PROFILING OF ARTISANAL AND SMALL SCALE MINING IN OLODE AREA, SOUTHWESTERN NIGERIA

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ABSTARCT
Nigeria is endowed with solid mineral deposits ranging from metallic and non metallic or industrial minerals that are of diverse economic value. Records show that exploitation of many of the minerals remains at artisanal level where mineral exploitation is characterized by mining in the crudest way, using local tools and implements that expose the mining community to several hazards , extreme environmental degradation and loss of farmlands. Olode is located within Longitude 7°05′ and 7° 15′ and Latitude 4°55′ and 4° 00° in the Southwestern Basement Complex of Nigeria where black and green color tourmaline, garnet and beryl are target minerals. This study is to X-ray activities of artisanal miners in the area and assess the impact of their operation on the environment and the standard of living of the people of the mining community.

The methodology involved oral interviews, administration of questionnaires and geo-traverse of the communities. The questions that covered the mining activities, land acquisition and utilization for mining, Health – Safety-Environmental (HSE) issues, medical and the conditions of living in the communities were put together and administered. The results were analszed, rated and represented pictorially using pie chart.

The study revealed that mining is done in the most crude way and the environment badly affected. The standard of living of the people in the mining communities is generally poor, manifesting different levels of human abuse and child labour. Medical attention is poor with high rate of sudden death common among the average aged people in the area. Induced population growth and several levels of social vices are common features of the rural setting.

Some steps that could be taken to make artisanal and small scale miners (ASM) become willing partner of government in the sustainability of the solid mineral sector for sustainable development are proposed in this paper.

Key words: Artisanal, Olode, mining, crude, sustainable, X-ray.

Introduction

Mining is the extraction of minerals from either below the earth surface as underground mining or from the surface as open cast mining. Both methods fundamentally have different effects on the environment, especially the host community where mining is taking place and even the methods of mining differ.

Artisanal and small scale mining (ASM) form a thriving economic activity in at least 25 countries on the African continent, providing direct employment to as much as 2.5million people and a subsistence for more than 20 billion people (ILO, 1999 and SPPD RAF/99/023. Final Project, New York , Genever, UNDESA, 2003). In Nigeria , informal surface mining of metals, gemstones and industrial minerals have been going on in the Southwestern Nigeria for a long time.

The group of rare metals occurs as non-intergrowth or as intercalations in granite and pegmatite rocks (Okunlola, 1998). Weathering of host rocks, erosion, transportation and subsequent deposition in stream beds, accumulate these metals as alluvial deposits in addition to their occurrence as eluvial deposits and primary veins in host rocks. The alluvial nature of the deposits gives artisanal miners accessibility to these deposits and mine the metals through the use of in- sequential method of mineral exploitation, which is done through crude and unscientific methods.

Artisanal miners employ local implements like hoes, cutlasses and diggers and engage unqualified cheap labor for their operations. By this local method of mining, the artisanal miners are only limited to the alluvial stream beds in addition to un- coordinated sporadic pitting of areas suspected to host mineral. This is the reason the artisanal mining operations cause extreme environmental degradation, loss of farmland, inaccurate record , poor accountability and subsequent economic loss to the government and the local community where they operate.

When solid minerals are detected in a place, the complex interplay of geological ,technological , economic, social and strategic factors place a demand on the feasibility of economic mining and utilization of the mineral. However, this is not the case in artisanal and small scale mining; these operational factors are conspicuously ignored. As a result of the neglect, production is discontinued after the so-called high grade metal being sought after suddenly disappears which could be described mining on trial and error basis

In 1974, Lukman, in a position paper at the 10th Annual Conference of the Nigerian Mining , Geological and Metallurgical Society, enumerated the potential risks and rewards in mining thereby encouraging public investment in the industry.

Economic exploitation of Ore has been a hard task for artisanal miners because of their shallow knowledge in geologic principles. Economic geology is the study and analysis of geologic bodies (rocks) and minerals (metals, industrial minerals , fuels and water) that can be utilized profitably by man. This knowledge should precede mining venture which is not the case in artisanal mining. Studies have shown that Nigeria is endowed with abundance of these mineral resources that could be economically recovered for industrial revolution of the country (Garba, 2002; Okunlola, A.O. 1998; 2001; 2003; 2009 and Okunlola et.al.2006;) and only by accurate knowledge of geologic principles can a profitable extraction of these solid minerals be made .

