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Assessment of the Effect of Stone Quarrying on the Environment of Anguwa Uku Area, Gombe Metropolis, Gombe State

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ABSTRACT

A significant direct and indirect predictor of human health is environmental quality. A significant factor in bad health and a miserable existence, declining environmental conditions also impede sustainable growth. This study aimed to assess the effects of stone quarrying on the environment and inhabitant of Anguwa Uku of Gombe Metropolis. In order to achieve the study aim, a mix-method research design was used, in which both quantitative and qualitative data were gathered. In-depth interviews (IDIs) and questionnaires were utilised to gather data for this investigation. For the purpose of gathering data, the participants and houses were chosen using purposive and systematic sampling techniques The quantitative and qualitative data was analysed using descriptive statistics. On the other hand, a theme method was used to analyse qualitative data. According to the data analysis results, 30.7% of the sampled respondents in the study area utilised a mechanical way of granite stone extraction, whereas 69.3% of them employed a manual method. In the study area, certified firms often utilise the mechanical approach, whereas self-employed miners mostly use the manual method. The majority of the miners in the research region, according to the results, utilised hammers (41.1%), dynamite (20.5%), diggers (12.8%), burning tires (10.2%), wagon drill (7.7%), and chisels (7.7%), to remove granite stone. However, the IDI's findings revealed that the local residents suffer greatly from the operations surrounding the quarrying site, including structural destruction, air and noise pollution, soil erosion, land degradation, pit creation, and flora destruction. In addition, the majority of residents' experience chronic coughing, chest pain, breathing difficulties, vision issues, and hearing disorders. It was concluded that the study's local environment is damaged by quarrying operations; as a result, action must be taken to stop the situation in order to ensure sustainability in the future. The study recommends that companies should implement land reclamation measures at specific intervals to prevent flooding, land degradation, erosion, the creation of potentially dangerous pits, and other environmental issues that could negatively impact the study area's residents.

Keywords: Environment, Stone, Quarrying, Effect, Anguwa Uku Gombe

INTRODUCTION

The maintenance of human welfare and means of subsistence is closely related to a number of different endeavours, including trading and agriculture. Nonetheless, the quarry sector continues to provide a negligible contribution in emerging nations such as Nigeria (Statista, 2024). The open-pit extraction of both soft and hard rocks is

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known as stone quarrying (Fornaro & Lovera, 2004 cited in Mahapatra, 2023). Quarrying is a type of land use technique that involves removing non-metal and non-fuel materials from rock, according to Ukpong (2012). Common techniques for open-pit quarrying include the use of rock drills and dynamite explosions (Ukpong, 2012 cited in Mahapatra, 2023). Meeting the many demands of civilisation depends heavily on quarrying, which includes the removal of overburden, drilling, blasting, and rock crushing for a variety of uses (Kalu, 2018; Taiwo & Ogunbode, 2024). The numerous advantages it provides from job creation and income to government revenue, supporting related enterprises, supplying raw materials to the building sector, and serving decorative purposes underline its significance. Quarrying has been a major contributor to the economies of many countries, including Nigeria. The Central Bank of Nigeria (Central Bank of Nigeria 2024) reported that Melodi & Ogunyemi (2019) estimated the contribution of quarry activities to Nigeria's GDP, showing N62.39 billion by the end of 2023.

Numerous detrimental effects on the environment result from it, including destruction of flora, siltation of rivers, disturbance of animal habitat, soil erosion, noise pollution from blasting mountains, transportation of boulders by trucks, dumpers, etc., and dust pollution (Kindiga, 2017 quoted in Mahapatra, 2023). The resources of soil and water were severely strained by quarrying operations. Additionally, it upset the pre-existing ecology and regular hydrogeological cycle. It modifies the substratum, changes the layout of the landscape, disturbs the natural habitat, and modifies the genetic resources of the regional biodiversity. Additional quarrying operations worsen water contamination, noise pollution, and dust emissions. Crop fields flood as a result of waste rock dumping obstructing the natural drainage system and causing streams and rivers to divert to other areas (Maponga & Ruzive, 2002 cited in Mahapatra, 2023).

