

ARTISANAL QUARRIES IN KADUNA METROPOLIS WITH ASSOCIATED SOCIO-ECONOMIC BENEFITS

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ABSTRACT

This research assessed the socio-economic benefits that exist in artisanal quarries of Kaduna Metropolis. Rock quarrying like other mining sectors contributes significantly to the socio-economic development of those engaged in Quarry and their host communities. This study used questionnaire administration and field observation to collect data from 5 artisanal quarry sites in Kaduna Metropolis. Global position instrument (GPS) was used for taking the bearings and locations of the quarry sites. Geographic and Geologic maps of Kaduna metropolis were also used for the research. Result showed that Majority 238 (60%) of the respondents were married, majority of the workers were Moslems while only (18%) of them were Christians. The ethnic composition of the workers are Hausas forming the majority. Other ethnic groups were Isoko, Igbo, Ron and Guduf. Result also showed low level of education. Least monthly earning was N20, 000 per month by those engaged in artisanal Quarrying. The socio-economic conditions of overwhelming majority of the workers have improved as a result of earnings from the quarries. Observations and interview showed that the quarry miners did not use recommended safety wears. Many people are exposed to pollutants which may cause cancer later without realizing it.

Keywords: Artisanal, Quarry, Mining, Socio-economic

INTRODUCTION

Mineral products are at the core of today's civilization. Mining resource are important sources and measure of wealth for a nation. The manufacturing sector, the high technology industries and even 1 of the resource industries are all dependent on the mining industry in one way or the other. Thus, modern societies depend on the availability of rocks and mineral resources as many mineral products are found in typical American homes and homes in other developed societies (Mckelvey, 1973).

Quarrying is a method of mining that involves the extraction or exploitation of geo-materials such as rocks as constructional materials or industrial minerals, which most often takes place at the surface. In this study the terms "mining" and "quarrying" will be used interchangeably, since quarrying is a mining method.

Rock quarrying like other mining sectors contributes significantly to the socio-economic development of many countries, providing raw materials for local industries and for exports, facilitating the provision of infrastructures such as roads and the opening up of otherwise remote areas as well as providing employment opportunities. Today we depend upon the quarrying industry to construct, improve and maintain our homes, work places, hospitals, schools, shops, leisure facilities, roads, railways, water and sewage systems, airports, docks and nearly all the other structures that make up our "built" environment. Crushed rock from quarrying is also used in iron, steel and cement manufacturing industries, to

clean power station emissions, to increase the productivity of agricultural land, to reduce acidification of both land and water and to produce paints, medicines and plastics. Sand is additionally used to make glass.

The Artisanal and Small Scale (ASM) sector in Nigeria provides a rural livelihood to thousands of rural families dispersed throughout the country. Because the vast majorities of miners work casually, seasonally or are migrant workers from other parts of the country, it is impossible to determine the exact or actual number of workers in the ASM sector. Some studies have however claimed that there may be as many as 400,000 workers in Nigeria (SMMRP, 2005). Rock quarrying is however not any different from other informal activities as it engages all groups: men, women, and children. Birabwa (2006) revealed that rock quarrying involved mostly men who comprised 62 percent while the women were 38 percent. The ratio of women to men is related to the intensive activities involved in rock quarrying. Artisanal and small-scale rock quarrying also involves significant numbers of children – an issue that received international attention in the 1990s following press reports on child labour in coal mines in Colombia (MMSD, 2002).

Birabwa (2006) identified poverty as a major causative factor in the rock workers engagement in quarrying activities. Most of the workers related poverty to lack of money to buy food, clothing, to obtain shelter or to pay for their children's education. They therefore had to engage in quarrying activities, so as to meet these basic needs. To these workers Birabwa (2006) asserts, poverty is also associated with lack of adequate education. The rock quarry workers justified their low education status with their presence at the quarry. They also said that the nature of their work and the tools they used did not require formal education. What they needed was physical strength to extract, lift and crush rock boulders in order to earn a living. The ability to labour in this case is an asset that the poor use to realize livelihood outcomes, Birabwa (2006) concluded. This research therefore assessed the socio-economic benefits that exist in artisanal quarries of Kaduna Metropolis. Artisanal rock quarrying has been going on for a very long time in some location yet there is paucity of literature. This study therefore sets to seek answers to the following research questions:

- i. Who are the people involved in rock quarrying in Kaduna metropolis?
- ii. Where are the rock quarrying sites located in Kaduna metropolis?
- iii. What are the methods of rock quarrying employed by the miners?
- iv. What are the effects of rock quarrying on the socio-economic life of the miners?