Regional Geological Setting

Nigeria lies within the Pan-African mobile belt, located between the Archean-Proterozoic West African and Congo Cratons, south of the Touareg shield (Clifford, 1970 and McCurry, 1976). The geology of Nigeria is defined by crystalline and sedimentary rocks which are almost equal proportionally (Jones and Hockey, 1964). While the sedimentary rocks are scattered within the seven major sedimentary basins in Nigeria, the crystalline basement rocks are spatially located in the southwest, north central and Obudu areas of the Southern Nigeria. The lithological setting of the southwestern basement complex has been described by various authors among whom is Elueze, (1999) that grouped the rocks as the ancient migmatite-gneiss complex, the schist belt and the Pan-African plutonic series (cc600Ma) (Fig.1). The biotite-gneiss and the banded gneiss constitute the Granite Gniess complex. The biotite-gneiss is strongly foliated, fine grained and widespread in the basement complex. The alternating bands of light and dark parallel color or foliation is a distinctive future of the gneiss complex. The relative amount of the dark and light minerals and the degree of banding makes systematic mapping possible, banding is a distinctive criterion for the sub-division of the granite-gneiss family. Woakes et.al. 1986, considered the lithologic units as the polymorphic migmatite-gneiss-quartzite complex (Pan-African to Eburian), low grade sediment dominated by schist and some metamorphic units represented by N-S trending structural configurations. Adekoya (1995) reported that the schist belt essentially is made of pellitic and semi-pellitic schist and phyllites

where quartzite, polymict, metal-conglomerate, iron-formation, marbles, calc-silicate rocks and subordinate metal-igneous rocks are common. Oyawoye , (1972) and McCurry (1976) believed that the schist belt are relicts of a single supral-crustal cover while Olade, (1976), described the schist belt as a fault-controlled rift-like structure. Grant (1978), Hott, (1982) and Turner, (1988) supported the fault-controlled theory of Rahaman, (1976) Rahaman, et.al., (1988) suggested the existence of a basin of deposition for the schists. Emofurieta and Ekuajemi (1995) regarded the migmatite-gneiss complex as a product of a long polycyclic evolutionary process aged between 2.8 – 2.0Ga and even as old as 3.0Ga (Dada et.al.1996) and Rahaman and Ocan, (1978) , discussed the relationship in the pre-cambrian migmatite gneiss of Nigeria.

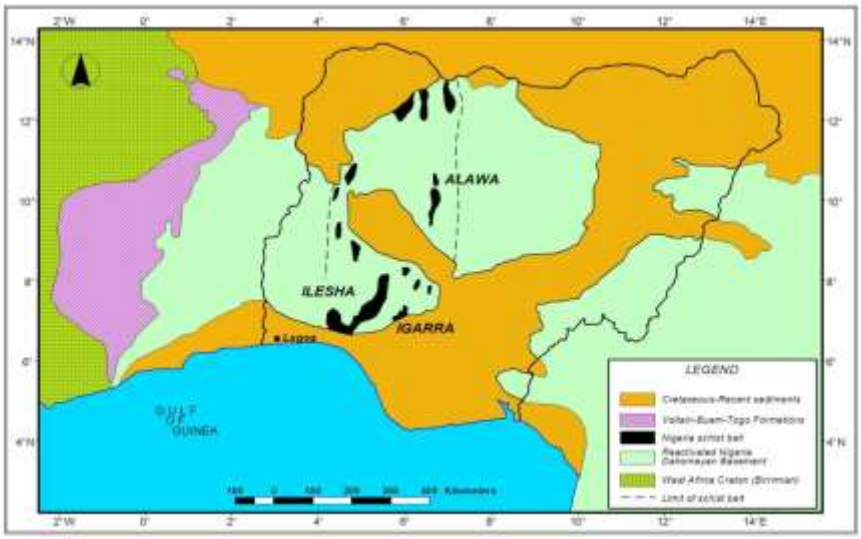


Fig 1: Map showing the location of the Schist Belt and the limit of West African Craton (Adapted after Elueze, 1989)

The study area lies within the Southeastern Basement Complex on sheet 261SE of Ibadan map (Fig.2).The geology is characterized by a N-S trending sillimanite and sillimanite-quartzite ridges, medium grained granite, granite-gneiss, amphibolites and pegmatite intrusions. From evidence gathered on the field from the miners,

pegmatite in this area hosts black and green color tourmaline, garnet and beryl .

