

Challenges Associated With Land Management in Ishiagu Quarrying Sites of Ebonyi State, Nigeria

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ABSTRACT

Land is an essential but finite resource that requires careful management to address the needs of current and future generations. Quarrying, a significant land use, often generates revenue for governments but frequently occurs without a full understanding of its environmental impacts and the consequences for other land uses. Byproducts of quarrying, such as dust and vibrations, lead to various health issues like respiratory and skin problems as well as increased maintenance costs, structural damage, and social conflicts. Furthermore, land degradation can displace local populations. This study focuses on the land management challenges in quarrying areas of Nigeria, particularly analyzing land use patterns, the adverse effects of quarrying, factors contributing to poor management practices, and proposing strategies to mitigate these negative impacts on the environment and communities. The research involved 280 individuals, including residents and quarry staff in Ishiagu Ivo Local Government Area, using a purposive sampling technique. Out of 280 administered questionnaires, 250 valid responses were received, reflecting an 89.3% response rate. Analytical methods employed include descriptive statistics, factor analysis, and logistic regression for data interpretation. Findings revealed significant air and noise pollution affecting agriculture and residences, with inadequate government supervision identified as a key issue. Compensation methods for property damage were primarily determined by quarry companies. Recommendations include improved oversight and pre-valuation of environmental impacts before quarry operations commence, utilizing advanced technology to enhance management practices and reduce adverse effects on the community.

Keywords: Land, Land Management, Quarrying, Environmental Impact, Isisagu, Ebonyi, Nigeria

INTRODUCTION

In any community, the matter of land typically elicits intense emotions, not just within individuals but also within various social groups. This is so because land is fundamental to the achievement of economic, political and cultural advancement. The issue of land management in quarrying site seems to generate lots of debate amongst the host communities, as a result of landlessness, insecurity of land tenure, land use conflict and land devaluation orchestrated from the negative impact from quarrying such as noise pollution, air pollution, land degradation and increased in the rate of property dilapidation. Land is the entirety of a man's life and the framework that upholds all other activities carried out by man. Emeasoba (2011) opined that human life and society cannot exist without land. She also pointed out that the reliance of individuals on land differs on the surface from one society to another due to various factors such as the degree of economic and technological advancement, as well as political and cultural aspirations.

The foundation of all existence relies on land for the construction of homes, cultivation of food and the final resting place for individuals. While the fundamental necessities of life are often identified as food, clothing and shelter, it is accurate to claim that land constitutes the singular essential need for humanity, as every other basic requirement is derived from it. Therefore, land is man and man is land. Prior to the discovery of solid minerals, the inhabitant of the study area were predominantly peasant farmers who engaged mostly in crop and fish farming. However, following the discovery of solid minerals in 1976, land use practices have changed greatly and are geared towards the exploration and exploitation of solid mineral resources as a basis for government to earn revenue for development purposes.

The continual quest for natural resources without much consideration of its compatibility with other land uses has to a reasonable extent increased challenges in land management in the study area. The quarrying operation has disrupted the equilibrium in the communities where it operates, causing significant harm to the environment by depleting vegetation and agricultural land. The continuous dust cover on the surface inhibits photosynthesis, resulting in the stunted growth of plants. The dust emanating from the quarries poses a more severe threat to individuals residing in proximity, adversely affecting the skin and respiratory system. The accumulation of dust on structures, coupled with the vibrations from explosive use, escalates routine maintenance costs due to accelerated wear and tear, manifested through structural cracks, damaged roofs, shattered windows from flying rock fragments, and persistent conflicts between the host communities and the quarrying company. Inhabitants are rendered landless continually, conflicts arising from land ownership. Unfortunately, the land quality continues to deteriorate with little or nothing being done about this. As a result these challenges, the study seeks to examine the land management practice in the study area.

Objectives of the Study

1. To examine the land use pattern in the study.
2. To determine the effect of quarrying activities on other land uses.
3. To identify the factors responsible for inappropriate land management in quarry areas.
4. To examine the measures adopted in mitigating the negative impacts of quarrying on other land uses.