People who live close to quarry sites and those who operate heavy machinery should be especially concerned about the effects on their health (Nemer *et al.,* 2020; Opondo *et al.,* 2023; Noy, 2023; Okafor *et al.,* 2023). The health effects are manifold, including difficulties with hearing, mishaps brought on by machinery, and harm from stones and gravels during the processing stage. To exacerbate these concerns, Gerhardsson *et al.,* (2021) noted that workers' heart problems developed as a result of vibrations from the machinery. The structural integrity of nearby residential buildings has reportedly been impacted by the strong vibrations produced by these machines, which has resulted in the eviction of the original residents, who were primarily farmers (Norén-Cosgriff *et al.,* 2020; Arthur *et al.,* 2022).

For instance, in Malaysia, the quarry sector is thought to employ over 30% of the labour force involved in construction. Because they give the lower class job chances, quarry operators have been highlighted as a major contribution to the Malaysian economy. Over 0.5 million people were directly employed by Pakistan's granite sector in 2010, which was anticipated to have an annual revenue of approximately US$ 1 billion (Ilyas & Rasheed, 2010 cited in Halwenge, 2015). In Nigeria, granite mining is assisting in supplying the demand for increased infrastructure. In terms of compressive ability, the material is the most widely used, readily available, reasonably priced, and dependable building material (force). Thus, as an extractive industry, granite quarrying supplies more than 60% of the raw materials needed for building and other construction projects.

Since 1970s when quarrying activities start in Unguwa uku, 70,000m^2 out of the 160,00m^2 of the total land area of the study area have been destroyed by quarrying

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activities (Ministry of Energy and Mineral Resources Gombe, 2024). However, since Gombe town was established as the state capital of Gombe in 1996, there has been a significant increase in the demand for crushed gravel for building, which has led to a rise in the granite quarrying on the Gombe hill. Therefore, more than one-third of the study area's (Gombe Hill) total land will be affected by quarrying operations during the course of the next 30 years if the pace at which demand for construction materials increases together with the rate at which quarrying activities continue.

Quarrying activities in Anguwa Uku has degraded the local environment and has an impact on the wellbeing of the local populace. Both humans and the environment have suffered significant harm as a result of the employment of explosive chemicals and devices in addition to physical rock-breaking instruments. While quarries can have a significant negative impact on the environment, many of these effects can be reduced or controlled with careful planning and management. In addition, there are frequently many opportunities to protest against these effects and improve the environment, such as by relocating or creating new habitats. Thus, it is critical for environmental health to comprehend the detrimental effects of quarrying in the Anguwa Uku area, as doing so will contribute to the advancement of scientific knowledge aimed at improving environmental quality.

Therefore, based on these backgrounds this study assessed the effects of stone quarrying on the environment of Anguwa Uku area, Gombe metropolis with a view to provide information for sustainable management of the area. The study aimed to evaluate the environmental problems associated with the quarrying activities and examine the effects of quarrying on the health of the residents and miners in the study area.

The Study Area

Gombe State is located in the northeast region of Nigeria, with Gombe serving as its capital. Its total area is 20,265km^2. Gombe State borders Bauchi State to the west and Yobe and Borno States to the east (See Fig. 1). Gombe Metropolis is located between Latitude 10°17'30"N to 11^{0}7’30"E and longitude 10^{0}15'0"N to 11^{0}10’30"E (See Fig.1). It is the administrative headquarter of Gombe LGA with an area of 52 km² (Geohack, 2014). Geographically, Anguwa Uku is located in the vicinity of Gombe Hill with an extent area spans a circle radius of about 2km and is found between latitude 10° 18' 00" N and 10° 18’ 00" N and longitudes 11° 12' 00" E and 11° 12’ 00" E (Ministry of Land and Survey Gombe, 2024).

