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The Solid Mineral Sector and Economic Diversification in Nigeria

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Abstract
The research studied the diversification of Nigeria economy through solid mineral sector. The objectives of the study are; to examine the effect of policy guidelines on solid mineral mining to economic diversification of Nigerian, to explain Government neglect of the solid mineral sector which affects economic diversification of Nigerian, and also it studied how ethnicity affects the production of solid mineral to economic diversification of Nigeria. One hundred and thirty five (135) questionnaires were administered in Zamfara and Taraba states to generate data and one hundred (100) were returned successfully within one year. The following hypotheses were formulated: policy on artisanal mining has no direct relationship with economic diversification of Nigeria, funding of the solid mineral sector does not positively affect economic diversification of Nigeria. The researcher used parametric –z test at significant level of 0.05% to accept or reject the hypotheses and Probit analysis to confirm results. A survey design was adopted in analyzing the hypotheses which led to the findings; that funding was greatly retarding the mining of solid mineral in Nigeria and lack of necessary laws and policies also affects solid mineral mining in Nigeria. Estheticism also contributed adversely on solid mineral mining to economic diversification. In conclusion, it was discovered that poor funding, ethnic sentiment and inadequate laws and policies of government were some of the factors that militate against development of solid minerals and hence diversification of the Nigeria economy. In view of the observations the following recommendations were given by the researcher: that adequate science data relating to solid mineral should be generated by the government to determine the actual capacity of solid mineral in Nigeria, to recover the cost implication, government should issue sale licenses to

investors on the sector at a reasonable price, government should employ Professionals to add value to solid minerals education and investment. Those interested in the solid mineral mining sector should be encouraged by the government by providing an enabling environment on the area of tax reduction, security, infrastructural facility etc.

Keywords: Development, Diversification, Mining, Solid Mineral, Economic
JEL Classification: Q56

1. Introduction

The team of this work is the diversification of Nigeria economy through solid minerals aimed at achieving economic growth and development. Today, Nigeria economy needs to be diversified based on the oil glut in the oil market that has affected price downwards. This situation has contributed that effective implementation of Nigeria budget could no more be sustained. But early in 1970s - 1980s, Nigeria was experiencing a boom economy that even made her to give out loan and aid to some poor countries of the world even sponsored apartheid in South Africa. The boom days was the period Nigeria was playing key role in Economic contribution to the world market of which solid minerals was one of the contributors. That by 1940s Nigeria was one of the major producers of tin, columbite and coal in the world. If Nigeria had sustained her productive capacity (boom) in agriculture and solid minerals till today, Nigeria would have been one of the best economies in Africa. The discovery of oil in 1956 shifted the government's interest from agricultural based economy to oil based economy with little or no interest to the former. With the discovery of oil and price of oil continue to skyrocate to the benefit of oil producing nations, government decided to shift attention from agriculture and solid minerals to oil.

The mining law which was codified under the act of 1999 is handled by the ministry of solid minerals development. The mining in Nigeria is fully occupied by agencies owned by state. In view of this, the general output of agriculture and indeed solid minerals continue to reduce. The solid mineral as separate from liquid mineral is exploited from its natural form in the solid state underground. Okezie (2016) stated that it is the natural deposit of solid state minerals under the ground which are usually mined by individuals, states or Federal government. The liquid minerals are also mined, but are naturally found in liquid or semi liquid forms. There is no doubt that Nigeria is confronted with a huge financial burden partly caused by reduced federation revenues which have been largely sourced from the proceeds of crude oil sales

The reduction in global crude oil prices is not expected to reverse at least in the short run, thus the need to diversify the economy towards improving other sources of revenue. One key sector which offers great potential in achieving this is the solid minerals sector. The solid minerals sector, according to *Nwaob (2011),* had been

targeted by the previous administration to contribute 5% to GDP by 2015 and 10% to the National treasury by 2020. According to Karande and Kulkarni (2016) the government has achieved 100% aerial geo-physical survey of the country, the data is available at the ministry of mines and steel for the development of would be miners. However, this does not provide reliable details of the estimated quantity of the nation's solid minerals which can only be achieved by more detailed geo-science data gathering. The solid minerals industry is affected by the following problems;

Funding- Funding is one of the factors that affects the gathering of geo-science data, so as to determine the actual value of solid minerals in Nigeria. Okezie (2016) stated that funding is one of the greatest problems in the mining industry especially in the solid minerals sector. Due to lack of funding adequate survey of solid mineral sector were not carried out. The existing licenses are worth just the mineral titles without any reliable information on existing quantity and mining licenses in Nigeria cannot be used as collateral for loans as done in advanced economies. There is urgent need for detailed geo-science data gathering to be done so as to assign value to these licenses. The government should make it possible to use solid mineral licenses as collateral for borrowing money from banks as applied from other advanced economies.