Scope of the Study

The study has adopted Crushed Rock Quarry Company and Pioneer Sino Chino quarrying sites among other quarry sites in Ishiagu Ivo Local Government Area of Ebonyi State, Nigeria as the case study. This is as a result of their common location and proximity to other land uses. The study looked at land management challenges in the study area, the land use pattern, the effect of quarrying on other land uses, the factors responsible for inappropriate land management, the measures adopted to mitigated this impact and suggests ways to enhance land management practice in quarrying sites, with reduced effects on other land uses.

Emperical Review

Peter and Azubuine (2018) conducted a research study examining the impact of stone quarrying on air, soil, water in Ebonyi State, Nigeria. They highlighted that the composition of Earth's atmosphere, a complex mixture of gases, has undergone significant alterations due to human activities ranging from domestic energy use to large scale industrial operations, contributing to the undesirable state of atmospheric constituents through pollutant emissions. The study observed that during the rainy seasons at the Ishiagu site, air quality results at the points of the edge, 250m, and 500m were higher than the control and Federal Ministry of Environmental standards. It was noted that these values were lower than during the dry season, primarily attributed to the rain's mitigating effect, which reduces particle travel due to decrease wind. The researcher also highlighted that many quarries scale down their activities in the rainy season, aligning with reduced construction projects such as road and bridge construction that require substantial quantities of stones. Consequently, the reduction in quarry activities during this season contributes to a decrease in air pollution. Additionally, individuals residing in close proximity to these quarry sites face heightened risks of respiratory illnesses from inhaling particulate matters, particularly PM10, and other substances such as CO, SO_x, and NO_x, known as acidic oxides that can form various concentrations of acids when dissolved in water.

Alli (2001) conducted a study on reflecting environmental issues in solid minerals development in the valuation processes. He opined that the impact of solid mineral development will result from the environmental issues that accompany the development. Unless adequate mitigation measures are taken, the development could impact adversely on the environment. Should this happen, it will, in turn, have a pronounced bearing on the values of the properties. He mentioned that in solid mineral development, pollutions may be due to heavy noise from vibration accompanying blasting, high level of dust that might be

released into the atmosphere by constantly moving of trucks, soil and water contamination from the discharge of the effluents, and so on. He added that unless adequate measures are taken to combat the adversely on the environment leading ultimately to environmental degradation, significant harm to property, the living organism and the ecological system.

Berett and Bradly (2012) conducted a study focusing on the best management practice for quarry operations to comply with the Edwards Aquifer Rules. They elucidated that when applying for development within the recharge zone, commonly termed as an Edwards Aquifer protection plan, various plan types are involved, including a water pollution abatement plan. The potential repercussions on groundwater quality and water supplies stemming from quarry operations in areas subject to the Edwards Aquifer rule are a concern for many citizens and regulators. To meet pollution prevention goals, one proposed method is the utilization of berms to hinder surface drainage run-off into a quarry pit by diverting the flow around it.

Mkpuma et al. (2015) conducted a study addressing the environmental challenges associated with both surface and underground mining activities. They emphasized that any mining system, including quarrying, introduces potential environmental risks. Surface mining, in particular, necessitates the temporary disturbance of large land areas, giving rise to various environmental concerns such as soil erosion, dust, noise pollution, water pollution, and impacts on local biodiversity.

Oginyi (2010) conducted a study investigating the environmental conditions of quarry industries, particularly focusing on their detrimental practices like pollution and unsafe behaviours, and explored how these issues impact the well-being of employees in Ebonyi State. The author noted that a significant portion of quarry workers comprises mainly illiterate individuals, both men and women, lacking awareness of the environmental consequences due to insufficient information on safety measures. As a result, the author highlighted the negative repercussions faced by employers and residents, including pollution, various degrees of occupational accidents, and physical harm from flying stones during blasts, physiological risks, and psychological trauma. The indiscriminate location of these sites without consideration for residential areas was identified as a contributing factor.

Bamgbose et al. (2014) conducted a study investigating the challenges posed by quarry activities among rural dwellers in Odeda local government area of Ogun State. The authors highlighted the environmental impacts of quarrying, including air pollution, noise pollution, water pollution, and damage to biodiversity. They emphasized the adverse effects on farming activities and livestock rearing in the region due to these environmental consequences.

