ENVIRONMENTAL IMPACT OF SAND MINING AND ITS ATTENDANT SOIL LOSS IN CHIBIRI, KUJE AREA COUNCIL, FCT ABUJA

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ABSTRACT

The study examined the awareness of the environmental impact of sand mining by the respondents and its attendant soil loss in Chibiri, Kuje area council, FCT Abuja. Questionnaires were administered to 400 respondents who were randomly selected in the study area to elucidate their understanding on the environment impact of soil mining. The depth, width and length of the mining pit was measured using tapes to estimate the volume of soil loss over a period of seven days. The result showed 85% of the respondents were males and were actively engaged in mining activities. Most of the respondents (82%) were aware of the negative impact of mining activities. Impacts reported by the respondents were thus; land alteration (45%), ecosystem disturbance (25%), soil erosion (20%) and loss of vegetation (10%). The dimensions of the mining pit increased from day one to day seven. Consequently, the volume of sand mined area also increased from 1,244.70 m^3 in day one to 2,565.10m^3 in day seven. The study concluded that sand mining should be properly monitored by the government with policies enforced to curtail its negative impacts and the attendant soil loss.

KEYWORDS: *Environmental, impact, Sand, mining, Soil loss.*

Background to the Study

The world is increasingly becoming urban; developing nations are striving to become developed and consequently engage in processes such as improved socioeconomic activities, social services, infrastructural development and provision of basic amenities (such as housing, water and electricity, e.t.c). With an estimated 16 million housing deficit (Atejioye, and Odeyemi, *2018*) and infrastructural development in Nigeria, there will continue to be great demand for sand and other construction materials in developing areas such as the Federal Capital Territory which has experienced rapid population growth and physical expansion especially since the mid - 1980s due to the influx of people from different part of the country. It has therefore become imperative to provide adequate housing and infrastructure for the teeming increasing population. Draggan (2008) reported that sand mining and gravel extraction are a worldwide activity in both developed and developing countries. Globally, many people are increasingly being influenced into sand mining on daily basis (Robert, 2014). This trend of mass movement of people into sand mining has become a major concern for people living in the sand mining fringe communities (Saviour, 2012). However, all the efforts by various governments in curbing this phenomenon have not been very successful; due to the benefits associated with sand mining and other factors (Kusum, 2015). Unfortunately, the extensive use of sand and the increase in mining activities have negative environmental impacts on both the local and global levels (Huang *et al.* 2018), and urgent measures are needed to limit the

effects. Leal *et al* (2021). The environmental consequences vary, in part, depending on where sand is mined and sourced.

Bisht (2021) reported that scholarly work on sand extraction and its impact is emerging as a growing field of research although still limited. In developing countries, data on their extraction are not readily available making environmental assessment very difficult and contributing to the lack of awareness on the issue. In Nigeria, mining of sand occurs both on small and large-scale in major parts of the country but largely uncounted for because of the illegality of most of the activities. Amongst the available works on sand mining in country;Lawal (2011) investigated the Effects of Sand/Gravel Mining in Minna Emirate Area of Nigeria on Stakeholders and concluded that the miners are the main gainers in the business. Furthermore, Samson and Simon, (2012) in a study in Ado-Odo/Ota Local Government Area, Ogun state reported that excavation activities have induced damages on the existing drainage pattern due to sediments discharge to adjacent water bodies with the implication of inducing flooding. On the other hand, Tamunoene, and Tamunotonye, (2018) attributed the creation of marginal lands as a result of sand mining in the Niger delta. Okeke *et al* (2019) and Akanwa, (2020) assessed its impact on water quality in Ontamiri River in Owerri and Ulashi River, Okija Anambra State respectively and established the fact that the level of the water quality parameters were higher than the WHO and NESREA permissible limits. However, there have been no studies on the environmental effect and volume of soil loss from sand mining operations in Chibiri, Kuje Area Council of the FCT. This study seeks to assess the people's knowledge on the environmental effects of sand mining and to also estimate the quantity of soil loss as a result of soil mining in the study area.