Power- The current power development drive and resultant privatization embarked upon by the government cannot be done without considering other sectors the industry will rely to achieve growth in the economy. Kearney and Bensaheb (2017), observed that federal government intends to develop commercial generation through hydro, coal and liquid natural resources to assist in the production of solid mineral, this should be implemented adequately hence some equipment required heavy power supply to mobilize the equipment in to work. According, Henry (2014), who projected that the roadmap to the development of solid minerals, that coal can generate about 30% capacity. Power supply should be extended to rural areas because solid mineral mining always available in the rural areas.

Transportation- A well developed mining industry thrives on well established transportation network, which supports the movement of equipment to mining sites and the evacuation of minerals for sale and export. There are currently a number of infrastructural development initiatives in road and rail, being embarked upon by the Federal and State governments. These however do not take into consideration planned linkage with existing or intended mining sites. Infrastructure is a major element for the success of any mining industry. The federal government needs to look in to a holistic view regarding infrastructure development and mining sector plan, and execute in synergy with other sectors (Hyde and Jenkins, 2016). Africa mines 90% of the diamond marketed in the world market, 81% of cobalt, 62% of platinum, 70% of gold, 50% of magnesium and chromium, and 30% of copper. Africa also produces 66% of world cocoa, 66% of sisal, 95% of groundnut and 25% of coffee beans and cotton (Hyde and Jenkins, 2016). There are rich reserves of coal, oil and iron ore in Africa (Chukwujekwu, 2005). United Nation (2014) notes that despite the abundant

natural resources in Africa, Africa contributes only 2% of the total industrial output of the world's market economies. Although this statistics may have changed, but does not disprove the fact that Africa contributes far beyond expectation in the world's industrial output. With the abundant resources, African countries should rank amongst the richest and most developed nations. Unfortunately, possession of abundant natural resources does not determine the greatness of a nation.

Professionals- In today's globalizing based economy, Nigeria should provide adequate manpower to improve production in the solid mineral mining industry. According to Hyde and Jenkins (2016) the major determinant of greatness is the available pool of knowledge, talent and creativity adequately applied in delivering goods, processes and services. Mogbo (2016) noted that there are potentially great nations endowed with abundant natural resources, but are underdeveloped as a result of lack of professionals in the industry, yet some nations like Japan and Israel are potentially poor in natural resource, but have developed industries because they had pool of professionals in all fields. They are potentially great but underdeveloped countries are regular suppliers of raw materials to the developed nations; who add values to the resources and resupply them at higher cost. Thus the economies of the underdeveloped countries are manipulated, controlled and determined by the developed nations. Nigeria is counted as one of the countries richly endowed with natural raw materials including solid minerals and its raw materials can be attested to be healthy, abundant and supporting multiple uses Kearney and Bensaheb (2017). They are capable of providing an enviable quality of life for citizens and visitors if properly harnessed and utilized. They can attract and sustain business and tourism that translate into economic wealth. However, Lamido (2015) notes that Nigeria was one of the 50 richest countries globally in the 70s, but now one of the 25 poorest countries in the world (Daily Independent, 2013; Information Nigeria, 2013). Nigeria, the ninth largest producer and sixth largest exporter of crude oil, is still hosting the third largest number of poor people in the world after China and India (Ehinomen and Adeleke (2012). Jim-Yong–Kim (2014) claims that two-thirds of the world's extreme poor are concentrated in just five countries – India, China, Nigeria, Bangladesh, and the Democratic Republic of Congo. It is difficult to imagine that poverty in Nigeria is in the mist of plenty. No gainsaying Nigeria lack the productive human capital to tap its abundant solid mineral resources and translate such to economic wealth. There is therefore great need to build up Nigeria's indigenous technology that will enhance healthy harnessing and utilization of the natural resources such that the future is sustained.

Security- Adequate security should be provided by the Government to the solid minerals miners. The issue of security threat in Nigeria has affected the major areas of solid mineral mining in the economy, therefore contributions of solid minerals to our nation have continue to decline greatly (Henry, 2014). Therefore, issue of security must be top on the list. Other problems include, adequate policy framework to encourage miners, good road for easy access to sites and government to establish

adequate marketing board that will be ready to work with miners for easy exportation to other countries of the world (Lamido, 2015). With these measures, Nigeria will improve on her production in solid minerals sector.