Mangalagowri and Nagaraj (2016) undertook a study focusing on the dynamic shifts in land use and their repercussions on agriculture. The authors highlighted that the existing land use configuration is influenced by various factors such as the size of the human and livestock population, demand patterns, technological advancements, cultural traditions, land location and capabilities, and institutional factors like ownership patterns and state regulations. They emphasized that, in addition to economic implications, land use patterns possess significant ecological dimensions that, if overlooked, can lead to disastrous consequences.

Gay and Sanchez (2019) conducted a study on the dynamics of land use and land cover changes in two mining regions, exploring their implications for conservation in the Amazon forest. The regions under scrutiny are situated within the Brazilian legal Amazon. One of them is known as Renca (National Reserve of Copper and Associates), characterized by unofficial gold mining extraction that has recently been a focal point of debates concerning the environmental impacts of mining in protected areas. Renca encompasses a significant number of protected areas and indigenous lands. The second region is centered on the Mineracao Rio de Norte project, a major producer of Brazilian bauxite. The authors highlighted various competitive uses in mining areas, including the construction of new roads, urban settlements to accommodate the expanding mining workforce, agricultural frontier activities, and biomass plantations. They emphasized that induced deforestation resulting from the establishment of mining infrastructure and associated secondary forest clearings, such as those linked to new roads, urban expansion and indirect economic activities stimulated by mining, surpasses the impact of intensive land use within mining leases. The two areas were noted to exhibit different levels of mining development. Through an analysis spanning ten years being 2004 to 2014, one of the regions depicted changes

in consolidated areas with pre-existing mining ancillaries, transport infrastructure, and urban settlements. Similarities in patterns were observed for both buffers that is 35km and 70km, indicating shared drivers for these processes at different thresholds. The authors elucidated that the development of new mining projects in the area led to induced deforestation, and they asserted that land use changes can be traced to the scale of mining extraction and project size. They concluded that the size of mining companies serves as an indicator of their commitment to mitigating, avoiding, and compensating for environmental impacts. It is agreeable that shifts in land use patterns within a specific region can be attributed to the extent of mining extraction and the scale of mining projects in that particular locality.

Liu and Hansen (2015) introduced a systematic methodology aimed at establishing a correlation between laboratory test data and actual field performance. They underscored the importance of taking into account both the material properties and the specific exposure conditions encountered in field situations. This comprehensive approach has subsequently informed the development of field assessment procedures, particularly focusing on visual evaluation criteria, which are essential for effectively analyzing performance in real-world applications.

Yilmaz et al. (2023) contributed significant insights into methodologies for evaluating the structural performance of concrete elements, particularly with regard to their response under environmental exposure. This work has guided our systematic assessment approach, facilitating a comprehensive understanding of how these elements perform when subject to various environmental conditions. The insights gained from their study are crucial for the development of robust evaluation practices in the field of structural engineering.

Fahim (2019) in his study advances concrete durability research, particularly for exposed architectural applications, by offering: quantitative evidence of air entrainment's protective benefits in real structures; a practical, reproducible method for balancing durability, aesthetics, and strength; and economic justification demonstrated through long-term maintenance and repair savings. The findings guide mixture design optimization and field quality control for durable concrete in harsh environments, highlighting the significance for environmental air pollution friendly practice where functionality and aesthetics are paramount. The research underscores air entrainment as a cost-effective strategy to enhance concrete durability while maintaining visual quality, considering mixture proportioning, rigorous quality control, and sustainability implications.

METHODOLOGY

The research approaches adopted for this study were both qualitative and quantitative techniques. To cover the study area effectively, a field survey were conducted with structured questionnaires for the major study population and anchored with semi-structured interviews for the secondary population and other relevant secondary data. The sample size of 280 was determined using a purposive sampling technique. Hence, 280 questionnaires were administered to residents and staff of quarry sites in Ishiagu Ivo Local Government Area. However, 250 questionnaires were properly filled and returned for collation represents 89.3% response rate. This response rate was considered enough by the researcher. Descriptive and inferential statistical tools were adopted using logistic regression model.