THE STUDY AREA

Kaduna metropolis comprises of Kaduna North, Kaduna South, parts of Igabi and Chikun Local Governments Areas as shown in figure 1. The area lies between 10° 26'N and 10° 36'N latitudes, 7° 23' E and 7° 35' E longitude.

The climatic condition of Kaduna metropolis is divided into two: rainy season and dry season, each of about six months respectively. The rainy seasons is distinguished by the availability of rainfall, the wet months start in April and end in October (Aremu, 2008). At this period, extreme rains especially in the months of August and September do occur in between and whenever they occur, they usually cause serious destructions.

The entire land area is underlain by Precambrian basement complex rocks of migmatite – gneiss complex, Meta sedimentary/Meta volcanic (mostly schist, quartzites, and amphibolites), Pan African granitoids and cal – alkaline granites and volcanics of Jurassic age (Olyuide, 1995). Figure.2 present the geological map of Kaduna metropolis adapted from Geological and Mineralogical Map of Kaduna State.

The migmatite – gneiss complex constitute the largest group of rocks in Kaduna Area. The soil type found in Kaduna metropolis is tropical ferruginous developed soil on sandy parent material. Mallo (1993) described the soil of the Ribadu cantonment as tropical ferruginous that is mainly lithosoil developed on sandy material.

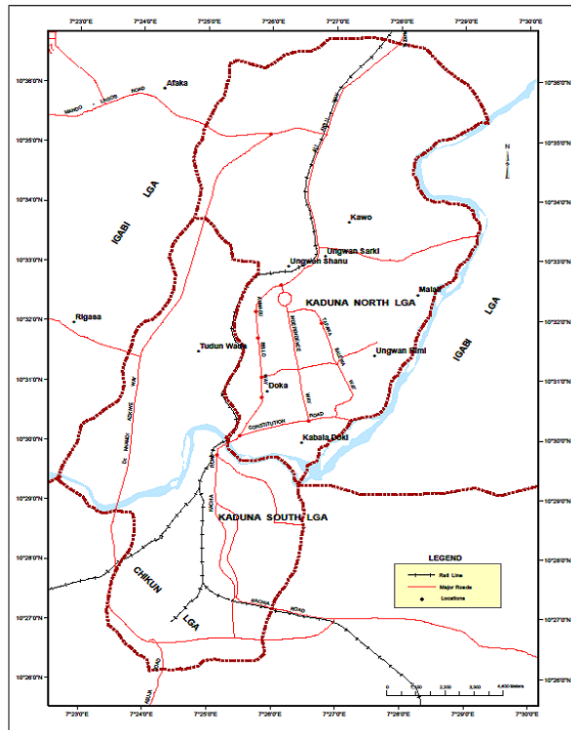


Figure 1: Kaduna Metropolis
 Source: Geo Dept. NDA Kaduna (2013)

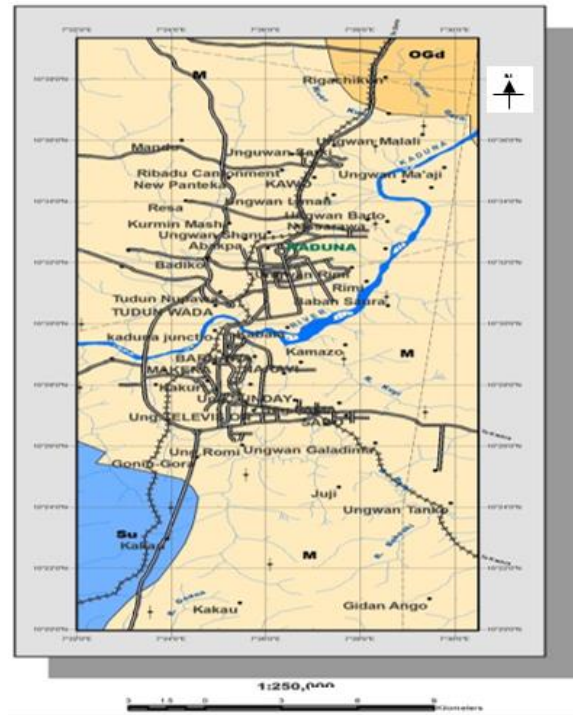


Figure 2: Geological Map of Kaduna Metropolis adapted from Geological and Mineralogical Map of Kaduna State.
 Source: Geological Survey Department of Nigeria (2004).

Kaduna metropolis lies within the northern guinea savannah zone with the trees dominated by *Isobrerlinia doka*. The other trees are *Azelia Africana*, *Burkea Africana*. Within the city much of the natural vegetation has been replaced by exotic species, which are observable in the parks, gardens and road sides.