1.1 Statement of the Problem

The issue of solid mineral development in Nigeria has come of age. The government cannot be said to utterly neglect solid mineral, but lack of commitment to really tackle the issue of poor policy to check artisanal mining which has undermine growth of the sector. Several states look the other way round as the locals engage in unauthorized mining. Besides, funding of the sector has not been effective which has left the sector to exploiters. Also, ethnicity has a key role in the poor development of the sector as many clans do not want clear cut development of the solid minerals in their zones without particularly settling them financially. The ownership of land system also play a set back to the sector.

1.2 Objectives of the Study

The following objectives are raised for the study:

1. To examine the effect policy guidelines on mining to economic diversification of Nigerian
2. To explain Government neglect of the solid mineral sector which affects economic diversification of Nigerian.
3. To study how ethnicity affects the production of solid mineral to economic diversification of Nigeria

1.3Research Questions

The following research questions are raised for the study:

1. What effect has government policy on solid mineral mining in economic diversification of Nigeria?
2. How does funding of the solid mineral sector affect economic diversification of Nigeria?
3. What is the effect of ethnicity in the mining of solid mineral and economic diversification of Nigerians?

1.4 Hypotheses

The following hypotheses are formulated for the study:

1. a) Policy on artisanal mining has no direct relationship with economic diversification of Nigerian.
   b) Policy on artisanal mining has direct relationship with economic diversification of Nigeria
2. a) Funding of the solid mineral sector does not positively affect economic diversification of Nigerian.
   b) Funding of the solid mineral sector has direct effect to economic diversification of Nigeria.
3. a) Ethnicity does not directly affect economic diversification of Nigerian.

b) Ethnicity does directly affect economic diversification of Nigeria.

1.5 Significance of the Study

The study shall benefit many people in Nigeria, especially the people in solid mineral producing areas as they assess the issues raised in the study to set aright ethnocentric feelings that militate against rural development. The study shall also be of benefit to researchers as they shall see good recommendations here to proffer solution to troubled solid mineral areas. Government shall also benefit from the study in seeing how to really develop the solid mineral sector.

2. Review of Related Literature

2.1 Conceptual Framework

Notable locations and quantity (Tones) of Solid Minerals in Nigeria

S/No.	Resources	Quantity	States
1	Talc,	Over 40 million tones	Niger, Osun, Kogi, Ogun, Kaduna Ebonyi, Abia, Edo and Benue states
2	Gypsum	Over one billion	all over Nigeria.
3	Iron ore	4 billion tones	Kogi, Edo, Delta, Enugu, Niger, FCT Ogun and Abia states
4	Lead/Zinc	10 million tons	Over eight States (not mentioned)
5	Bentonite	700 million tons	Taraba and Bauchi
6	Gold	–	Mambilla Plateau in Taraba and Niger State
7	Bitumen	42 billion tons	Scattered everywhere in Nigeria
8	Coal	Nearly 3 billion tons	indicated resource and over 600 million tons proven reserves
9	Salt	1.5 million tons	Benue Spring salt, Plateau and Ebonyi
10	Gemstones	–	In almost all states in Southern Nigeria
11	Kaolin	3 billion tons,	Abundantly found in all the Northern States
12	Dolomite	Over 4 billion tones	Kwara and Oyo states
13	Tourmaline	–	Almost all states of the Federation
14	Quartz	–	All Eastern states and Middle Belt
15	Phosphate	Over 5 trillion tones	Ebonyi, Enugu, Abia Imo, Delta, Benue and Kogi states
16	Molybdenum	Over 3 billion tones	Abia, Edo and kwara States
17	Emerald	Over 3 billion tones	Taraba, Edo, Adamawa, Abia and Nasarawa states
18	Sapphire	Over 2 trillion tones	Nassarawa and Benue States

S/No.	Resources	Quantity	States
19	Lignite	Over 5 billion tones	Nasarawa, Zamfara,Abia and Sokoto states
20	Silver	Over 1 billion tones	Sokoto, Borno,Nassarawa and Zamfara states
21	Zinc	Over 4 billion tones	Ebonyi, Abia, Zamfara, Nassarawa, Taraba and Kogi states
22	Granite	Over 6 trillion tones	All the states
23	Galena	Over 4 billion tones	Nassarawa, Abia, Plateau, Kogi and Kwara states
24	Columbite	Over 2 billion tones	Plateau
25	Tin	Over 3 billion tones	Plateau and Nassarawa states
26	Diamond	Over 2 billion tones	Taraba, Zamfara, Sokoto, Niger and Nassarawa
27	Aluminium	Over 1 billion tones	Akwa Ibom, Abia, Rivers and Cross River
28	Magnessium	Over 2 million tones	Adamawa, Nassarawa, Gombe and Bauchi states
29	Manganese	Over 500, 000 tones	Borno and Nasarawa states
30	Kyanite	Over 3 million tones	Kaduna, Nassarawa, Niger and Bauchi states
31	Wolframite	Over 1 million tones	Kaduna, Niger, Kebbi, Sokoto and Zamfara states
32	Limestone	Over 3 trillion tones	All the states
33	Barytes	Over 3 trillion tones	All Northern states
34	Lead	Over 5 million tones	Ebonyi, Enugu, Abia, Imo, Delta and Benue states
35	Clay	Over 5 trillion tones	All the states
36	Feldspar	Over 3 trillion	Nassarawa, Bauchi, Gombe and Adamawa states
37	Rutile	Over 3 million tones	Southern states
38	Diatomite	Over 2 million tones	Taraba, Niger, Borno, Nassarawa and Plateau states
39	Lithium	Over 3 billion tones	Nassarawa state
40	Coke	Over 2 million tones	Enugu, Abia, kogi, Imo,Edo, Plateau and Nassarawa States