RESULTS AND DISCUSSION

This section deals with the analysis of questionnaires collected and presented in the following:

Table 1: Analysis of the Distribution and Return of Questionnaire.

Categories of respondents	Questionnaire distributed	Number of Questionnaire returned/ retrieved	Number of Questionnaires not returned or improperly filled	Percentage of Questionnaires returned/ retrieved	Percentage of Questionnaire not returned or improperly filled	Total
Residents of	137	120	17	42.9%	6.1%	49%

Quarry Sites						
Staff of Quarry Sites	143	130	13	46.4%	4.6%	51%
Total	280	250	30	89.3%	10.7%	100%

Source: Researcher's Statistical Computations, 2021

Table 1 shows that a total of 280 questionnaire were distributed of which 120 questionnaires were properly returned representing 42.9% of residents of quarry sites, 130 questionnaires were also properly returned representing 46.4% of staff of quarry sites. While a total of 30 questionnaires were not returned representing 10.7%. Moreover, the returned questionnaire of 89.3% appears sufficient to do justice to the study. In order to examine the challenges in land management in quarrying study area, questionnaires were administered to the respondents. The result from the questionnaires collected is presented in the tables below:

Table 2: Awareness of the following effects on land.

S/N	Description	Frequency		Ranking		D	D ²
		Yes	No	Yes	No		
1	Air Pollution	185	65	1	6	5	25
2	Noise Pollution	173	77	2	5	3	9
3	Water Pollution	110	140	3	4	1	1
4	Property dilapidation	169	81	4	3	1	1
5	Damage of facilities	117	133	5	2	3	9
6	Land degradation	177	73	6	1	5	25
							70

The finding in the presentation above showed the summary of the position of various respondents on their awareness of the various effects caused by quarrying activities on land uses/properties. It can be deduced that the respondents acknowledged awareness of the following effects caused by quarrying in the study area; air pollution, noise pollution, property dilapidation and land degradation. On the other hand, the second group claimed ignorance of the other effects on land which includes water pollution and damage of facilities. Alli (2001) mentioned that in solid mineral development, pollution may be due to heavy noise from vibration accompanying blasting, high level of dust that might be released into the atmosphere by constantly moving trucks, soil and water contamination from the discharge of the effluents, and so on.

Table 3: How will you rate these effects on the following land use.

S/N	Item	Very Serious	Serious	Undecided	Not Serious	Not Very Serious	Total
1	Residential	187 (74.8%)	52 (20.8%)	- (0%)	7 (2.8%)	4 (1.6%)	250 (100%)
2	Commercial	85 (34%)	89 (35.6%)	8 (3.2%)	56 (22.4%)	12 (4.8%)	250 (100%)
3	Agricultural	155 (62.2%)	78 (31.2%)	5 (2%)	9 (3.6%)	3 (1.2%)	250 (100%)

Table 3 showed the rate of effects caused by quarry activities on the following identified land uses (residential, commercial, and agricultural land uses). It is evident from the Table that 187 respondents representing 74.8% of the respondents opined that these effects are very serious on residential properties, 52 respondents representing 20.8% stated that it is serious while 7 and 4 respondents representing 2.8% and 1.6% respectively had a contrary opinion which they stated that these effects are not serious and not very serious respectively on residential properties. It can be deduced from the Table that 85 respondents representing 34% believed that these effects are very serious on commercial properties, 89 respondents representing 35.6% stated that the effects are serious while 56 and 12 respondents representing 22.4% and 4.8% respectively had a contrary opinion, that the activities of quarry site have no serious or very serious effects on commercial land uses or properties respectively. Whereas 8 respondents representing 3.2% of the respondents were undecided as to whether quarrying has effects on commercial properties. Furthermore, the Table also shown that 155 respondents representing 62% are of the opinion that these effects are very serious on commercial properties, 78 respondents representing 31.2% of the respondents indicated that these effects are serious on agricultural properties, while 9 and 3 respondents representing 3.6% and 1.2% respectively thinks otherwise. Whereas 5 respondents representing 2% of the respondents were undecided as to whether quarrying has effect of agricultural land uses. Additionally, Moelesti and Tsefamichael (2017) discovered that escalated quarrying operations between Rustenburg and Brits town have the potential to adversely affect the environment. This impact includes a reduction in vegetation, depletion of natural resources, loss of scenic beauty, and contamination of surface water resources. Alli (2001) added that unless adequate measures are taken to combat the adverse effects of these polluting agents, the resultant pollution and contamination will impact adversely on the environment leading ultimately to environmental degradation, significant harm to property, the living organism and the ecological system. These results showed that the effects of quarrying are severe on the above mentioned type of properties whether very serious or serious.

