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Assessment of Environmental Impact of Limestone in Quarry Areas of Gombe, State Nigeria

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***Abstract* - In the face of today's escalating problems regarding dwindling resources, growing segregation, climate change, waste management and much more, a societal need has risen to change existing systems, and ways of functioning, to a new direction. It is expected that the proposal will find out the environmental effect of limestone quarrying in limestone deposit areas in Gombe State knowing that extraction and processing of mineral resources is the backbone of the national economy in many developed and developing countries of the world. However, the great danger posed by mineral exploitation such as abandoned sites, biodiversity damage, uses of hazardous chemicals with potential health risks to mine workers and neighborhood communities deserve urgent attention. Research has played a large role in the sustainability discussion and is actively forming and reforming the comprehension of the current situation as well as what need to change and the methods to do so.**

Keywords: Limestone, Environmental, Quarry Areas.

I. INTRODUCTION

Limestone quarrying is a major economic activity in many developing countries including Nigeria [1]. Nigeria is endowed with abundant mineral resources of international value, including gold, marble, gypsum, gemstones, iron ore, natural gas, topaz, coal, clay, lead, tar sand, construction stone and construction sand. While the exploitation of natural resources has traditionally been seen as a vital part of economic growth, it is now well recognized that concern for environmental and socio economic consequences must be included as a key component of development activities. In many developing nations like Nigeria, quarrying is an important contributor to the national economy. However, the negative environmental impacts of quarrying are increasingly being recognized as critical [2]. The quarrying sector may strengthen the economy at the national scale; it may also present an entirely new set of problems at the scale of the local community. Exercising social responsibility in small, remote centers, however, often m means that international and transnational corporations must interact with rural or indigenous people who have strong emotional and historical links to the land [2]. Limestone quarrying activities can led to health effects ranging from respiratory problems to mental disorders. Studies in Tanzania revealed that symptoms of heavy metal poisoning such as sensory disturbance, tremor, gingivitis, metallic taste, neurasthenia and night blindness are common [2]. In the last five years, studies on environmental impact of limestone quarrying and processing in Sagamu (Sagamu – Ogun State, Nigeria) have revealed a declining kola nut output from the plantations within a few kilometres radius of the cement factory [3]. Exploitation and processing of minerals in a particular area creates cultural impacts, which involves the changes to norms, values and beliefs of individuals that guide and rationalize the cognition of themselves and their society [4]. There is little or no work on Ashaka Cement factory and its environment.

II. LITERATURE REVIEW

2.1 Geological Setting

The geology of Nigeria is made up of three major litho-petrological components, namely, the Basement Complex, Younger Granites, and Sedimentary Basins. The Basement Complex, which is Precambrian in age, is made up of the Migmatite-Gneiss Complex, the Schist Belts and the Older Granites [5]. The Younger Granites comprise several Jurassic magmatic ring complexes.

2.2 Environmental damage

"Environment" as used in this work has three components, namely, the sum total of external conditions in which organisms exist; the organisms themselves including the floral and faunal community; and the physical surroundings such as landforms. All these three aspects, which include various entities such as air, water, land, vegetation, animals including human, landscape and geomorphological features, historical heritage etc. area adversely affected one way or the other during the course of mineral development [6].

2.3 Geological hazards

Lime stone quarrying operations normally upset the equilibrium in the geological environment, which may trigger

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off certain geological hazards such as landslide, subsidence, flooding, erosion and tremors together with their secondary effects. Some cases of subsidence and instability associated with draining of oil and gas from the subsurface reservoir have been reported in the Niger Delta [7].

2.4 Socio-environment problems

Some socio-environmental problems are sometimes created as a result of certain peculiarity of the mineral industry. Since minerals are exhaustible and renewable commodities, the life of a mine and, consequently, the lime stone quarrying activities in a place has a limited time. The stoppage of lime stone quarrying activities imposed by depletion of the available reserves often leads to migration of people from the lime stone quarrying areas to other places [4].

III. MATERIALS AND METHODS

3.1 Research Design

This study will employ the use of survey research design. The choice of this research design is considered appropriate because of its advantages of identifying attributes of a large population from a group of individuals. The design was suitable for the study as the study sought to examine co-operative education using Gombe state university as a case study.

3.2 The Study Area

This study was conducted at the Gombe State ministry of solid minerals. The choice of this study area was informed by its involvement in land administration and reforms in the state. This study considered Gombe State because it's the only place that has limestone quarry in North-East Nigeria.