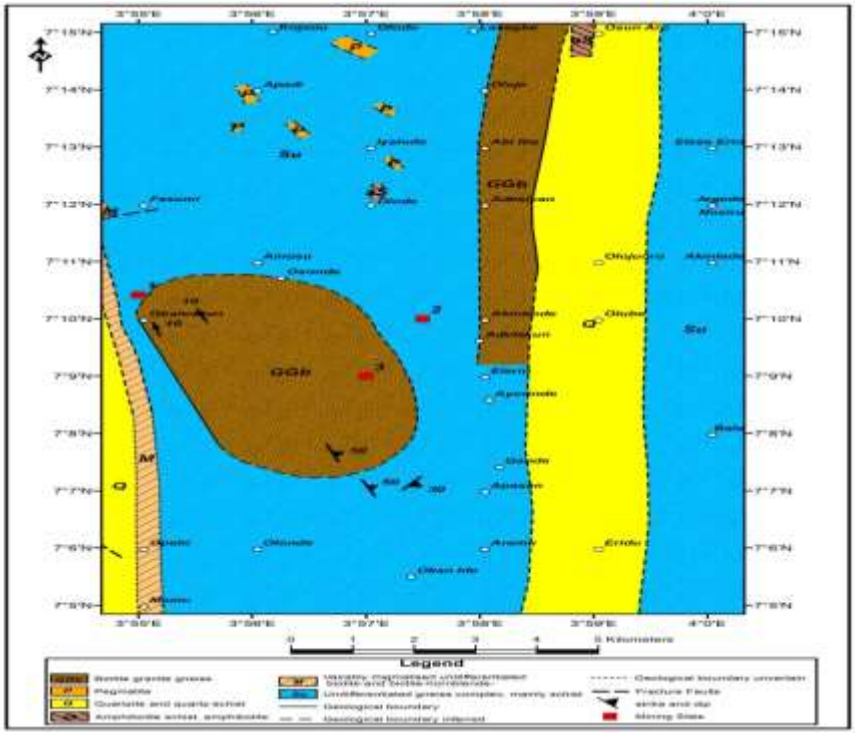


Fig.2:- Geological map of study area (adapted from GSNA, Ibadan Sheet 59).

Methodology

The method adopted for this study included desk top reviews, reconnaissance survey of the host mining communities, geological mapping on a scale of 1:50,000 that covers a total area of about 1617Km^2 , Oral interviews and administration of questionnaires. The study area extends from Latitude. 7^o 05N and 7^o 15N and Longitude. 03^o 55E and 4^o 00E comprising Gbayo, Olonde, Olojuoro, Falansa and Lamolo major communities. The locations of the active and old mining sites were identified and studied. The presence of three mining companies was discovered on site who were reported to have started operation in the community since 1985. However, they were either operationally inactive or still engaged in skeletal services at the time of the study because

artisanal mining has taken over the operation of mining in the communities. During the desktop review, the general geology of the area was studied before moving to the field for reconnaissance survey. One hundred and fifty questions were generated for this study and these were arranged to cover specific areas of the operation of mining companies and the activities of artisanal miners. The questions were specifically targeted to cover the operations of the mining companies and the artisanal miners in the study area in the following areas: available manpower and equipment, land acquisition and utilization for mining, condition of living in the communities , Health – Safety-Environmental (HSE) aspect of mining in the area , medical and other related issues. Traditional rulers, community leaders, residents and the miners constitute the bulk of the respondents to the questionnaires. The various responses were collated and analyzed statistically and rated.

Results and Discussions

Olode region is predominantly a farming community with hunting and lumbering as subsidiary occupation of the people. Mining in this community brought adverse effect on the traditional occupation of the people as farmers where, many abandoned the farm for mining business to secure immediate monetary benefits. There is what I called ' Induced Settlement' as a result of mining activities in these communities and this created a sudden increase in the population of the area. Other common features observed in these mining communities are increased social vices, refusal of children of school age to enroll in the primary and secondary schools built by the government to serve these communities, bad roads and pervasive environmental degradation. Tables 1 to 8 and the accompanied pie charts give a pictorial assessment of the situation, which is peculiar to artisanal mining communities in any part of the world.