Table 4: Summary of Logistic regression analysis on the effects of quarrying activities on agricultural land use.

Variables	Coefficient	P>/z/	Std. Error
Air pollution	-.0002657	0.065*	.000144
Noise pollution	-.0003967	0.002***	.0001269
Water pollution	.0000947	0.024 **	.0000419
Property dilapidation	-.000019	0.651	.0000421
Damage of dilapidation	-.0000299	0.507	.0000451
Land degradation	.0001282	0.002 ***	.0000409
Cons	1.545104	0.061	.8248102
Pseudo R²	0.0706	0	0
Observations	250	250	

The result shows that air pollution was significant and positively relate to the effect of quarrying activities on agricultural land use at about 0.065 probability level. The results suggest that the continuous activities of quarrying affected the quality of air in the study area. The pollution comes from crushing of rocks, screening and exhaust smoke from heavy duty trucks coupled with substances from the dynamite used for blasting the rock. Generally, when air is polluted the substances are deposited on the plants and this affects photosynthesis. Polluted air results to decline in agricultural productions in quarrying areas. The result is in consonance with the findings of Alli (2001), Offodile (2001) and Barrett and Bradley (2012). Noise pollution, water pollution and land degradation were significant at 0.002, 0.025 and 0.002 probability level respectively. The result suggests that the continuous activities of quarrying not only retard growth of plants but also make land not

useful for crop and animal production. This comes in the form erosion, dumping of stones recklessly and soil excavation. The result agrees with the finding of Bamgbose (2014) and Eshiwani (2014) who reported that environmental effects arising from quarrying affects farming activities and livestock rearing in the Odeda local government area of Ogun State, Nigeria. Nabutola (2003) emphasized that effective rural land management is crucial for ensuring food security, income generation, and fostering a conducive environment for improved living standards. Regarding water pollution, the result is consistent with the conclusions of Chima et al (2010), where the study identified urbanization, mining, industrialization, and various abuses as contributors to the degradation of water quality in bodies of water with minimal regard. Mkpuma et al (2015) supported these findings, indicating that mining, introduces several environmental challenges, including soil erosion, dust, noise, water pollution, and impacts on local biodiversity. This negative effect on land however reduces the fertility of the soil for agriculture, increasing landlessness, reduction in the value of land and land dispute on the few available land

Table 5: Summary of Logistic regression analysis on the effects of quarrying activities on residential land use.

Variables	Coefficient	P>/z/	Std. Error
Air pollution	-.0002499	0.092*	.0001432
Noise pollution	-.0006203	0.007***	.0002299
Water pollution	.0000262	0.590	.0000496
Property dilapidation	.0003929	0.092*	.0002204
Damage of dilapidation	.000271	0.444	.0000354
Land degradation	.0000413	0.324	.0000419
Cons	2.209297	0.003	.7555527
Pseudo R²	0.0468	0	0
Observations	250	250	250

Air pollution, noise pollution and property dilapidation were significant and positively relates to the effect of quarrying activities on residential land use at 0.092, 0.007 and 0.092 probability levels respectively. The result suggests that the activities of quarrying such as blasting, screening, excavation, crushing, dumping and transportation pollute the air, create noisy environment and damage buildings through vibration from explosives. These constitute great harm to the residents of such properties proximate to the site.

The result aligns with the findings of Peter and Azubuine (2018), who indicated that individuals residing near these quarry sites face an increased risk of respiratory illnesses due to the inhalation of particulate matters, particularly PM10, and exposure to substances such as Co, Sox, and Nox, which are known to be acidic oxides. Aigbedion (2005) highlighted that substantial dust emissions from both cement factories and mining activities in Nigerian limestone quarries occur daily, contributing to air pollution.