The land use categories include: residential land use, institutional land use, commercial, industrial land use, urban agricultural land use, vacant lands, water and non-urban land use. Kaduna metropolis has a population of 1,303, 376 million people (NPC, 2006).

MATERIALS AND METHODS

This study used questionnaire administration and field investigation to collect data from 5 artisanal quarry sites in Kaduna Metropolis to acquire information on socio-economic status of the miners as well as secondary sources of information obtained from similar researches done in Nigeria and other countries. Global position instrument (GPS) was used for taking the bearings and locations of the quarry sites. Geographic and Geologic maps of Kaduna metropolis were also used for the research. 5artisanal quarry sites were selected based on the fact that the artisanal quarries had rock outcrops and were operational. These sites are Kabala Doki quarry, Kaduna quarry Malali, P.W quarry, Kinkinau quarry and Baban Saura quarry.

Four hundred and ten copies of questionnaire were distributed but 396 successfully responded and constitute the main element of this study.

RESULTS AND DISCUSSION

Socio-economic characteristics of the Miners: Majority 238 (60%) of the respondents were married and 158 (40%) were not married while 325 (80%) of the workers were Moslems, 71 (18%) of them were Christians. The ethnic composition of the workers showed that Hausas formed the majority of 350 (88%), and other ethnic groups of Isoko, Igbo, Ron, Guduf and others constituted 46 (12%) of the respondents. Result also shows that 158 (40%) of the quarry workers had primary school education, 96 (24%) had secondary school education and 142 (36%) of the quarry workers did not go to school.

This finding show that Muslims are in majority because they are more in population, quarrying requires only hard work and is open to all tribes and religions. From interview with the quarry workers, it was discovered that high level of education is not essential to do quarry work.

Table 1: presents male and female sex ratio of the respondents

Gender	Frequency	Percentage (%)
Male	396	100
Female	-	-
Total	396	100

As indicated in Table 1, all of the respondents 396 (100%) were males. An in-depth interview with some of the management staff and other workers shows that there is disproportionate representation of males to females due to the strenuous nature of work in the industry. According to them, "the work is a dirty job and our women do not want to be dirty." From observation, the few women involved in the quarry business were involved in the buying and selling of the aggregates/products. Others were involved in selling of food, water, and soft drinks at the quarry sites. Women also played supportive roles in sieving and washing of ores and as service providers. This supportive role according to SMMRP (2005) explained that perhaps some cultural beliefs and practices could have hindered women's participation in mining, such as Islamic religious practices of "purdah" and "kule".

Age distribution of the respondents

In terms of age distribution, result shows majority of the work force in the artisanal quarry industry are youths between 11 years to 20 years of age with total number of 200 respondents (51%). They are either unemployed or schooling while they take quarry work as part-time. Most respondents within 40 years and above are involved in the administrative section of the quarry industry. It is important to note that there were no children below the ages of 18 years in all the quarries sites investigated as against international Child labor law (ILO). The use of simple tools to break hard rock make quarrying a strenuous activity, hence limited to able bodies. This finding is similar to Birabuwa (2005).

Quarry sites location

The location and bearings of the rock quarrying sites were identified using GPS.

Table 2. Present a summary result of field experiment that was performed.

Name of Rock Quarry	Location	Northings (DM)	Eastings (DM)	Elevation
P. W Nig. Ltd	Babasaura area of Chikun LGA	10° 30'N	007° 28'E	589m
Essinglory Nig. Ltd	Eastern bye-pass	10° 26'N	007° 24'E	587m
Duwan Nig. Ltd	Mararaban Jos	10° 40'N	007° 29'E	632m
Blue Cycle Nig. Ltd	Mararaban Jos	10° 40'N	007° 29'E	627m
Baban Saura quarry	Baban Saura area of Chikun LGA	10° 30'N	007° 28'E	589m
Tudun Wada quarry	By Kaduna Polytechnic (CST)	10° 31'N	007° 24'E	615m
Kinkinau quarry	Kinkinau village. Kaduna South LG	10° 31'N	007° 24'E	617m
Mararaban Rido quarry	Mararaban Rido Chikun LGA	10° 25'N	007° 31'E	635m
Goningora quarry	Goningora, Kaduna South	10° 26'N	007° 23'E	584m
Kariga quarry	By NNPC	10° 30'N	007° 28'E	602m
Kabala Costain quarry	Kabala Costain, Kaduna North	10° 29'N	007° 26'E	534m
Destiny quarry	Malali	10° 33'N	007° 28'E	593m
Kaduna quarry	Malali	10° 32'N	007° 28'E	605m
Sonny quarry	Malali	10° 33'N	007° 28'E	534m

The map of the investigated quarry sites is shown in Figure 3. It was observed that most of the quarry sites especially the artisanal quarries are now surrounded by settlements contrary to the start of quarrying when there were no settlements as indicated from interview of the respondents. The above observation is consistent with the findings of Kariuki (2001) that quarries are supposed to be isolated from development, mainly because explosives are occasionally used to blast rock but developments often encroached on them.