Land acquisition for mining

Acquisition of land for mining purposes is a collective responsibility of all stakeholders. While the government, through Cadastral Office of the Ministry of Solid Minerals, provides the

legal framework for a legitimate mining of solid minerals anywhere in Nigeria, the community provides the access to the land by giving a formal authorization to the company after certain legal framework is acceded to by such mining company. The information contained in table 1 and figure 1 is a representation of the reality of things in these communities. While 20% of the respondent believed that these mining companies forced their ways into the community , 20% felt compensation was either paid into the wrong hands or not paid at all, while another 10% did not understand what land compensation means. The 50% that agreed that compensations were paid could be said to belong to few influential indigenes of the communities. It could be inferred that the 50% could have represented that class within the community. Compensation for land and other developmental incentives that could have been the entitlement of the other 50% in the community were not there, so to these group of indigenes, whatever arrangement existed between the mining companies and the leaders of the community did not consider their interest. The follow-up mechanism from the Ministry of Solid Minerals, which could have guided in the implementation of all agreements was not there to rescue the average dwellers of these mining communities.

Table 1:- Land Acquisition for Mining (number and percentage respondent)

	Mining Land acquired by force	**Compensation paid**	**Compensation not paid**	**No Idea**
Number of Respondent	**10**	**25**	**10**	**5**
Percentage(%)	**20**	**50**	**20**	**10**

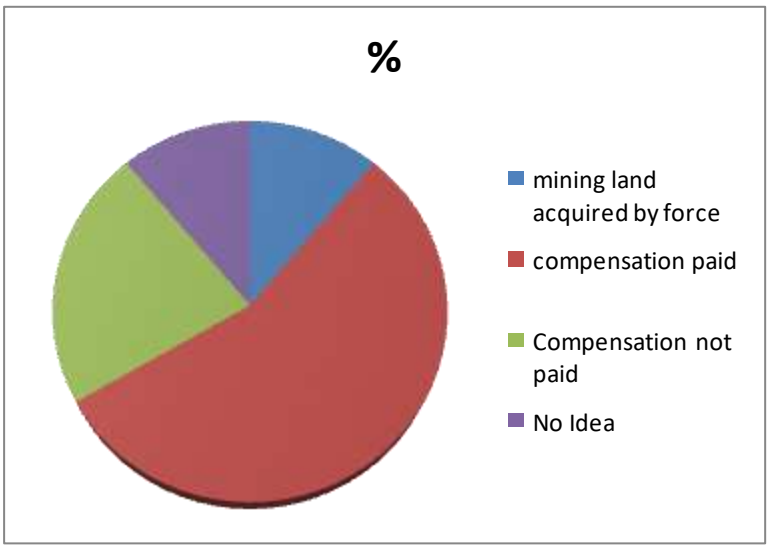


Fig.1:- Pie Chart Showing Percentage Respondent on Land Acquisition Pattern for Mining Purpose

Mining Method

Mining operation in these community is partly mechanized and artisanal where an hydraulic excavator and a compressor for spot-drilling of rocks are positioned in one of the sites at Falansa and Lamolo areas and the use of simple tools like hoes, cutlasses, shovels, diggers and head pans peculiar of artisanal mining. Unlike underground mining where metal ore are exploited at depth under the earth surface, mining of beryl and tantalite in these communities could be regarded as open cast mining. Artisanal mining is a trial and error operation and this is why a sporadic sport-drilling of suspected ore-carrying veins is a common practice. In this study area, 60% of the operation is by the use of simple tools (Fig.2).

Table 2:- Mining Methods

	Mechanized mining	Semi-mechanized mining	Use of simple tools
Number of Respondent	**2**	**10**	**18**
Percentage(%)	**6.7**	**33.3**	**60**

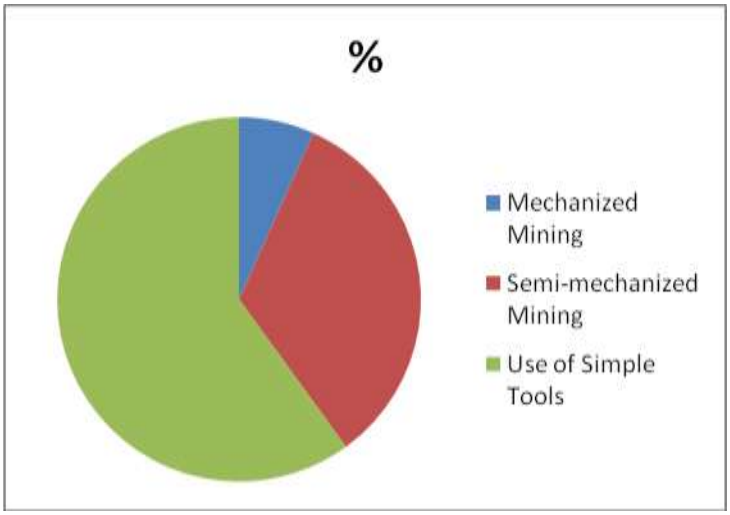


Fig.2:- Pie Chart Showing Percentage Respondent on Mining Methods Adopted by Miners