S/No.	Resources	Quantity	States
41	Tantalites	Over 3 millions	Zamfara, Nassarawa, Bornu, Plateau states.
42	Bitumen	Over 5 trillion tones	Enugu, Abia, Imo, Anambra, Kogi, Plateau, Edo, Kwara and Ebonyi states.
43	Uranium	Over 1million tones	Bornu, Yobe, Gombe, Adamawa, Taraba, Nassarawa, Plateau, Bauchi and Abia

2.2 Problems of Solid Mineral Development in Nigeria

The following were identified as problems to mining industry in Nigeria

Security- Security is regarded as a serious threat to the production of solid mineral in Nigeria. But the very recent achievements by the previous administration in terms of security, especially efforts against terrorism should be sustained (Amadiegwu, 2017). The north central, north-east and North West regions are known to have some of the country's major solid mineral deposits. But due to the persistent plague of terrorism and tribal conflicts, exploration of solid minerals activity in these areas has been temporally suspended. Fernandas and Moscovitch (2017) noted foreign entrants into the mining sector have been discouraged due to lack of security in these areas, if terrorism is put to an end in these regions and other major areas in the country it will indicate an increase in mining activities.

Policy- Policy on artisanal mining in Nigeria has not been encouraging. Goodhar and Laitmn (2016) recorded that policy on artisanal mining is less than 0.5% of GDP formulation from the entire policy guide line on mining industry in Nigeria, which indicate that this figure is solely from the formal mining sector. The majority of artisanal mining sector is largely from informal sector and is based on the use of crude equipment and extremely dangerous working practices. It is estimated that about 80% to 85% of current mining activities in Nigeria is via artisanal and small scale mining (Enejere, 2017). Furthermore, the sales of channel surveys is largely unofficial and embedded with smuggling and distribution cartels leading to loss of revenue from taxes, loss of revenue from royalties and exposure of miners to uncontrolled risks (Edugbanya, 2014). The evacuation of this mining product cannot be controlled by government thereby causing environmental degradation, erosion and excessive pollution, amongst other negative effects. Therefore government should conduct adequate census on artisanal and small scale mining and put them in their records for proper policy frame work.

Training and equipment supply.

Funding- that is provision of funds to improve production and possible absorption by bigger companies

Enlightenment on safe mining practices

Government should respond to the following:
1) Establishment of a marketing board for solid minerals. The absence of solid mineral buying centers and lapidaries has enabled the flourishing of illegal sale cartels out of the country, with resultant loss of solid minerals revenue from taxes and royalties (Ejindu, 2017). As a matter of urgency, the government should establish various mineral buying centers and lapidaries across the relevant zones in the country.
2) States or local governments should be encouraged to domicile solid mineral production on the ones that are discovered in their state or local government. States and local government, including private sector can collaborate to produce solid minerals in the country.
3) The government should apply a derivation formula that will be beneficial to the states and local governments so as to improve production of solid minerals sector.

Establishment of a solid mineral development bank will provide investor friendly loans, specifically designed to cater for the various stages of the mining life cycle (Chew, 2017). These will have interest rates and repayment terms specifically designed around the mining life cycle, making funding more accessible to miners, and repayment terms more reflective of the realities in the mining industry. Furthermore, the government can provide special incentives for solid mineral development banks, or commercial banks having special packages for the solid mineral sector (Chew, 2015).