3.3 Population of the Study

The population of this study will consist of eighty-two (82) Staffs of Ashaka Cement Factory and Gombe state ministry of solid minerals.

3.4 Sources of Data Collection

Data was collected from primary and secondary sources. Primary data was obtained through questionnaire and personal interviews with both management and senior staff of the commission. This method was adopted to enable detailed and independent information not covered by the questionnaire to be expressed by the respondents. Secondary data will obtain from published reports, books, internet, journals, newspapers and magazines. For analytical comparison of facts and proper compilation of facts and figures, survey of existing documents was deemed necessary.

3.5 Instrument for Data Collection

Data was collected through questionnaire carefully designed and administered to the respondents, as well as through personal interviews. On the whole, the questionnaire constituted the major instrument for data collection. The questionnaire contains sections A and B. Section A contains personal information about the respondents. Section B is the main body of the questionnaire. This section contains seventeen (17) close ended questions using a four (4) point scale instrument through which the opinions of the respondents were expressed.

3.6 Validity of Research Instrument

The validity of the research instrument was assessed by the experts in the Faculty of Environment, Gombe State University. These experts assessed the relevance of each item in relation to the objectives of the study, the hypotheses to be tested as well as the comprehensibility of each item in relation to the cognitive level of the respondents. They will validate the instrument by effecting necessary corrections, examining the contents and ascertaining clarification of ideas as well as appropriateness of the items.

3.7 Method of Data Analysis

Simple statistical analysis such as mean, standard deviation and percentage was used as technique of analyzing the data generated while chi-square was used to test the research hypotheses. All the tests were conducted at 0.05 level of significance.

IV. RESULTS AND DISCUSSIONS

Table 1: Data used the research

Data	Sources of Data
Socioeconomic characteristics of the households	Questionnaire Survey
The population of the Study Area	National Population Commission
Method of quarrying	Questionnaire Survey
Tool use in the extraction	Questionnaire Survey
In-depth Interview	Field Survey

Table 2: Characteristic of respondent on Gender

Gender	Freq	Percentage	Freq	Percentage
Male	44	91%	37	98%
Female	5	84%	4	5

Table 3: Characteristic of respondent on Marital Status

Married	41	84%	21	56%
Single	8	15%	18	51%
Widow	3	6%	4	8%

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Divorse	2	4%	5	11%

Table 4: Characteristic of respondent on Educational level

Primary	3	34%	16	26%
Secondary	20	55%	18	27%
University	9	54%	4	11%
Others	2	6%	4	8%

Table 5: Characteristic of respondent on occupation level

Civil Servants	10	44%	18	36%
Business Personnel	23	45%	14	29%
Mining	14	34%	34	64%
Farming	8	13%	8	15%

Table 6: Quarrying Methods

Methods	**Frequency**	**Percentage**
Manual	31	71%
Mechanical	10	29%
Total	**41**	**100%**

Table 7: Tools used in Extraction

Tools	**Frequency**	**Percentage**
Dynamite	8	20%
Hammer	16	41%
Digger	5	7%
Wagon Drill	3	10%
Burning Tyre	4	10%
Chisel	3	12