The Study Area

Chibiri is a settlement located within the Kuje Area Council of the FCT and lies between Latitudes $8^0$25' N and $8^0$55'N and Longitudes $6^0$57'E and $7^0$30'E. (Kuje Area Council, 2010). Figure 1;

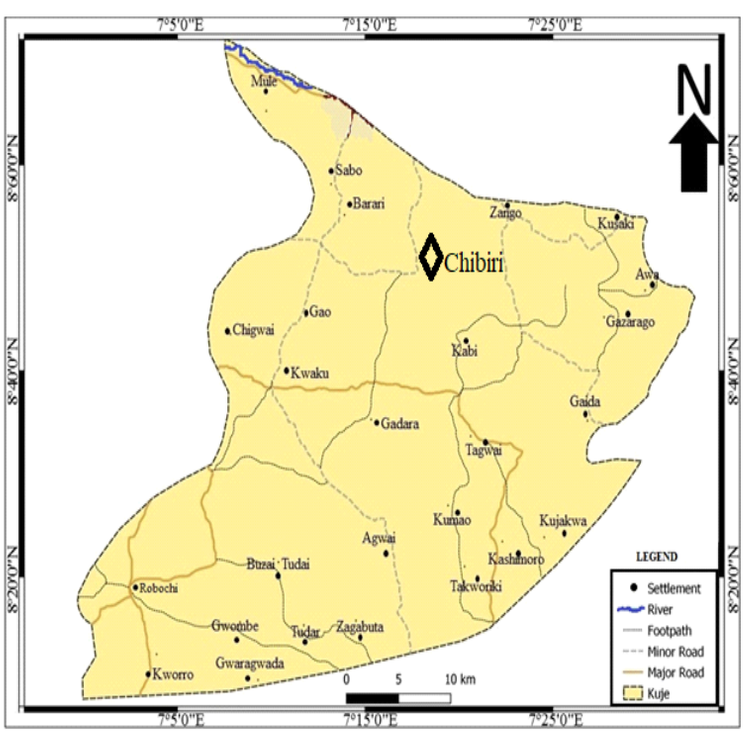

Figure 1.2: Map of Kuje Area Council Showing Settlements.

Source: GIS Lab., UniAbuja.

Kuje Area Council falls within the tropical climate (Kuje Area Council, 2010) with temperature range between 30.4^{0}C and 35.1^{0}C in the dry season and 25.8^{0}C and 30.2^{0}C in the raining season Balogun (2001). The mean annual rainfall total ranges from 1145mm to 1631.7mm (Ishaya and Mashi, 2008). It is located within the savannah zone vegetation of the West African sub-region although patches of rain forest occur in the rugged south-eastern parts. (Adekayi, 2000). The Agwai-karu hill range which is found in the study area is surrounded by the Robo and Rubochi plains and drained majorly by rivers Robo, Yewu, Afara-bokwoi and Kanana. Alluvial soils are found within the plains which are very fertile for agricultural activities which forms the main economic activity. Other activities include hunting and mining.

DATA COLLECTION AND ANALYSIS

The study adopted survey research design which involved the administration of questionnaire to elucidate information on the knowledge of the people on effects of sand mining on the environment. Using the Taro Yamane (1964) formula,400 respondents were randomly selected from the population of Chibiri community. Field survey included the measurement of the mining pits in order estimate the quantity of soil loss. Measuring tape and ranging poles were used to measure the depth, width and length of sand mining pit over seven (7) days and the data used to estimate volume of soil which is the product of the averages of depth, width and length of the pit.

The formula is given thus; $V = L \times B \times H$.
Where V is the Volume of sand loss
L is the average length and
B is the average width and H is the average depth.

Descriptive statistical tools were applied in analyzing the data and results presented in percentages and frequencies.

RESULTS AND DISCUSSION

TABLE 1 DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

SEX	RESP	%	AGE	RESP	%	LEVEL OF EDUCATION	RESP	%	OCCUPATION	RESP	%
Male	340	85	21 – 30	64	16	Primary	80	20	Farming	200	50
Female	60	15	31 – 40	152	38	Secondary	256	64	Trading	72	18
			41 – 50	100	25	Tertiary	64	16	Civil servant	88	22
			51 – 60	44	11				Artisan	40	10
			>60	40	10						
Total	400	100		400	100		400	100		400	100