2.3 Achievements made so far in the solid mineral mining in Nigeria.
The past administration made a lot of achievements which the current administration anchored upon to move forward. All we advice is to consolidate on these achievements done by previous governments and improve on them. Those achievements including continuation and completion of projects already embarked upon (Chew, 2016).
1) Establishment of the Nigerian Mining Cadastre office: this office supervises solid minerals mining in Nigeria and report to the Federal government.
2) They have presented a Road map for the development of the sector
3) Airborne geophysical survey of the entire country,
4) Waiver of customs and import duties for plant, machinery and equipment imported for mining operations
5) Provision of about three to five years tax holiday as applicable to solid mineral miners
6) Free transferability of funds and permission to retain and use earned foreign exchange, and competitive tax rate.

It is expected that that the solid minerals and agricultural sectors in Nigeria would provide if properly utilized employment, foreign exchange, and increase in output. In terms of her rich agricultural heritage, Nigeria contributes significantly in the world export of agro material like cocoa, rubber, cashew nuts/kernel etc. Other agro materials in abundance are cereal, cassava, yam, tomatoes, onions palm, ginger, gum

Arabic and sesame. Raw Material Research and Development Council – RMRDC (2016) reported that Nigeria is endowed with a variety of solid minerals many of which are yet to be exploited.

2.4 Theoretical Framework

The work is based on Byrd et al. (2016) theory of solid mineral mining in developing countries. Byrd et al. (2016) asserted that the basic principles of solid mineral mining are:

1. Economic Exploration
2. Economic Exploitation
3. Amenable Legal Environment
4. Contusive Ethnic Environment

In the economic exploration, the cost of exploration must be necessarily less than the benefit to be derived, otherwise, the venture is not worth it and the cost of exploiting of the minerals must also not exceed the benefit to be derived (Byrd et al., 2016). The legal environment must be such that the government in question must be willing to cooperate with the exploiters and explorers, while the land owners in ethnic nationalities must be willing to allow efficient mining in their zones. This theory brings out the problems encountered by miners of both solid and liquid minerals in Nigeria, and so, it is adopted by this study.

2.5 Empirical Studies in line with the Objectives of the Study

Ngwama (2011) studied the factors that affect solid mineral development in Nigeria. The study was performed on a total of 699 local wards in Zamfara and Taraba States who were classified as artisanal miners. Social reasons include illiteracy 26.9%, parental uncaring (27%) locals showing no interest in adhering to ethics of mining (41.6%), low income generation (19.3%), and societal recluses (19.6%). Terrific poverty was a result in 33.3%; religious fanaticism (45.9%) and the study also identified 63.7% of locals to be hyperactive, inattentive and disruptive in community peace. Most frequent psychological disorders include poverty phobia (68.8%), anxiety (49.4%), anger (32.5%), fear (43.2%) and learning disability (37.9%). The most prevalent health disorders often noticed by illegal miners in the local areas included visual disorders (23.5%), asthma (14.9%), and anemia (15.2%), and hearing deficiency (8.2%).

Akongwale (2013) studied the role of police guide lines on solid minerals in economic diversification of Nigeria which is in line with the objective of this research. Both qualitative and quantitative (descriptive) analyses were employed. The study showed that the solid mineral sector in Nigeria has the potential to contribute immensely to the economy of Nigeria. It revealed that the development of the solid mineral sector in Nigeria could help to combat poverty, via creation of jobs by given it forward linkage with other sectors of the economy. Most importantly it will help to alleviate some of the problems associated with "enclave "nature of the Nigeria economy as also observed in this work that made Nigeria economy to be vulnerable to fluctuations in

the world oil prices. The research concluded that the realization of this potentials need to strengthen the Nigeria's existing solid mineral development policy and creating an enabling environment for private sector to take a lead in the industry.

Adekeye (2010), in his study on the impact of conflict and ethnicity the effects on the production of solid mineral to economic diversification of Nigeria which is in line with the objective two of this work. The study also employed qualitative and quantitative (descriptive) analysis which reveals that there is much more to gain from the development of mining in the solid mineral sector than is currently organized and there is much to lose from the non development of the sector. The gains will include creation of jobs, foreign exchange earnings, and provision of infrastructures etc to the economy. The result reveals that conflicts, terrorism and ethnicity should be taken care of by the government and that adequate security should be provided at the mining sites so as to protect life and property/equipment or mining instrument.

Agba (2015) studied the government neglect to mining of solid minerals. The work employed qualitative and quantitative (descriptive) analysis to resolve problem. The study reveals that Nigeria stands to benefit from the development of solid minerals sector if adequately developed. The paper concludes that adequate environment must be provided for miners and private sector to participate actively in the production of solid minerals in Nigeria.

2.6 Gaps in Review of Related Literature

The study on the reviewer of literature did not clearly point out the issue of tribal sentiments and sectional interests that make the local to refuse government- licensed miners to step into their enclaves. They see solid mineral in their zones as their God-given natural deposits as theirs and theirs alone. This study shall evaluate these areas.