Offodile (2001) added that large quantities of dust are let into the atmosphere resulting from activities of mining, thereby polluting the air and the neighbourhood leading to increase in health hazard. This effect on residential land use reduces the value of land in the area, because not everyone will be willing to buy land in an hazardous area.

Table 6: Summary of Logistic regression analysis on the effects of quarrying activities on commercial land use.

Variables	Coefficient	P>/z/	Std. Error
Air pollution	-.000414	0.575	.000737
Noise pollution	.0001887	0.005***	.0000666
Water pollution	.0000224	0.767	.0000755
Property dilapidation	-.0000412	0.576	.0000736
Damage of dilapidation	-.0001296	0.007***	.0000481
Land degradation	.634007	0.991	.0000546
Cons	1.143923	0.147	.7881026
Pseudo R²	0.0468	0	0
Observations	250	250	250

Noise pollution and damage of facilities were significant and positively relate to the effect of quarrying activities on commercial land use at 0.005 and 0.007 probability level. The result suggests that the activities of quarrying such as blasting, screening, excavation, crushing, dumping and transportation results into noise pollution, thereby constituting great harm to the users of such properties proximate to the site. On the aspect of facilities damage the result implied that quarrying activities result into damage of facilities such as roads, electricity and damage of shops by heavy duty trucks. This aligns with the discoveries of Oginyi (2010), whose research examined the prices borne by employees and residents due to exposure to adverse effects such as pollution, varying levels of occupational accidents, and physical injuries caused by stones propelled into the air during blasts, as well as physiological risks and psychological trauma.

Table 7: Ranking of the factors contributing to the challenges of land management in Ishiagu quarry sites.

S/N	Description	Very Important	Important	Less Important	Unimportant	Nil	N	FX	X	Ranking
1	Poor supervision	197	48	5	-	-	250	1192	4.77	1
2	Influence from unscrupulous community leaders	78	128	33	11	-	250	1023	4.09	5
3	Insufficient advanced technology	153	79	18	-	-	250	1135	4.54	2
4	Carelessness site operators	104	96	50	-	-	250	1054	4.22	4
5	Lack of trained personnel	35	143	67	-	5	250	953	3.81	6

6	Non adherence to the law	122	105	19	4	-	250	1095	4.38	3
7	Ignorance	47	102	86	-	15	250	916	3.66	7

The data presented in Table 7 revealed that the mean mark, derived from respondents' assessments of the factors contributing to the challenges of land management in Ishiagu quarry areas of Ebonyi State, highlights significant findings. Poor supervision of quarry operations by approved government agencies received the highest rating, achieving a weighted mean score of 4.77. Conversely, ignorance of the effects by the operators was the least emphasized factor among respondents, earning a lower weighted mean score of 3.66. This outcome affirms that inadequate supervision of quarry activities by regulatory bodies is the primary factor contributing to the land management challenges in Ishiagu quarry sites of Ebonyi State, Nigeria.

Table 8: Ranking of methods used by quarry operators in redressing affected property owners in the study area.

S/N	Item	Always	Sometimes	Seldom	Not Used	N	FX	X	Ranking
1	Compensation for noise pollution	- (0%)	45 (18%)	87 (34.8%)	118 (47.2%)	250 (100%)	427	1.71	6
2	Compensation for dust hazard	- (0%)	107 (42.8%)	96 (38.4%)	47 (18.8%)	250 (100%)	560	2.24	3
3	Compensation for house damages	40 (16%)	150 (60%)	60 (24%)	- (0%)	250 (100%)	730	2.92	1
4	Contribution to educational advancement	28 (11.2%)	65 (26%)	143 (57.2%)	14 (5.6%)	250 (100%)	607	2.43	2
5	Contribution to infrastructural development	- (0%)	54 (21.6%)	46 (18.4%)	150 (60%)	250 (100%)	404	1.62	5
6	Monetary compensation	6 (2.4%)	67 (26.8%)	125 (50%)	52 (20.8%)	250 (100%)	527	2.11	4
7	Compensation for hazardous waste disposal	- (0%)	54 (21.6%)	- (0%)	196 (78.4%)	250 (100%)	358	1.43	7

As indicated in Table 8, the highest-rated method employed by quarry operators to address the challenges faced by affected property owners was compensation for house damages, receiving a weighted mean score of 2.92. Conversely, compensation for hazardous waste was the least favoured, with respondents assigning it a lower weighted mean score of 1.43. This outcome affirms that quarry operators commonly utilize compensation for house damages as a strategy to tackle land management challenges in the study area.