According to the National Population Commission (2024), the approximate population of Gombe state is 2.35 million, with the population of the metropolis being 266,844 as of 2006. The approximate population of Anguwa uku is 2,423 (National Population Commission, 2024). Gombe Urban Area's ethnolinguistic population is made up of the Fulani, Tera, Bolewa, Tangale, Jukun, Hausa and Kanuri people, among others. Anguwa Uku's key economic pursuits are quarrying activities, farming, raising domestic animals, among others. Other study area residents are involved in business and public/civil service. The Hausa/Fulani tribes are the most prevalent in the research area (Abbas, 2012 cited in Bashir & Bello, 2023).

Anguwa Uku is located in the Sub-Sudan climate zone. The two main seasons that define Anguwan Uku climate are the wet season (April to October) and the dry season (November to March). When the trade wind that blows from the Saharan belt establishes itself over the region, the dry season is increasingly harsh. The season's harsh conditions are brought on by this dry, dusty wind. The temperature drops to 24°C (75°F) in particular during the months of December through February (NIMET Gombe, 2024).

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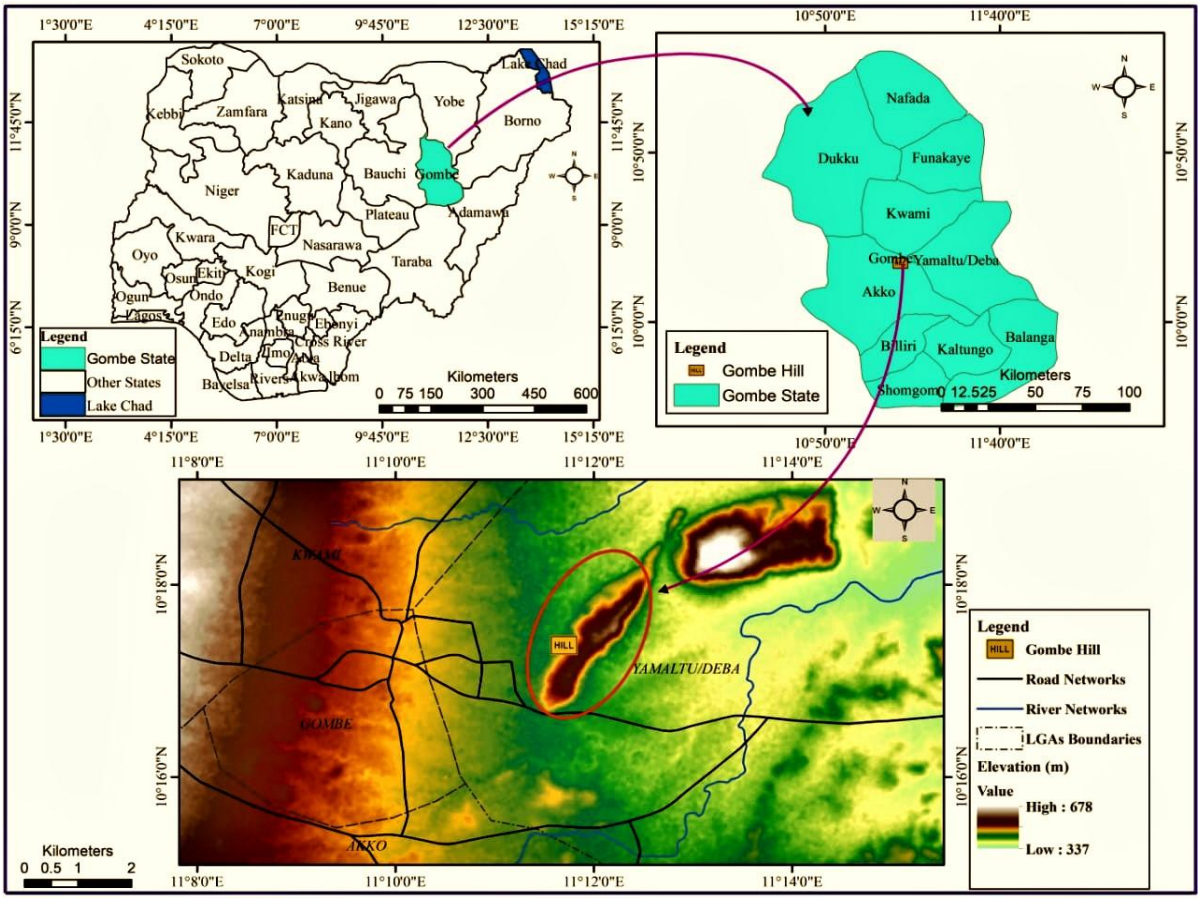