Artisanal rock quarries take place where there are rocks, a reflection of the geology and also the rocks must also be outcropping, a reflection of the high relief of the area.

Methods of rock quarrying employed by the miners

The reconnaissance surveys revealed that in Kaduna metropolis, the quarry types are basically small-scale and artisanal. Small-scale rock quarries are mechanized using explosive, crushers grinding machines and bulldozers, amongst others. The artisanal quarries use simple tools, like hammers, chisels, wedges, firewood to break up the rocks into smaller fragments.

Observations and interviews showed that the quarry miners did not use recommended safety wears. Only 40 (10%) use improvised safety wears such as eye glasses as safety goggles (Plate III), and water hosts as hand gloves (plate IV). There were no face masks to prevent dust raised in the course of quarrying from entering their eyes and noses instead they use eye glasses as improvised Safety Goggles (Plate III).

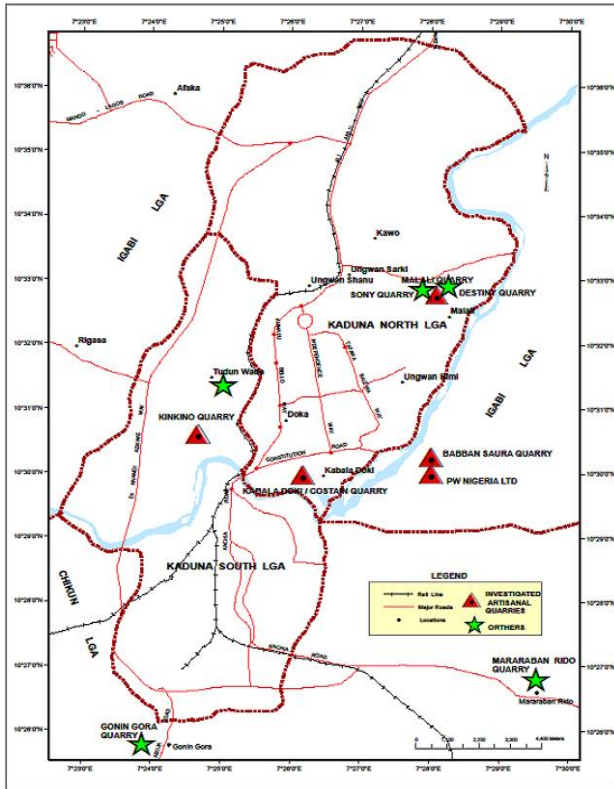


Figure 3: Map of investigated quarry sites



Plate I: Quarry worker using hammer to break the rock fragments as required by the end users



Plate II: Wedges to assist in breaking rocks



Plate III: Eye glasses as improvised safety goggles



Plate IV: Pieces of Water Host Used As Hand Gloves

Implications of using improvised safety wears

Dust raised in the course of artisanal quarrying contain heavy metals like Pb, Cd, Ni, Cr and Cu that are toxic to all organisms even in low concentrations (Botkin and Keller,1998). Moriber 1974 and Alloway and Ayres (1994) on heavy metal pollution showed that environmental destruction could be insidious and its harmful effects only become apparent after long periods of exposure. Many people are exposed to pollutants, which may cause cancer later without realizing it. That is the reason why the quarry miners should be aware of the implications of not using appropriate safety wares.

Products of Artisanal Quarrying

The products of the artisanal quarries range in size as follows:

- i 1/2" used for construction or house decorations
- ii 3/4" used for casting of beams
- iii Dust used for molding blocks and interlocking tiles.

"Kankura" or hardcore, about 50cm in diameter are big size boulders quarried with the aid of wedges which separates them from the main rock body. They are used for foundations of buildings and suck-away among other things.

Effects of Rock Quarrying on the Socio-economy of the Workers

The summary of income level of the artisanal miners per month is presented in Table 3.