Table 3:- Mining Workers by Age Group

	Adult	Youth	Children (<18yrs)
Number of Respondent	**10**	**15**	**14**
Percentage(%)	**25.64**	**38.46**	**35.89**

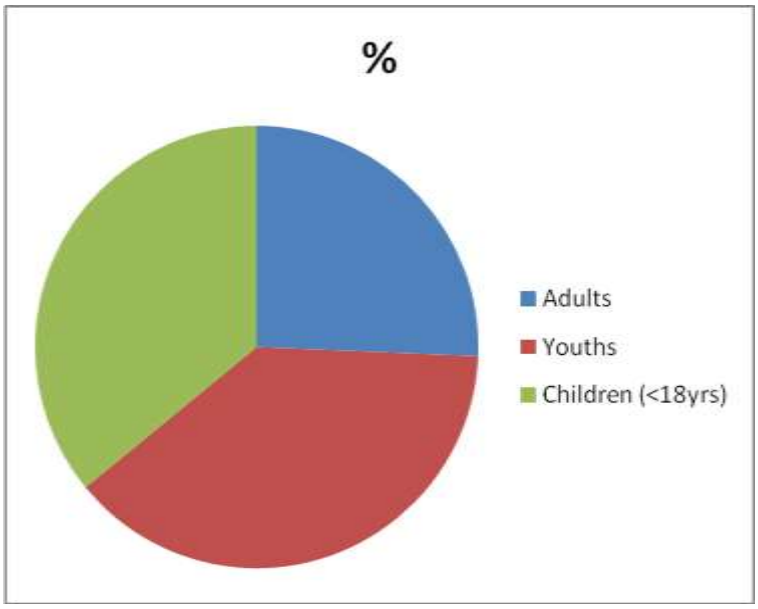


Fig.3:- Pie Chart Showing Percentage Respondent Mine Workers by Age Group

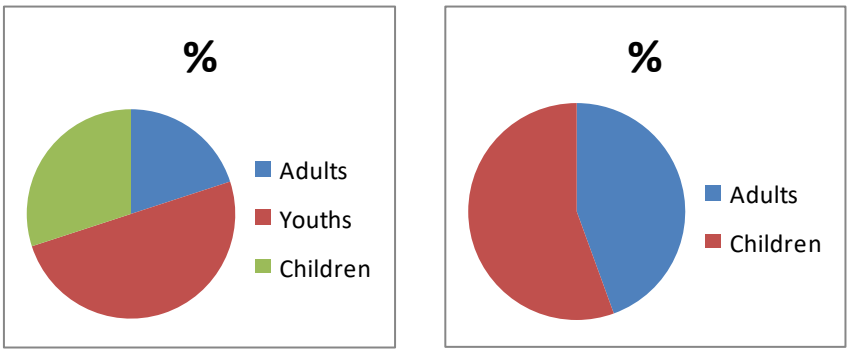
Mine Workers

Mining is a capital intensive business venture and this probably explains among other factors, reasons why few people invest in full-scale mechanized mining. At the same time, mining is a lucrative business that can deliver profits on invested capital. The artisanal miners do not care about the geology of their site as long as their crude methods give them return on their investment. One of the factors that favors artisanal miners is availability of cheap labor which is readily available among youths and children in most villages. This is aptly represented in Table 3 below, with 38.46% youths and 35.89% children as mine workers in these communities. This report agrees with SADC report (MMSD-SA, 2001) which indicates that 50% of those employed in mining sector are women and children. In Table 4, it is shown that about 56% of the children are females and 30% males. There was no record of female adults as mine workers and this could be possible because of the culture of limiting the contact of girls of marriageable age with men. Many of the female children provide services as hawkers, selling petty items to the miners but whatever service provided by children

on mining field, it is still considered as child-labor which should be discouraged.