Figure 1: Map of Gombe Metropolis Showing the Study Area.

Source: Department of Geography GIS Lab. Federal University of Lafia

The geology of Anguwa Uku is found in Zambuk ridge of Upper Benue. The younger granites of the Jos plateau and Bauchi plain to the north and south, and the tertiary basalts of the Biu plateau to the east, define the boundaries of the Zambuk ridge area. The Zambuk ridge gradually merges into the Benue basin and the Chad basin, respectively. The majority of the rocks in the Anguwa Uku (Gombe Hill) area are made of granite complex, which makes them suitable quarry material (Ministry of Land and Survey Gombe, 2024).

The study area falls within Guinea Savanna vegetation zone. Sadly, the land and vegetation of Anguwa Uku have been lost because of ongoing quarrying operations. Neem, Bobao, and other common tree species can be found in the study area (Mbaya, *et al.,* 2019).

In terms of topography Anguwa Uku is located at the base of the Akko escarpment on the west, the Gombe plains to the south, and the higher area east of the Bye Pass and Kaltungo road intersection. The highest points on the terrain are found in the eastern portions of the British Cotton Gilling Company area (Anguwa Uku), which is approximately 412 meters (1250 feet) above sea level, and the Liji hills, which are sandstone hills scattered throughout the southern portions of the town site at an elevation of roughly 610 meters (1850 feet) (Ministry of Land and Survey Gombe, 2024).

MATERIALS AND METHODS

Research Design

In order to achieve the study's aim, a mix-method research design was used, in which both quantitative and qualitative data were gathered. The questionnaires that comprised

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the socioeconomic characteristics of the respondents, the method of quarrying, and the use of devices and tools in the quarrying operations in the study area provided the quantitative data with numerical values. Conversely, In-depth Interviews (IDI) were used to gather qualitative data from the study area's miners and local community members regarding their perceptions of the detrimental effects of quarrying on the environment and the health issues that are linked to it.

Type and Sources of Data

Primary and secondary sources of data from various sources were used for this study. The necessary data types and sources are shown in Table 1.

Table 1: Data Used for the Study and Sources

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

Source: Author's Analysis, 2024

Procedures for Sampling and Data Collection

The population of this study constitutes the residents and miners of the study area. A copies of fifty (50) structure questionnaires were directly administered to the residents of the study area. The sampling technique used is systematic sampling where only the head of households was administered with questionnaires, as per the customs of Hausa/Fulani communities where housewives are prohibited from interacting with outsiders. An additional forty (40) copies of questionnaires were systematically administered to those who engaged in quarrying activities (miners) to derive some additional information which will enable the researchers to gain a deeper understanding of the phenomenon under investigation.

In-depth interviews (IDIs) were another method used to collect data from the participants. The IDIs were recorded using a tape recorder and note taker, and the transcribing process produced qualitative data. The approach of purposive sampling was used to find responders for the IDI. Research assistants helped with the administration of the questionnaire all across the study area.

Procedure for Data Analysis

Descriptive statistics was used to analyse the generated data. The qualitative data generated from IDI on tape recorder was transcribed, coded and presented in thematic forms. All issues inform of texts were integrated in various sections of the discussions.