Table 9: Distribution according to how the value of compensation for damages on properties are determined.

S/N	Description	Frequency	Percentage
1	By the quarrying companies	198	79.2%

2	By individual property owners	52	20.8%
3	By Estate Surveyors and Valuers	-	-
	Total	250	100

The above Table 9, presented the respondents distribution according to how the value of compensation for damages on properties are determined. 198 respondents representing 79.2% of the respondents opined that the quarry companies determine the amount for compensation for damages, 52 respondents representing 20.8% of the respondents pointed that individuals whose properties are affected usually determine the amount for compensation, while none mentioned that the Estate Surveyors and Valuers oversee the determination of the appropriate amount of compensation on damage properties.

Table 10: Measures toward addressing the challenges of land management in quarry sites

S/N	Item	Strongly Agree (5)	Agree (4)	Undecided (3)	Disagree (2)	Strongly Disagree (1)	N	FX	X	Ranking
1	Infrastructural development	24 (9.6%)	47 (18.8%)	- (0%)	144 (57.6%)	35 (14%)	250 (100%)	636	2.54	5
2	Constant supervision by professional bodies	96 (38.4%)	91 (36.4%)	- (0%)	30 (12%)	33 (13.2%)	250 (100%)	937	3.75	1
3	Use of advanced technology by the site operators	52 (20.8%)	98 (39.2%)	- (0%)	73 (29.2%)	27 (10.8%)	250 (100%)	825	3.30	2
4	Monetary compensation	78 (31.2%)	43 (17.2%)	- (0%)	91 (36.4%)	38 (15.2%)	250 (100%)	782	3.13	3
5	Stop quarrying in the area	25 (10%)	67 (26.8%)	- (0%)	88 (35.2%)	70 (28%)	250 (100%)	639	2.56	4

It was observed from the study that there is a strong consensus that the implementation of continuous supervision by professional bodies and the adoption of advanced technology would effectively address the challenges of land management in Ishiagu quarry sites of Ebonyi State, Nigeria, with minimal or no adverse effects on other land uses.

SUMMARY OF FINDINGS, IMPLICATION AND CONCLUSION

The researcher conducted a study in a specific area revealing that land ownership predominantly follows family and individual patterns. It was found that the primary land uses in the vicinity of the quarry site are agricultural, residential, and commercial. Despite being aware of the negative impacts of quarry operations, residents tend to remain because the land is primarily inherited, and no alternative land has been provided. The study highlighted significant damages due to quarry activities that have adversely affected recognized land uses, reflecting the extent of environmental degradation. Quarry operators have employed various methods to mitigate these negative effects, with compensation for house damages being a predominant strategy. However, it was noted that compensation amounts were determined by the quarry companies themselves rather than by professional valuation bodies such as Estate Surveyors and Valuers. Moreover, the research identified several challenges in land management within the quarrying context, including poor supervision, inadequate technology, and non-compliance with legal standards. These issues were classified as major challenges, while other secondary factors also exist. Environmental consequences of quarry operations such as air and water pollution, noise pollution, land degradation, and property damage were shown to affect land uses differently, leading to reduced land values, ongoing disputes over fertile land, and increasing incidences of landlessness

among the local population. The study emphasized a noticeable deficiency in updated information held by operating companies and regulatory agencies, which hinders effective management and response to the evolving landscape of the study area. Quarrying activities are recognized as significant land uses, yet improper land management has led to various environmental issues, including air, water, and noise pollution, as well as land degradation. These problems have resulted in challenges such as landlessness, insecure land tenure, conflicts over land use, diminished property values, and insufficient land information systems. Despite these difficulties, residents continue to live and farm in the area due to population growth and inherited lands. To better integrate quarrying with other land uses, ongoing supervision, advanced technology, and financial compensation for damages are necessary.

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