Table 4:- Mining Workers by Sex

	Male (%)	**Female (%)**
Adults	**20.0**	**44.44**
Youths	**50.0**	**0.0**
Children	**30.0**	**55.55**



A **B**

Figs 4A &B:- Pie chart showing males and females activities in mining

Health-Safety –Environment (HSE)

Health, safety and environmental issues are completely ignored and disregarded by miners in this community. Although a maternity clinic exists in Olode town, it is quite a distance from the mining sites and even then, the clinic is operated like a patient medicine store without any resident qualified doctor. The influx of artisanal miners from neighboring states and countries puts more pressure on the medical needs of the villagers and the miners. Sudden death is reportedly common, particularly among the youths of the area.

Mine workers disregard safety rules and health care facility is not adequate and occurrences of geo-hazards are common in the mining communities (Table 5)

The landscape after mining presents another serious challenge to the entire communities. Land reclamation arrangement to restore the land to its previous purpose as a farming community, was not done in this area. Old and abandoned mining pits were spotted in many places in the study area. Safety precautions were flagrantly ignored by mine workers which could also be responsible for the high death rate among mining youths. It is evident from close observation of the mining activities in these places that lives of artisanal miners are always at risk.

Table 5:- Health & Safety of Mine Workers

	Safety Rules In Force	**Geo-Hazards Common**	**Health Care Observed**	**Sudden Death Common**
Number of Respondent	**5**	**9**	**4**	**14**
Percentage(%)	**6.25**	**28.1**	**12.5**	**53.12**

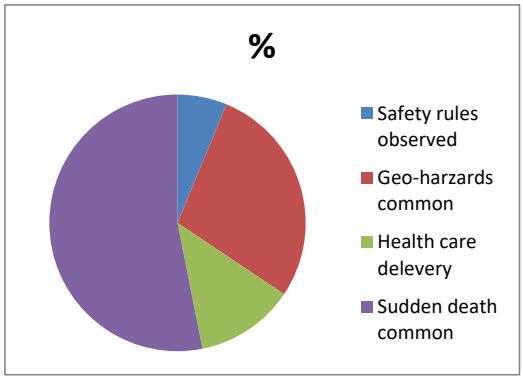


Fig. 5:- Pie Chart showing how effective safety rules are observed and concern for safe health care delivery system

Royalties, Rents and Revenue Mobilization

Small Scale mining in SADC countries is reported to be contributing up to 50% of the GDP and in Zimbabwe alone, the sector contributes up to 25% of the total gold production (MMSD,2001). The characterization of the contribution of the Nigeria ASM can be considered as work in progress. Mining rights legislation provides the legal framework for the orderly development of the mineral extractive industries. Royalties and rent are legal payment in respect of mineral won in the course of mining under the Nigerian Law (Mineral s Act Cap 121, 1946). In the mining district of Olode, the implementation of relevant regulatory laws for revenue generation from artisanal mining was a difficult task. Perhaps because relevant supervisory agents have restricted their operation to big mining companies which could easily be identified. Findings from this research indicated that about 64% of artisanal miners in Olode paid nothing to the covers of the government (Table 6). The occasional payment recorded from these sites (27.27%) may probably not get to the right account because there are no government receipts to authenticate the payments.

Oral questioning and discussions with the miners and some of the villagers revealed these facts:

1. royalties and rents paid are not the correct amount , so the remittance to government becomes irrelevant and difficult to defend.
2. for reasons of tax- evasion, the royalties may not have been paid at all.
3. Or it could be that revenue collectors go for the collection at their own time which makes payment to government treasury irregular.

These shortcoming could have been as a result of the reasons below:

a. The so-called mining companies were owned by individuals which could either not have been registered or illegally operating with expired license.

b. The ad-hoc nature of the company's operation made it difficult to quantify the amount of mineral won at any particular location and time.
c. Record- keeping is a marked failure with artisanal small mining and in all the sites, there was no record of past production nor was there a daily production record.
d. The get-rich-quick syndrome synonymous with an average person in our society made supervision and enforcement of relevant regulatory laws difficult for the supervisory officers.
e. The type of arrangement between the miners, the landowners and local chiefs have not helped revenue generation in any way.

This made the negative impact of artisanal mining on national economy enormous.