RESULTS AND DISCUSSION

Socio-economic Characteristic of the Respondents

Table 2: Socio-economic Characteristics of the Respondent

	Residents		Miners	
***Gender**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Male	44	91.7%	39	100%
Female	4	8.3%	0	0%
***Marital Status**				
Married	41	85.4%	20	51.3%
Single	6	12.5%	19	48.7%
Widow	1	2.1%	0	0%
Divorce	0	0%	0	0%
***Age**				

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21-30yrs	10	20.8%	17	43.6%
31-40yrs	18	37.5%	11	28.2%
41-50yrs	14	29.2%	9	23.1%
51yrs and above	6	12.5%	2	5.1%
***Level of Education**				
Primary	17	35.4%	9	23.1%
Secondary	24	50%	11	28.2%
Tertiary	3	6.3%	4	10.3%
Non-formal	4	8.3%	15	38.4%
***Occupation**				
Civil Servants	8	16.7%	0	0%
Business Personnel	23	47.9%	1	2.6%
Mining	11	22.9%	38	97.4%
Farming	6	12.5%	0	0%
***Average Monthly Income**				
Below-N30,000	10	20.8%	5	12.8%
N31,000- N40,000	19	39.6%	8	20.5%
N41,000- N50,000	11	22.9%	9	23.1%
N51,000 Above	8	16.7%	17	43.6%

Sources: Fieldwork, 2024

The personal information of the respondents, including gender, age, marital status, level of education, occupation, and average monthly income, is displayed in Table 2. According to the respondents' gender distribution, male made up the great majority of the study area's population (91.7%), while female made up 8.3% (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 Gombe Metropolis, which forbid women from working and assign them to caring tasks at home, in contrast to Plateau State, where women engage in mining activities like stone crushing. Women are supposed to take care of the children at home. The research area's marital status revealed that 85.4% of its inhabitants are married, compared to 12.5% who are single. Table 2 also showed that, at 51.3%, more miners were married than single, widowed, and divorced people, who made up 48.7%, 0%, and 0% of the total. Marital status has no bearing on quarrying operations in the study area, according to the obtained finding.

The findings (Table 2) also revealed that the majority of people living in the study area were in the age range of 31 to 40 years, which made up 37.5% of the population. The remaining people were in the age groups of 41 to 50 and greater than 51 years, which made up 29.2% and 12.5% of the population, respectively. However, Table 2 shows that people who are 21 years of age or older make up over half (43.6%) of the sampled population of mine workers. In contrast, the age groups of 31–40, 41–50, and 51 years and above make up 28.2%, 23.1%, and 5.1% of the population, respectively. The majority of the responders, according to the results, were in their prime working years. Physical strength is typically required for manual mining (quarrying), and younger people tend to be more energetic than older ones.

The data collected on the respondents' educational status (Table 2) showed some diversity in the spectrum, with 50% of the study area's people having completed secondary education and 35.4% just having completed primary education. But the respondents also disclosed that, among the sampled respondents in the study region, those with non-formal and tertiary education make up 8.3% and 6.3% of the respondents, respectively. The residents in this study appeared to have a low educational background; majority having only completed their primary and secondary school.

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However, the findings (Table 2) also revealed that majority of participants in quarrying activities in the study area (38.4%) 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, 28.2% and 23.1% 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. These results are comparable to those of Mahapatra, (2023), who discovered that over 34% of respondents lacked literacy. 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, 47.9% of study area respondents engaged in business activities, while 22.9% 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. The result in Table 2 showed that majority (39.6%) of the residents of the study area made between N31,000-N40,000 per month and 16.7% of the sampled respondents earned above N51,000 naira per month. On the other hand, majority (43.6%) of the miners earns above N51,000 per month and 23.1% earned between N41,000-N50,000 per month. While 20.5% and 12.8% of the respondents earned between N31,000- N40,000 and below N30,000 respectively. 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 sustain their livelihood as Table 2 revealed 43.6% of the respondents earned above N51,000 per month.

