.1.4 CONCLUSION

The Geographical Survey of Nigerian mineral resources indicate the availability of minerals in specific locations of the country, and this brings about the trend in developmental pattern noticeable in the country.

The location of particular mineral influences the sitting of its major industry and probably down stream industries that might use the major industry’s by-products; and the resultant effect is cities development, employment opportunities and developmental planning, as well as tourism potentials associated with it.

The government should provide enabling environment for entrepreneurs and stand against illegal mining encouraged by unpatriotic elements and dangerous foreign exploiters. Furthermore the communities should view the mining firms as partners and source of development. The firms on the other hand should treat the indigenes as their host.

#### 1.1.5 APPRECIATION

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