Table 6:- Royalties and rent on Acquired mining land

	Regularly paid	**Paid occasionally**	**Not paid at all**	**No Idea**
Number of Respondent	**1**	**3**	**6**	**1**
Percentage(%)	**9.09**	**27.27**	**54.55**	**9.09**

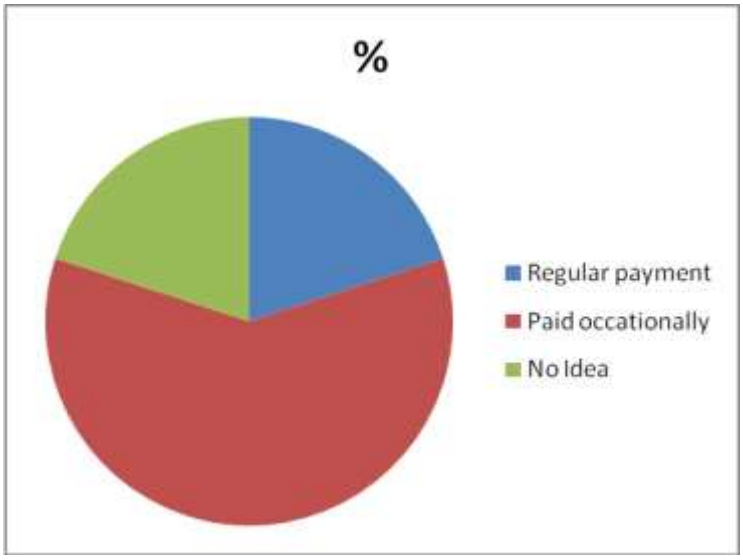


Fig.6:- Pie Chart showing the level of compliance with mining law

Mineral Sales and Marketing.

Mining is not a single expert job. Professional skill of geologists, mining engineers, surveyors, economists and chemists are required in a mining business. Artisanal mining in contrast, is a joint business among miners who are not professionals, labourers and the landowner or traditional chief of the village. The individual mineral merchant produces the financing the landowner donates his parcel of land for cash compensation and the laborers carry out the digging. In most cases, a 1:2 or 2:3 sharing ratio are often agreed between the merchant and the labourers. Where the fund for the business is supplied by the merchant, he buys whatever proceeds from the labourers at ridiculously low price. There are three sale outlets for the mineral won from this community. The ore is either sold to the mineral merchants on site or taken to the city nearby. (Table 6) but there are no record of exportation of mined ores from site. Mineral grade is fundamental to the price in international market and this is ensured by mere physical inspection and prices are fixed without any qualitative assessment. The qualities are determined arbitrarily on site and weight are measured by differential method, using very obsolete mechanical weighing

balance directly on site or at the village. In some instances, the transactions are held at the local mineral market in Ojoo, Ibadan.

Table 6:- Sale and marketing of Ore

	Mined Ore sold on site	**Mined Ore taken to nearby town for sale**	**Mined Ore sold on site and in town**	**Mined Ore exported**
Number of Respondent	**18**	**5**	**2**	**0**
Percentage(%)	**72**	**20**	**8**	**0**

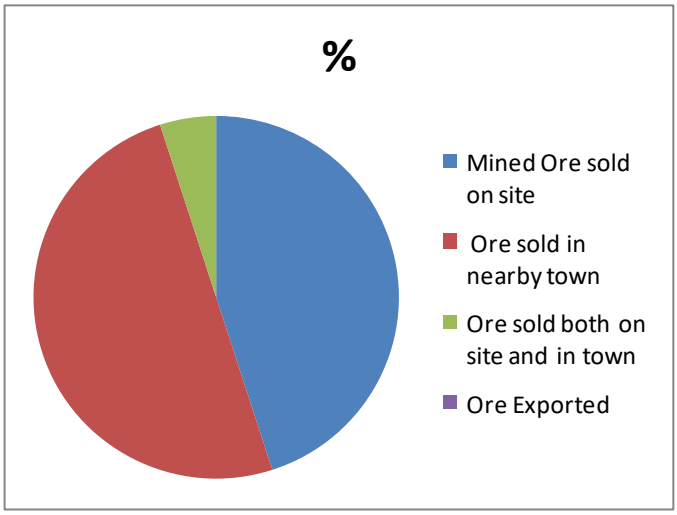


Fig.6:- Pie Chart showing how mined Ore is disposed

Cost of Living

The traditional livelihood and culture of the people in the study area have been destroyed by the influx of people of diverse cultural backgrounds into the communities. The induced population growth created by the miners and the mineral merchants, forced prices of goods and services to soar to about 60% (Table 8). The price survey carried out by this researcher in the village market and

Olomi, a community at the exit of Ibadan towards the mining village, showed that prices of every household article in these mining communities are higher than the cost of the same article at Olomi.

