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ENVIRONMENTAL IMPACT OF GRAVEL MINING IN COMMUNITIES IN OJI RIVER LOCAL GOVERNMENT AREA OF ENUGU STATE

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Abstract
Increase in demand for sand and gravel mining has recently increased due to its demand in the construction of dams, roads, and building. The environmental impact of sand and gravel mining in three communities in Inyi town in Oji River Local Government Area of Enugu State has been studied using survey design. The aim of the study is to evaluate the impact of sand and gravel mining in the selected communities. The objectives of the study include; to investigate the method used by the miners in mining sand and gravel in the study area and to ascertain the impact of sand and gravel mining on the environment of the study area. Data for the study was collected through questionnaire, field observations and interview. 120 copies of well- structured questionnaire were distributed to the communities. Statistical tool use in the analysis of the data was simple percentage. From the study, sand and gravel mining in the selected communities has resulted to loss/reduction of farm lands and grazing lands, loss of vegetation, loss of biodiversity and economically important tress, destruction of landscape and beauty, confrontations/conflicts amongst communities, dust, water and soil pollution. The study therefore recommend promulgation of law guiding the mining operations in the study area, monitoring of the operations of the miners as regards to waste disposal, enforcing the miners to pay some dues to the community leaders which will be used in providing potable water supply in the entire community and other basic amenities.
Keywords: mining, environment, unregulated, destruction and landscape.

Introduction

For thousands of years, gravel have been used in the construction of roads, dams and buildings (Akanwa et al. 2017). Gravel is an indispensable natural resource in the society. It occur naturally in the environment and is commonly used in variety of construction industries worldwide. Recently there has been an increase in demand for sand and gravel in the construction industries. The increase in demand has left the environment where thisresources occur into serious environmental impact and pressure.

In Oji River local government area of Enugu State, gravel mining is widespread throughout the communities but the mining of this two resources is highly unregulated, uncontrolled and is being

carried out at an alarming rate for decades. Due to the abundance of the resource in the study area, many construction industries on daily basis troop in to the communities in search of the two resources. This has resulted to both positive and negative impact in the study area. The gravity of the situation cannot be over emphasized. It has posed a threat not only to the environment but also to food security via low agricultural yield and destruction of economic land. It has also resulted to some health challenges amongst the miners, water and soil pollution, erosion, deforestation, destruction of agricultural land and in some cases death of miners (Ako, *et al*., 2014 and Akanwa, 2018) and (Mathada and Kori (2012).The above findings was in line with the present study, during recognizance survey, the adverse environmental effects of sand and gravel mining in the study area includes; open trenches, pits, deforestation, erosion, and damage to agricultural land of the study area. According to interview conducted with the miners, tipper drivers and the villages, the communities travelled far to the neighboring communities in search of agricultural land for cultivation, rearing of animals in the communities has become a very big problem as the lands has been left bare, the villagers travelled to the neighboring villages in search of water resources as the only river in the study area has been polluted and the quality and taste altered. The above was in line with (Aromolaran, (2012) and (Musah, 2009) rivers and their floodplains are an environmental sources of sand and gravel, although these aggregates are of paramount importance but has proven to be a source of pollutant to the environment. Supporting the above, (Ezeaku, 2009) and (Kondolf, 2008) noted that mining of sand and gravel on floodplain affects the water table and altered the land use. It was based on the above, that this research become necessary in order to show the negative effects of gravel mining in Inyi in Oji River local government area of Enugu State and also to proffer solutions on how to mitigate the impact.

Study area

The area of this research is Inyi in Oji River Local Government Area in Enugu State, Nigeria. It is the most vibrant community in terms of economic activities, industrialization and heavily populated. The villages within the study area are Agbaliji, Obune, Umuome and Enugwu Inyi. It has an area of about 403km^2 and a population of 126,212 at the 2006 census. The district is fast developing and host to infrastructural development, industries, hotels, businessmen and women students, civil servants, hospitals, thermal power station, timber shade, police training school, rehabilitation clinics and home, leprosy settlement, traders with a few farmers mainly at the sub-urban of the district.