Table 3: Income level of Artisanal Miners

Income per month	Frequency	Percentage (%)
Below 200	-	-
N20, 1 00 – N30, 000	198	50
N30, 1 00 – N40, 000	119	30
N40,1 00 – N50, 000	59	15
N50,1 00 and above.	20	5
Total	396	100

Table 3 reveals that out of 396 respondents, 198 (50%) are on monthly income of between N20, 100 – N30, 000, 120 (30%) are on monthly income range of between N30, 100 – N40, 000, 59 (15%) are on income range of N40, 100 – N50, 000 and 20 (5%) earn over N50, 000. There were no respondents that earn less than N20, 000 per month. The last two categories of income represent earnings of managers and supervisors to whom the workers sell the crushed rocks for onward sale at the market. The income of the rock breakers is not fixed but dependent on how much rock the workers are able to break per month.

Result shows that the socio-economic conditions of overwhelming majority of the workers have improved as a result of earnings from the quarries. The in-depth interview of the miners showed that 79 (20%) of the respondents interviewed claimed that they got married from income derived from quarry, 159 (40%) claimed to have used the money to support their children's schooling, while others 79(20%) bought vehicles (cars, motorcycles, bicycles), 59 (15%) built or repair their houses and 20 (5%) used the income to support their parents and pay their own school fees.

One interviewee claimed that the rock quarry business in Baban Saura village has benefited the villagers, for it has provided them with employment, which has improved the lives of not only themselves also that of their families. The workers might not be aware of the socio-economic benefits of quarries that it has far reaching implications for sustainable development. As sustainable development has one principal goal: to improve the quality of life, for ourselves and for generations to come. It is based on three founding pillars, namely, environmental, economic and social dimensions (Buhagier, 2006).

Conclusion

Artisanal rock quarrying like other mining sectors contributes significantly to the socio-economic development of any area where rocks and or minerals exist. Artisanal rock quarrying provides raw materials for local industries, facilitating the provision of infrastructure such as houses, roads opening up of otherwise remote areas as well as providing employment opportunities among others. One of the problems associated with quarrying is the dust from rock powder (silicates and heavy metals) which is a health hazard to workers. Quarry miners do not use the recommended protective safety wears instead they use improvised safety apparels such as eye glasses or shades for safety goggles and pieces of water host tubes for hand gloves. The quarry workers improperly kitted for the quarry work are exposed to heavy metal pollution. Simple protective measures and safety gears could make the difference between life and death, thereby ensuring the sustainability of human life.

Artisanal quarrying uses simple implements such as hammers, shovels, diggers, fire woods for operations as against other form of quarrying (large and small scale quarrying) that uses explosives, Drilling machines, Bull dozers and pay loaders among others).

A potential problem associated with mineral resource development is the possible release of harmful heavy metals that constitute the dust released to the atmosphere. The harmful effect of these metals is insidious and becomes apparent long after exposure. Many people are exposed to pollutant which may cause cancer and other health challenges later in their life without realizing it.

Main problems associated with quarries in the study area include reasons of lack of resources, lack of or non- application of safety regulations, illiteracy level, lack of training, and inadequate equipment among others. The use of proper safety equipment or wears constitute sustainable or smart quarry manning as the life of the workers are prolong if the safety wears are used.

Recommendation of the Study

Artisanal quarrying and mining industries by their very make up are not environmentally sustainable. The overwhelming evidence is that the artisanal quarries largely work the land illegally, are labour intensive, with low rates of recovery, low standards of safety and health with significant impact on the environment among others. The potential future of artisanal quarrying in Kaduna metropolis and Nigeria in general lies in artisanal quarrying in a more sustainable way. This admittedly is a difficult problem to fix, given the many constraints of monitoring the activities of artisanal quarries and mines. Nonetheless, to begin to address this dilemma, it is recommended that:

- i. Effective monitoring should be done by the inspectorate division of the department of Mines in the Ministry of Solid Mineral and offenders of environmental laws should be arrested and prosecuted.
- ii. Public enlightenment campaigns should be mounted to get the state, local government; traditional rulers and community heads enlightened on environmental sustainability and the activities of the artisanal quarrying or mining. Their involvement will help in curbing illegal mining activities.
- iii. To show that the government had not completely abandoned the artisanal miners, government should encourage and assist them to regroup themselves into cooperatives, where they can

- be licensed, given financial assistance and probably scaling up to mechanized methods of quarrying or mining.
- iv. The miners need to be enlightened on the necessity of wearing the recommended protective safety wears as they are constantly exposed to insidious heavy metals of Pb, Ni, Cu, Cr, and Cd among others.
 - v. Regular health checks should be carried out on the miners to check for the presence of these heavy metals in their system.

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