Method of Quarrying in the Study Area

Table 3: Method of Quarrying

Method	Frequency	Percentage
Manual Method	27	69.3%
Mechanical Method	12	30.7%
Total	**39**	**100.0**

Source: Fieldwork, 2024

Table 3 showed that 69.3% of the sampled respondents in the study area used manual method of extracting granite rock as compared to 30.7% who used mechanical method (See Fig. 2). 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 (5-7 meters deep) and chemical explosives like dynamites to blast the rocks. Additionally, self-employed miners typically employ the manual method, but accredited companies such as AYU Company, Triacta Company, EEC (Eighteen Engineering Company), Tinka Point Nigeria Limited, etc. typically use the mechanical method. Similar findings were reported by Asante *et al.,* (2014) who stated that heavy machinery and chemicals were employed, respectively, in the stone quarrying operations in the Kumasi and Krobo areas.

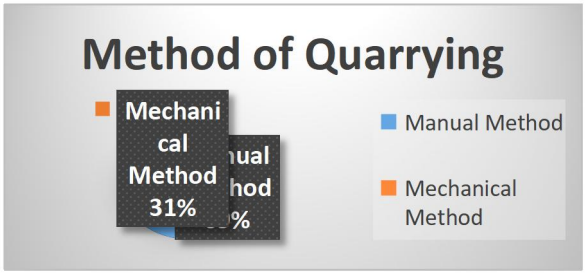

Figure 2: Percentage of Method of Quarrying in the Study Area.
Source: Author's Analysis, 2024

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Device/Tool Use in the Extraction

Table 4: Device/Tools use in the extractions

Device/Tools	Frequency	Percentage(%)
Dynamite	8	20.5%
Hammer	16	41.1%
Digger	5	12.8%
Wagon Drill	3	7.7%
Burning Tyer	4	10.2%
Chisel	3	7.7%
Total	**39**	**100.0**

Source: Fieldwork, 2024

The result (Table 4) of the findings revealed that majority of the miners (41.1%) used hammers, 20.5% used dynamite, 12.8% utilised diggers, 10.2% used burning of tires, 7.7% used waggon drillers, and 7.7% used chisels to extract the granite rock in the study area. 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 utilise 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 utilised for various building purposes (Plate 1). Furthermore, in the study area, burning of tyre on the rock is used to soften the rocks and make them more amenable to blasting (Plate 2).

Plate 1: Miners Using Hammer in Making Sizable Stones in the Study Area.
Source: Fieldwork, 2024

Plate 2: Effect of Burning of Tyres and Destruction of Vegetation on the Environment of the Study Area
Source: Fieldwork, 2024

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Detrimental Effects of Quarrying on the Environment of the Study Area

Through in-depth interviews with residents and miners, the detrimental effects of quarrying on the environment are ascertained in the study area. The results of the participant interviews indicated that noise pollution in the study area was produced by granite stone quarrying operations and related activities. Majority of the noise occur from machinery and equipment used in the extraction process. Equipment used in quarrying operations, such as dynamites, hammers, wagon drill, and hauling equipment, produces noise. The study area is very noisy from operations including blasting, loading, unloading, and transport. These activities cause hearing disorder to the people of the study area, creating cracks and vibration on their structures, frighten away domestic animals and making the inhabitant sleepless due to sound disturbance especially during the day. This study demonstrated that vibration on structures and noise pollution are caused by granite quarrying in the Anguwa Uku area. These results were in line with those of Navas *et al.,* (2019), who discovered that quarries create a lot of noise and dust, which has an impact on nearby residents and quarry workers.

Plate 3: Land Degradation in the Study Area
Source: Fieldwork, 2024

Participants also disclosed that air pollution is another detrimental effect of quarrying on the environment of the study area. The environment is contaminated by air pollution, which lowers the quality of the air because harmful substances such particulate matter which are present and can enter the lungs through inhalation. The study area quarry site releases dust into the air due to explosions, wind, and moving vehicles. This lowers air quality and poses health risks to nearby residents and miners.