Population of the Study

The targeted populations for this study is the mining communities in Inyi in Oji River Local Government Area of Enugu State. It comprises of Umuome, Obune and Agbaliji Inyi in Oji River local government area of Enugu State.The selected communities are blessed with abundant of sand and gravel which has been mining for more than thirty (30) years now with so many environmental hazards.

Sample and Sampling Techniques

Sample is a portion of a population selected for study while sampling techniques is a method of selecting sample from the population. In order to obtain a research data for the study, the communities was divided into three zones namely: zone A (Umuome), B (Agbaliji) and C (Obune). Moreover, among thezones listed above, random sampling was used to the selected the respondents that the questionnaire was given. 120 copies of questionnaire were distributed to selected respondents in the selected sites.

Method of Data Collection

Information used in the research is from primary and secondary sources. Questionnaire were distributed to literate people of the communities while oral interview was used by the researcher to get information from the illiterate ones who cannot read and write. The researcher also observed degradation of land, pollution of water resource during the recognizance survey.

Discussion of the Results

Table 1: General Information on the Respondents

Question	**Frequency**	**Percentage (%)**
SEX:		
Women	40	33.33
Men	80	66.67
Total	**120**	**100**
AGE GROUP:		
Adult from 15-30 years	70	58.33
31-41	40	33.33
42 and above	10	8.33
Total	**120**	**100**
Occupations	**Frequency**	**Percentage (%)**
Miners	68	56.67
Farmers	32	26.67
Student	20	16.67
Trading	24	20
Total	**120**	**100**
Educational level	**Frequency**	**Percentage (%)**
Secondary	20	16.67
Tertiary	7	5.83
Informal	90	75
Others	3	2.5
Total	**120**	**100**

Author's Computation from Field Data (2018)

Table 1 showed information about the respondent's age, gender, marital status and so one. From the table, it was observed that majority of the respondents were men (66.67%) and this group fall within the active age group of 15-30 years (58.33%). The table also showed that majority of the population are miners (56.67%). The explanation to this is that majority of the people in Inyi were active and within the working group. Based on that, they have the strength which they used in mining and farming contributing more to the generation of more wastes in the environment.

Moreover, the level of educational background of Inyi respondents was also ascertained to be informal, 67.5%, secondary school group 20.5%, tertiary group 7.5%, and others 4.5%. The implications of this is that majority of the people of Inyi have only primary educational background which means that the level of awareness of the health consequences of sand and gravel mining is very poor; and based on the lack of awareness, mine waste are carelessly dumped in the environment without prior treatment, leading to pollution the water bodies.

Methods of sand and gravel mining used in the study area and its Environmental Effects as reported by Respondents

From the survey, about 120 respondents, more than 65 acknowledged that the method of sand and gravel mining adopted in the study area is open mining where stones are digged out manually from the earth with monday hammer and digger. This method from observation leave the environment with open ditches where stagnant waters are filled with other environmental hazards such as death trap, mosquito breeding place, pollution of nearby rivers and soil. In order to find out if gravel mining has any environmental effects on the populace of the study areas, table 2 was formulated. From the table, there was a clearer picture when respondents' assertion that quarry has affected the environment was compared with their (respondents') years of stay in the town or community (Table 2).

Table 2: Opinion of Respondents on Effects of Quarry on the Environment

Year of stay in the town	**Do method of mining affect the environment?**		
Year of stay in the town	**Yes**	**No**	**No idea**
1-4 years	1	-	-
5-8 years	6	-	-
9-12 years	8	2	2
13-16 years	11	4	7
17-20 years	20	-	-
21-24 years	17	5	3
25-28 years	24	-	-
29-32 years	9		
33-36 years	10	-	-
37-40 years	12	-	-
41 years +	3	-	-
Total	**120**	**11**	**5**

Author's Computation from Field Data (2018)

It is evident from table 2 that those who have stayed relatively longer period within the mining area gave a hundred percent attestation that the methods use in mining gravel in the study area has affected the environment compared to those who have stayed for relatively shorter period where few of them responded 'no' to the question. Therefore, there it is clear that residents' appreciation of quarry effects on the environments is affected by their years of stay in the communities.