Table 8:- Comparative Commodity Pricing at Olomi and the village Market

	Prices of Articles Higher	**No Substantial Difference in Prices**	**Prices Relatively Lesser in the Village**
Number of Respondent	**9**	**3**	**3**
Percentage(%)	**60**	**20**	**20**

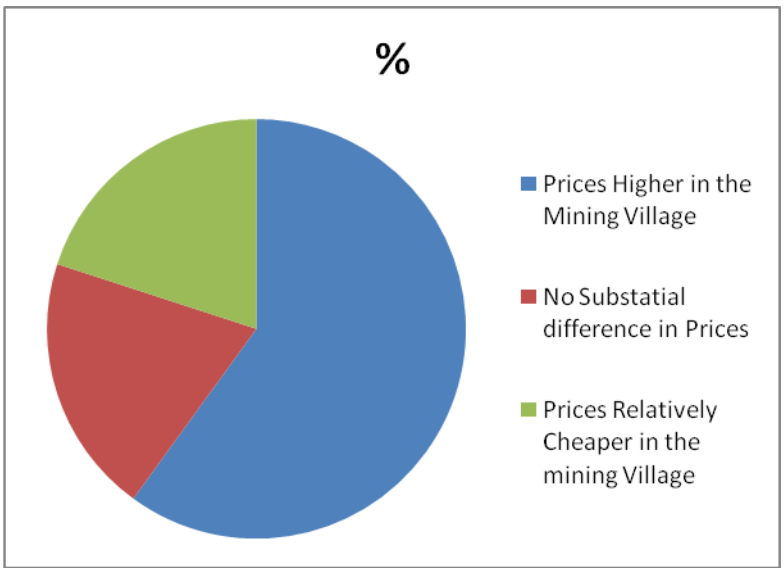


Fig 8:- Pie Chart showing Comparative Commodity Prices between Olomi and Olode Market

Recommendations

Mining in the most unprofessional way is a common practice amongst artisanal small scale miners partly because mining is a capital intensive business which the ASM cannot avoid and in most cases, the people are un-educated and lack the professional skill

needed in mining. The services of geologists, mining engineers, chemists and environmental scientists are inseparable, where each has to play his distinct role in the industry to make it sustainable. Artisanal and small scale mining (ASM) is an in-sequential method of mining which is susceptible to uncontrolled environmental degradation, several categories of human abuse and child labor, lack of accountability, poor infrastructural provision in the mining communities and different levels of vices. The incursion of artisanal and small scale miners into the mining business has made the development of the solid mineral sector practically unattainable for governments in many countries. Therefore, certain steps are recommended for the artisanal and small scale mining (ASM) to become a willing partner of government in the sustainability of the solid mineral sector for sustainable development:

1. Provision of a legal framework that will formalize the approval of artisanal small scale (ASM) mining as an integral economic activity that can be identified and held accountable.
2. Creation of mineral assessment centres in the local government headquarters of the mining communities. This will lead to the establishment of modernise village market centers' in mining communities.
3. Provision of mineral assessment form that will be administered by appropriate government agencies to ensure that miners operate within the armbit of the law.
4. Mining companies and miners must be compelled by law to engage the services of qualified and COMEG certified geologist in their staff roll.
5. Government must have to co-sponsor with mining companies, a geological and/ or geophysical investigations of an identified ore deposit before mining should be carried out
6. Cottage mineral beneficiation and processing industries should be established within the ASM communities for job creation of the teaming population of youths in the mining community.
7. The artisanal and small scale cooperative mining society could be formed to make a direct relationship between the miners, the indigenes and government possible. Through

the society, people-oriented poverty alleviation programs can be established at rural level. Establishment of formalized skill- acquisition training centers and rural information databank and guided mineral exploitation scheme for direct accountability are all feasible.

Conclusion

If artisanal and small scale mining is properly managed, it could be a strong and indispensible channel of economic mobilization for sustainable and capacity building for infrastructural development. The nature of the sector, the manner of their operation and the caliber of operators negate the principle of sustainable livelihood. A more articulated and structured participatory role from all stakeholders; government, miners, marketers and the community landowners, will ensure that the one-sided activity of the subsector, presently favoring the miners, will be equitably distributed. The potential of this subsector can be annexed for the overall development of the people and the community

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