The findings also revealed that land degradation (Plate 3) and flora destruction (Plate 2) are other detrimental consequences of stone quarrying that was identified by the participants in the study area. Damage to indigenous plants leads to the introduction of non-indigenous plant in the area. Plants species in an area have vital values because they represent a main part of the ecological system as they play an important role in balancing oxygen content and carbon dioxide in the ecosystem. A similar report on how stone quarrying degrades the environment was provided by Sati, (2015). In a similar vein, Bewiadzi *et al.,* (2018) noted that stone quarrying contributes to ecosystem devastation, erosion, land degradation, and loss of agricultural land.

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Furthermore, participants also revealed that quarrying operations in the study area cause pits to form, which may result in fatalities (Plate 4). During the rainy season, when water is poured into trenches, tiny children and animals fall into them, frequently resulting in to death. Malam Abubakar claimed that occasionally flooding occurs in the study area due to excavations made during granite rock quarrying. Additionally, the participants disclosed that heavy truck traffic in the area causes soil compaction as a result of quarrying operations. The study area experienced soil degradation due to the daily transit of heavy vehicles to the quarry, which affected the soil and caused the top soil to cement. These results corroborate those of Kalu and Ogbonna (2019), who discovered that soil degradation and pollution caused by quarrying operations in the Ebonyi State settlements of Akpoha and Ishiagu have impacted crop productivity and soil fertility.

Plate 4: Pit Creation as a Result of Quarrying Activities in Anguwa Uku Area
Source: Fieldwork, 2024

"According to Mr. Bitrus, soil erosion which was brought on by stone quarrying operations is the major environmental issue affecting the Anguwa Uku area."

The majority of the vegetation in the study region was destroyed by miners, which led to severe soil erosion. Different plant species were then cut down to make room for granite stone quarrying by leaving the soil exposed to wind and water erosion, the heavy trucks' high-speed operations while delivering the quarried stones also played a role in the study area's plant decline. Similar to what we have seen in our study region, Nartey *et al.,* (2012) reported that stone quarrying causes land degradation.

Positive Effects of Quarrying in the Environment of the Study Area

The participants disclosed that although quarrying operations in Anguwa Uku 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 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 in the Anguwa Uku area, quarrying operations supply raw materials

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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.

Health Problems Associated with Quarrying in the Study Area

"Malam Musa stated that hearing impairment is frequently very common among the local residents and miners, and that it is a result of the enormous noise generated by explosive devices during quarrying operations, which occasionally causes the residents to have insomnia during the day."

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. This is in line with that of Obasi *et al.,* (2019), who discovered that exposure to dust and noise caused a significant prevalence of ocular disorders, including conjunctivitis, cataract, glaucoma, and refractive errors, in quarry workers and residents of quarrying settlements in Abakaliki.

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 Mahapatra, (2023) 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, Naeth *et al.,* (2021) reported that both people and animals who are exposed to excessive noise might develop stress, anxiety, depression, hypertension, headaches, tinnitus, and hearing loss as a result of noise pollution.

"According to Malam Usman, the vast majority of the miners have ailments and chest problems as a result of employing the manual method of quarrying. He went on to emphasise that the local quarry workers are small-scale miners who harvest granite stone by hand and using conventional equipment."

Manual method of quarrying in the area involves the use of manual device and tools such as hammers, chisels, and diggers, among others. These caused miners in the area to sustain injuries of varying degrees. Abate, (2016) made a similar observation and observed that workers involved in stone quarrying activities experienced a range of health concerns, including physical injuries, respiratory disorders, and fatal accidents.

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

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crushing, and utilising hammers and chisels to smash the rock.

Recommendations

The following suggestions were offered in light of the research's findings:

i Instead of employing dynamite blasting, advanced machinery such as waggon drillers should be employed to drill holes by creating weak zones within the rocks. Dust, vibration, and noise levels will all be significantly reduced as a result.

ii Quarrying operations ought to be avoided in close proximity to residential areas, schools, hospitals, and places of worship. In such a case, the local residents ought to be moved to suitable places.

iii The enterprises ought to implement land reclamation strategies at certain intervals to prevent hazardous pit formation, erosion, flooding, and other environmental issues that could have an impact on the study area's residents.

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