4.4 Effects of sand and gravel mining on the environment

Respondents demonstrated in-depth knowledge of environmental effects of sand and gravel mining activities in their respective communities. Respondents noted varied degrees of effects as illustrated in Table 3.

Table 3: Respondents' responses to environmental effects of sand and gravel mining on the localities

Effects	Frequency	Percentage (%)
Loss/reduction of farm lands andgrazing lands	57	63.4
Source of breeding grounds for mosquitoesand spread of diseases	5	5.6
Erosion/loss of vegetation/fertility	15	16.6
Loss of biodiversity and economicallyimportant trees	13	14.4
Destruction of landscape and beauty	3	20%
Confrontations/conflicts	2	6.6%
Sand and dust pollution	1	0.05%
Pollution of underground water	15	16.5%

Source: researcher field work, 2018

Table 3 showed the level of impacts of sand and gravel mining in Inyi communities of the study area. About 63.4% of the respondents had the view that land and vegetation has been degraded due to sand and gravel mining. About 16.6% of the respondents reported that they were faced with air pollution, while 14.4% of the respondents reported noise as a major challenge. Only (5.6%) reported water pollution as a problem. The researcher also sought to understand the state of the land before sand and gravel mining was introduced therefore, questions were asked and the respondents explained that the type of land use before the introduction of sand and gravel mining was highly fertile. Majority of the respondents (66.7%) reported that the land was mainly used as grazing land for livestock. About 26.7% of the respondents indicated that the land was mainly used as a water catchment area and 4.4% of the respondents reported that the land was mainly used for growing crops. Only 2.2% of the respondent reported that the land was not in use. The above findings justifies the fact that since many of people in Inyi town in Oji River L.G.A. practice pastoralism (rearing of livestock) as there source of livelihood, they mainly use land for grazing of their livestock and the fact that most of sand and gravel mining sites are on hills which mainly serve as a water catchment area.

In the study area, 47%, 20% and 13% of respondents indicated erosion, landscape destruction and biodiversity loss, respectively, as the major negative environmental impacts of mining. Other negative impacts indicated are: loss of grazing lands, sand and dust pollution and conflict generation (Table 3). However, all respondents from each of the study are as indicated positive impacts of gravel mining as enhancing infrastructural developments such as road and housing and providing employment to mine workers, as well as providing income for landowners.

Effects on food production of the study areas

Furthermore, impact of sand and gravel mining on food production in the study area were also ascertained from farmers and the community leaders. This was also confirmed during recognizance survey at the selected sites in the study area. This was achieved using questionnaire distributed to the respondents in the study area. From the questionnaire, the domestic food production is low compared to the needs of the entire area. Respondents attributed this to the

quarry activities, as several farmlands have either been reserved for quarry activities or degraded. Land degradation has resulted from the removal of the top soils, trees and vegetation with heavy machines for stone and aggregates deposits. This has deprived the land of its nutrients and rendered it infertile for agricultural purposes. Consequently, few farmlands are available for farming activities. Even of the lands available, some have been deforested. Effects of this situation on food production within the communities are very remarkable. The above was further investigated and pictures taken to prove the extent of damage as result of sand and gravel mining in the selected communities.

Reduction of farm and grazing lands

From recognizance survey at the selected communities, the physical environment was observed to be serious affected with the gravel mining operation. The farm land has been seriously destroyed leaving the land bare and unfit for agricultural operations. It was further noticed that the land has been damaged that even farming activities can no longer take place. This has denied both farmers from carrying out their agricultural activities and also animals from grazing in the area. The pictures below portrays the level of damage caused by mining of gravel in the three selected communities in the study area.