3. Methodology

3.1 Research Design

A research design is a plan or blueprint, which specifies how data relating to a given problem should be collected and analyzed (Castrogiovanni, 2016). On this basis a survey, causal-comparative research design was used to compare the relationship between solid mineral development and economic diversification. Survey research is aimed at collecting data on a particular problem from a sample in order to get an estimated dimension of the problem in a large population.

3.2 Area of the Study

The study was carried out among the local miners of solid mineral in Zamfara and Taraba States.

3.3 Population of the Study

The target population is the collection of lead miners in Zamfara State and local Diamond miners in Gembu Taraba State.

3.4 Sample and Sampling Techniques

The sample of this study comprised of randomly selected local miners in Zamfara and Taraba states. A total of 100 local miners were selected for the study.

Sample size calculation from the entire population (Rural,).

$$sample\ size\ (n) = \frac{\frac{Z^2P(1-p)}{e^2}}{1+\left(\frac{Z^2P(1-P)}{e^2N}\right)}$$

Where

Z = is normal probability score

P = is the probability of success

E = is the margin of error

N = is the population size

From statistics table $Z_{\alpha/2}$ = 1.96, P = 0.5, e = 0.05 that is 5% and N = 210 artisanal miners from Zamfara and Taraba state. From the above formula we arrived at sample size of 135 (one hundred and thirty five). 135 (One hundred and thirty five) questionnaires were designed and sent to miners in both areas 100 were returned successfully.

3.5 Research Instrumentation

The researcher used questionnaire to generate data from members of the target population. The questionnaire was structured along:

SA = Strongly Agree, weighted 5

A= Agree, weighted 4

D= Disagree, weighted 3

SD= Strongly Disagree, weighted 2

NAD= Neither Agree nor Disagree, weighted 1

3.6 Validity of the instrument

The questionnaire was validated by experts from the ministry of solid mineral.

3.7 Method of Administration of Research Instrument

The researcher administered the questionnaire and achievement test very strictly complying with the ethics of research as there was coercion the right to the respondents' privacy was respected. Local interpreters were used to get the required message across since almost all the local miners are illiterate.

3.8 Method for Data Analysis

The researchers used parametric mean of responses in answering the research questions, while the hypotheses were tested using parametric Z- tests at significance level of 0.05. To accept each hypothesis, the rule is:

Accept null hypothesis if and only if table value is greater than calculated value, reject otherwise.

Sum of weights = 5+ 4+ 3+2+1 = 15

Mean of weights =15 divided by 5 = 3 = μ
Sum of Scores= ∑fw divided by ∑f =
To accept each questionnaire item, the rule is:
× must be greater than μ, otherwise, it is rejected.
Hypothesis is tested using the Parametric Formula:
Z = (× - μ) divided by ((standard deviation(s) divided by n))
Where n = ∑f and f= frequency.
Probit model
Using, the probit model to confirm the policy on artisanal mining, funding of solid mineral
$Y = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + e_1$
Where
Y = Gross domestic product (GDP)
b_0 = constant
b_1, b_2, b_3 = Coefficience /multiplier of x_1, x_2, x_3
X_1 = policy on artisanal mining
x_2 = Funding of solid minerals
x_3 = Ethnicity in the solid mineral sector
e_1 = Error term

H_0: Polices on artisanal mining, funding of the solid minerals sectors and ethnicity in the solid minerals have no significant influence on economic diversification of Nigerian economy (GDP)

4. Data Presentation and Analysis

4.1.1 Presentation of Research Question 1: What effect has poor policy on artisanal mining on economic diversification of Nigerian economy?
This is addressed from the responses from the following questionnaire items

Table 4.1: Responses from the Research Question 1

S/N	Questionnaire Items	wf	SA 5	A 4	D 3	SD 2	NAD 1	∑f	∑fw	Weighted mean	Decision
1	None		100	6	4	10	-	120	556	4.63	Agree
2	Average		50	50	10	7	3	120	497	4.14	Agree
3	Very great		100	10	5	-	5	120	560	4.67	Agree
4	Little influences		70	30	2	3	15	120	497	4.14	Agree
5	Very little influences		100	5	5	5	5	120	550	4.58	Agree

Table 4.1 shows the response of the respondents on presentation of research question 1: What effect has poor policy on artisanal mining on economic diversification of Nigerian economy. From the responses above, it is deducible that artisanal mining which is illegal is really a problem in Nigeria because the locals and many other internal factors hinder the progress of mining. Also it is shown that the respondents responded positively high that the effect of poor policy on artisanal mining on economic diversification of Nigerian economy has *very great* influence with mean 4.67.