The personal information of the respondents including gender, age, marital status, level of education, occupation, and average monthly income,isdisplayedinTable2.Accordingto the respondents' gender distribution, male made up the great majority of the study area's population 98%, while female made up 8% (Table 2). This suggests that men make up the majority of the study area's head of household. The respondents' gender distribution generally revealed that all miners in the study area are male, making up 100% of the workforce. This can be attributed to cultural norms in the Metropolis, which forbid women from working and assign them to caring tasks at home. Women are supposed to take care of the children at home [8].The research area's marital status revealed that 85 % of its inhabitants are married, compared to 15% who are single. Table 2 also showed that, at 51 %, more miners were married than single, widowed, and divorced people, who made up 48%, 4%, and 5% of the total. Marital status has no bearing on quarrying operations in the study area, according to the obtained finding. However, the findings (Table 2) also revealed that majority of participants in quarrying activities in the study area 38% had no formal education, as shown by their educational background. This presents challenges for the quarry workers, including injury and incompetence in using tools and devices. Following this, 28% and 23% of the respondents involved in the quarrying operations within the study area had completed their primary and secondary schooling, respectively. This demonstrated the poor educational attainment of the miners, the majority of whom only having a primary and non-formal education [9]. Among the literate, 28% completed elementary school, 14% went on to secondary school, 11% went on to higher secondary school, and 5% graduated. In terms of their occupation, 47% of study area respondents engaged in business activities, while 22% engage in mining or quarrying (Table 2). Due to the high population density in the area, it's possible that the miners who work there provide residents a way to conduct a variety of commercial activities. While other people in the study area took advantage of the availability of rock minerals in the area and started quarrying, which gave them a good supply of work opportunities? Quarrying activities is a good source of income and employment opportunity for people working in the quarry site of the study area which helps them to Table 3 showed that 69% of the sampled respondents in the study area used manual method of extracting granite rock as compared to 30% who used mechanical method. Manual method of quarrying in the study area involves the use of manual device and tools like digger, hammer and chisel, among others. Another basic manual extraction technique involves burning tires, which softens the rocks by allowing heat to permeate them and facilitate blasting. The mechanical method of quarrying in the study area, on the other hand, uses drillers to drill into the rock and chemical explosives like dynamites to blast the rocks. The result (Table 4) of the findings revealed that majority of the miners (41%) used hammers, 20% used dynamite, 12.8% utilized diggers, 10% used burning of tires, 7% used waggon drillers, and 7% used chisel. Dynamites are devices used in quarrying activities that are mostly made of explosive chemicals that produce a loud noise when they blast rock. Some companies in the area utilize this kind of quarrying. However, in the study area, diggers, chisels, hammers, and burning tires are commonly used by independent miners. Diggers and chisels are used to excavate and bore holes in rocks to facilitate blasting, while hammers are used to create large stones that are utilized for various building purposes. Furthermore, in the study area, burning of tyre on the rock is used to soften the rocks and make them more amenable to blasting.

V. ENVIRONMENT IMPACT OF LIMESTONE IN QUARRY AREAS

The participants disclosed that although quarrying operations give rise to environmental and health-related issues, the industry is crucial in mitigating poverty as the majority of the population works in the industry, which has

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raised their standard of living. Some of them have built homes, purchased food, and taken care of their families' necessities using the money they have made from their quarrying activities. For this reason, the people living in the study area benefit greatly from the quarrying activities. The participants also disclosed that quarrying operations supply raw materials for construction projects. Because quarrying is a crucial source of building materials for all construction projects, the study area's residents have easy access to building supplies like sand, gravel, and stones.

VI. HEALTH PROBLEMS ASSOCIATED WITH QUARRYING IN THE STUDY AREA

Participants disclosed that in the study area majority of the miners and residents have hearing impairments, which they attribute to the noises made by explosive devices and manual quarrying techniques. The participants also disclosed that air pollution from quarrying operations in the study area made breathing difficult for both residents and quarry workers. In addition, majority of the miners and residents have chronic coughs and eye problems, which are frequently linked to air pollution because of the introduction of harmful substances like asbestos, which causes lung diseases and chronic coughs, and particulate matter, which enters the eyes through openings and causes defects in the eyes. Similar results were reported by [10] in his study on the environmental, social, and health effects of stone quarrying in Mitrapur Pan chayat of Balasore District, Odisha. He discovered that respiratory issues, eye infections, coughs, sneezes, allergies, chest pain, headaches, accumulation of dust in the home, and sluggish growth of cattle and goat fodder were among the health problems caused by dust pollution due to quarrying activities. Similarly, [11] reported that both people and animals that are exposed to excessive noise might develop stress, anxiety, depression, hypertension, headaches, tinnitus, and hearing loss as a result of noise pollution.

VII. CONCLUSION

The study came to the conclusion that quarrying activities disrupt the local environment in the study area, and many of the residents who live nearby suffer greatly as a result of the activities, which include pit creation, physical structural destruction, noise pollution, air pollution, land degradation, soil erosion, and vegetation destruction. Nonetheless, the majority of the locals and the miners experience chronic coughing, chest pain, breathing difficulties, vision issues, and hearing impairments. Although quarrying activities in the study area have negative effects on the health of the local population, they also raise living standards by creating jobs and raw materials for construction projects like building roads and other infrastructure. The study area's quarrying practices included a variety of methods and techniques, such as surface mining, burning tires on the rocks before crushing, and utilizing hammers and chisels to smash the rock.

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