Plate 1. Loss of Vegetation due to gravel mining at Obune Inyi

Plate 2. Loss of Vegetation due to gravel mining at Agbaliji Inyi

Plate 3. Loss of Vegetation due to gravel mining at Umuome Inyi with erosion wiping the community and some water pollution seen in plate 4

Plate 4: water pollution at Obune due to mining of sand in the river

In the study communities, agriculture was the predominant the major economic activity for every family in the area. Oral interview conducted by the researcher showed that famers in the communities who can afford trading has resulted to trading while those that could not engaged themselves in laborer for nearby communities while others went to other communities to hire land for agriculture. The respondents testified that gravel mining has not only denied the people of the communities their means of livelihood but also hinder those who practiced agriculture to remain idle at home.

Destruction of landscape.

Landscape destruction, is one of the significant effects of mining in the area. The original landscape has been destroyed and altered as a result of excavated pits and trenches, leaving behind unpleasant sights which as well render the land unsuitable for any productive purpose (plate 4). During the raining season these pits collect and store stagnant water and as such, serve as breeding ground for pests such as mosquitoes and other water borne insects which in turn can affect the health of the people living in and around the area. The effect has resulted to the villagers going to other towns in search of land for agriculture and domestic water supply.

Plate 5. Pits formed from gravel mining resulting in the destruction of the original landscape of the area.

Deforestation

Mining of sand and gravel in the study area resulted in destruction of vegetation thereby destroying the natural habitats of some animals (plate 5). Some very important plant species are also destroyed and the soil is exposed to erosion. This further exposed the inhabitant to issue of using fertilizers in farming which also causes some damages to the soil, water and animal when they feed on it.

Plate 6. Destruction of vegetation due to sand and gravel mining leading to lost of natural habitats of some animals and some plants species.

From the above findings, it is evident that sand and gravel mining in three selected communities in Inyi that was blessed with abundant of sand and gravel has negative be impacted. The mining of the two aggregate has resulted to so many environmental consequences as mentioned above. Based on that, the land of the study area need serious forestation and sanitation.

Summary

Sand and gravel mining refers to the process of removing sand or gravel from a place of its occurrence. These materials occur in a variety of natural settings and are commonly used in the construction industries worldwide. Sand and gravel occur on land, oceans, rivers, streams, flood plains or hills. An increase in demand for sand and gravel for construction purposes has placed immense pressure on sand and gravel resources. Therefore, the extraction of these two important construction aggregates is bound to have considerable negative effect on the place where they occur. These aggregates are also mined for other purposes such as navigation purposes, agricultural drainage, flood control and channel stability but still remains the major material in the construction industries.

Implications of the Study

This research has enabled the researcher to come up with the discovery that there sand and gravel mining has impacted the environment ofInyitown located in Oji River Local Government Area of Enugu State. The condition has great implications to the social, economic and health of the public. Sand and gravel mining has given rise to the land degradation, water pollution, soil and air pollution in the communities which could lead to diseases if not properly checked. The impact of sand and gravel mining in study area make the inhabitants of the area to use fertilizer in farming and to travel all the way to Oji River urban and nearby communities in search of agricultural land and water for domestic use. The less privileged ones use the water irrespective of the level of contamination and side effects which may result in outbreak of diseases that can cause high mortality and morbidity especially in the infants and children.

Conclusion

The demand for sand and gravel for construction and other purposes is growing every day, and the process of mining these aggregates has resulted to serious environmental impacts. In Inyiin Oji River Local Government Area of Enugu State, Nigeria, sand and gravel mining has been going on at a large scale. Results of field work showed that destruction of landscape, deforestation, water pollution, loss of farm and grazing lands and the collapse of river banks are the physical environmental impacts associated with mining of these materials in the area.

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