4.1.2 Presentation of Research Question 2: How does poor funding of the solid mineral sector affect economic diversification of Nigerian economy?
This is addressed from the responses from the following questionnaire items

Table 4.2: Responses from the Research Question 2

S/N	Questionnaire Items	Wf	SA 5	A 4	D 3	SD 2	NAD 1	∑f	∑fw	Weighted mean	Decision
1	By highly limiting miners		110	10	-	-	-	120	590	4.91	Agree
2	Highly limiting relevant soil tests		80	20	10	0	-	120	510	4.25	Agree
3	Moderately endorsing artisanal mining		60	40	4	5	11	120	493	4.11	Agree
4	Bringing in crooks in the mining field		40	50	10	20	-	120	470	3.91	Agree
5	By all of the above		2	3	5	10	100	120	137	1.14	Disagree

Table 4.2 shows the response of the respondents on how poor funding of the solid mineral sector affect economic diversification of Nigerian economy. From the table it is shown that the respondents responded high that funding greatly limits and affects miners mining of solid minerals with weighted mean 4.91 anywhere not only in Nigeria. But the snag is that no committed government efforts are made so far to encourage local miners by funding them.

4.1.3 Presentation of Research Question 3: How does ethnicity in the solid mineral enclaves affect economic diversification of Nigerian economy?
This is addressed from the responses from the following questionnaire items.

Table 4.3 shows the response of the respondents on how ethnicity in the solid mineral enclaves affects economic diversification of Nigerian economy. The result from the table shows that the miners (respondents) in the area responded politely high that ethnicity discouraging external investors with weighted mean 5.00. Thus it infers that ethnic influences hinder mining by hindering investors both local and foreign.

Table 4.3: Responses from the Research Question 3

S/N	Questionnaire Items	WF	SA	A	D	SD	NAD	∑f	∑fw	Weighted mean	Decision
			5	4	3	2	1				
1	By discouraging external investors		120	-	-	-		120	600	5.00	Agree
2	By eliciting great resistance to mining ventures		90	-	12	10	8	120	514	4.28	Agree
3	By encouraging infringements into the mining process		60	40	20	-	-	120	440	3.66	Agree
4	By making armatures take over mining		3	2	5	5	110	120	158	1.25	Disagree
5	By necessitating loss of patronage		-	-	10	-	110	120	140	1.16	Disagree

4.2 Test of Hypotheses

The results from the probit model tables below justify the claim.

Table 4.4: Goodness of Fit

Dependent Variable: GDP	Value	df	Value/df
Deviance	0.000	12	0.000
Scaled Deviance	0.000	12	
Pearson Chi-Square	0.000	12	0.000
Scaled Pearson Chi-Square	0.000	12	
Log Likelihood[b]	0.000		
Akaike's Information Criterion (AIC)	16.000		
Finite Sample Corrected AIC (AICC)	.		
Bayesian Information Criterion (BIC)	12.876		
Consistent AIC (CAIC)	20.876		

Note: Model: (Threshold), Policy, Funding, Ethnicity; a. Information criteria are in smaller-is-better form; b. The full log likelihood function is displayed and used in computing information criteria

The result from the table 4.1 shows the degree of the dispersions of GDP as a result of the following factors poor policy on artisanal mining, poor funding of the solid mineral sector and ethnicity in the area of solid mineral. From the table if value/ (degree of freedom) are less than one (i.e value/df < 1) implies under dispersion. From the table since value/df = 0.000 implies under dispersion of the dependent variable GDP.

Table 4.5 Omnibus Test

Likelihood Ratio Chi-Square	df	Sig.
16.094	4	0.003

Note: Dependent Variable: GDP; Model: (Threshold), Policy, Funding, Ethnicity; a. Compares the fitted model against the thresholds-only model.

The result from table 4.5 shows the Omnibus test whish shows the adequacy of the probit model testing the influence of poor policy, poor funding and ethnicity on the dependent variable economic diversification of Nigerian economy (GDP). From the table since sig value = 0.003 is less than 0.05 level of significance infers that the model is significant and adequate.

Table 4.6 shows the parameter estimates of ordinal probit model for the following factors poor policy on artisanal mining, poor funding of the solid mineral sector and ethnicity in the area of solid mineral on economic diversification of Nigerian economy (GDP). From the table p-value (sig value) = 0.000 infers significance. It is shown that the independent variables poor policy, poor funding and ethnicity have significant influence on economic diversification of Nigerian economy (GDP) since their respective p-values (sig values) are less than 0.05.

Table 4.6: Parameter Estimates for Ordinal Probit Model

Parameter		B	Std. Error	95% Wald Confidence Interval Lower	Upper	Hypothesis Test Wald Chi-Square	Df	Sig.
Threshold	[GDP=988234]	-17.846	.3757	-18.582	-17.109	2256.265	1	.000
	[GDP=22333002]	-5.932	.1686	-6.263	-5.602	1238.628	1	.000
	[GDP=45065784]	5.932	.1686	5.602	6.263	1238.628	1	.000
	[GDP=60968298]	17.846	.3757	17.109	18.582	2256.265	1	.000
[POLICY=4.1400]		-11.886	.2380	-12.352	-11.419	2494.570	1	.000
[POLICY=4.5800]		11.886	.2380	11.419	12.352	2494.570	1	.000
[POLICY=4.6300]		-24.079	.4085	-24.879	-23.278	3474.101	1	.000
[POLICY=4.6700]		0[a]	.	.	.	.	.	.
[FUNDING=1.1400]		0[a]	.	.	.	.	.	.
[FUNDING=3.9100]		35.964	.5295	34.927	37.002	4613.717	1	.000
[FUNDING=4.1100]		0[a]	.	.	.	.	.	.
[FUNDING=4.2500]		0[a]	.	.	.	.	.	.
[FUNDING=4.9100]		0[a]	.	.	.	.	.	.
[ETHNICITY=1.1600]		0[a]	.	.	.	.	.	.
[ETHNICITY=1.2500]		0[a]	.	.	.	.	.	.
[ETHNICITY=3.6600]		0[a]	.	.	.	.	.	.
[ETHNICITY=4.2800]		0[a]	.	.	.	.	.	.
[ETHNICITY=5.0000]		0[a]	.	.	.	.	.	.
(Scale)		1[b]						

Note: Dependent Variable: GDP; Model: (Threshold), Policy, Funding, Ethnicity; a. Set to zero because this parameter is redundant; b. Fixed at the displayed value

4.3 Discussion of Results in Line with Objectives of the Study:

The study discovered that funding greatly retards mining of solid minerals in Nigeria. This is in tandem with the view of Bankole and Ogunsakin (2017) that poor funding has limited solid mineral mining in Nigeria. The study discovered that ethnic politics greatly limits mining of solid mineral in Nigeria. This agrees with the view of Bronfenbrenne (2011) that the major setback to local mining of solid minerals in Nigeria is ethnic politics. The study discovered that lack of necessary laws on meaningful mining militates against solid mineral mining in Nigeria. This agrees with

the view of Bello (2017) that Nigeria lacks relevant laws to properly regulate mining of solid minerals in Nigeria.

5. Conclusion and Recommendations

It is one thing to have potentials and another to develop the potentials. That a nation is richly endowed with natural raw materials is not a guarantee that the nation is rich especially when the resources are underutilized or mismanaged. Africa is richly blessed with raw materials yet most African countries are still poor, particularly Nigeria. This is due mainly to their inability to develop technologies that can tap their resources. It is no more in doubt that the greatness of a nation is closely linked to its technological capabilities. These have enabled them to harness their natural resources and those of other nations. However, acquiring technical knowledge is a cumulative process so national technological competence cannot be changed rapidly. Blue prints accompanying turnkey projects are no more than road maps; the buyers must travel the road alone by their efforts. Technical knowledge is largely tacit and specific, so it can only be mastered by painstaking learning.

Government should invest in geo-science data gathering on mining of solid minerals, recouping invested costs and margins from sale of licenses. Government should fund data gathering by employing professionals, and pricing the mining licenses according to the estimated quantity delineated, and mineral type involved. Intending miners should be willing to purchase an expensive license if it can be used as collateral for loans.

Private companies specializing in data gathering can be licensed to perform the geo-science data gathering, and be given exclusive right over data gathered. Coal mining should be developed for commercial export and foreign exchange shall be earned. There is, therefore, a need to develop a master plan for roads and rail for federal and state adoption. All identified mining locations should be considered when drafting this master plan, and it should be made mandatory for adoption by any level of government embarking on infrastructure development. Government should further strengthen the Mining Cadastre office through funding and training, complete the planned privatization of the Ajaokuta steel rolling plant, conduct the bitumen licensing round, complete the rehabilitation of National Iron Ore Mining Company, complete the structuring of a legal and regulatory framework for the steel sector; amongst other current projects being run by the previous administration. Government should re-establish the milestones of the roadmap for the development of the solid minerals and metals sector. Government should needs to re-establish the milestones for the roadmap and take necessary action to ensure achievement of the set goals. The current roadmap appears to have been treated as a theoretical exercise by either not setting realistic targets or not working to achieve them. Government should establish Solid Mineral development Bank to finance solid mineral mining in Nigeria.

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