Table 1 shows that 85% of the respondents were males which is higher than the females which was 15%. This revealed that males involved in sand mining activities more than females. Similarly, Madyise (2013) reported that there were more males (64%) because sand mining is a male dominated activity. Furthermore, it can be seen that 16% of the respondents were

between the ages of 21-30 years; 38% of the respondents were between the ages of 31-40 years; 25% of the respondents were between the ages of 41-50 years; 11% of the respondents were between the ages of 51-60 years and 10% of the respondents are from 60 years and above. This shows that there is a large number of young adults who are strong and are likely to engage in such mining activity. The result also shows that 20% of the respondents have primary education, 64% of the respondents have secondary education, while 16% of the respondents have tertiary education. The table revealed that the majority of the respondents have secondary education which is an indication that most of the respondents were literate who could understand the questions and are aware of environmental issues. Most of the respondents (50%) were farmers, 18% of the respondents were traders, and 22% of the respondents were civil servants, while 10% of the respondents were artisans. The result further shows that the aside the occupation of the respondents; they engage in sand mining in order to augment their income. Farming is known to be the major occupation of the population in developing countries.These outcomes imply that the age group, marital status, gender and educational levels could influence involvement and capacity in sand mining activities.

TABLE 2 Engagement, Awareness and Impact of Sand Mining in the study area

ENGAGEMENT IN SAND MINING	RESP	%	AWARENESS OF THE IMPACT	RESP	%	NEGATIVE IMPACT	RESP	%
Yes	358	89.5	Yes	328	82	Land alteration	180	45
No	42	10.5	No	72	18	Ecosystem disturbance	100	25
						Soil erosion	80	20
						Loss of vegetation	40	10
TOTAL	400	100		400	100		400	100

Table 2 shows that 89.5% of the respondents were engaged in sand mining while 10.5% of the respondents were not. Aside the fact that most of the respondents were farmers, they also engage in sand mining to boost their economic status. Furthermore, the resultshows that 82% of the respondents attested to the fact that sand mining has negative impacts to the environment, while 18 % of the respondents were not aware. Considering the negative effects of sand mining to the environment, 45% of the respondents were of the opinion that land alteration is the major impact; 25% of the respondents agreed that it was ecosystem disturbance, 20% of the respondents agreed that it was soil erosion, while 10% of the respondents agreed that it was loss of vegetation. Madyise 2013 reported responses for negative impact for land alteration, soil erosion and loss of vegetation as 14.5%, 9.7% and 16.3% respectively. Vegetation and ecosystems are destroyed along river banks to make access roads into mining areas. Pit sand and gravel extraction requires clearing of large open lands before mining. Consequently, the continuous removal of vegetation exposes the land to erosion.

TABLE 3 Average quantity of sand mined per day and the type of Truck Used

QUANTITY PER DAY (tons)	RESP	%	TYPES OF TRUCK USED	RESP	%
One to two	300	75	Six tyres	356	89
Three to four	60	15	Ten tyres	44	11
Five and above	40	10			
TOTAL	**400**	**100**		**400**	**100**

The table 3 shows that 75% of the respondents reported that the quantity of sand mined per day is one to two tons, 15% of the respondents agreed that the quantity of sand mined per day was three to four tons while 40% attested to the fact that the quantity of sand mined daily is 5 tons and above. The result of the study shows that 89% of the respondents agreed that the trucks were six tyres trucks/tippers, 11% of the respondents agreed that the trucks/tippers were ten tyres truck/tippers. The table revealed that the majority of the respondents agreed the trucks/tippers were six tyres trucks/tippers. A six-tyre truck has a loading capacity of about 4885kg while a ten-tyre truck has a capacity of 13145 kg. The Volume of sand being mined using these trucks is large and implies that much soil is been lost. Also, the continuous movement of heavy vehicles disturb agricultural land, human habitations, borehole users and can cause traffic hazards. Trucks' big wheels generally destroy gravel roads leading to mining sites which become uneven for other road users.

TABLE 4 Measurements of Sand Mining Pit for Seven Days in the Study Area

Days/Date Dimensions	Day 1 (31/5/21)	Day 2 (1/6/21)	Day 3 (2/6/21)	Day 4 (3/6/21)	Day 5 (4/6/21)	Day 6 (5/6/21)	Day 7 (3/6/21)
Length (m)	35.20	38.10	38.50	39.30	39.70	40.10	40.60
Width (m)	13.60	13.90	14.50	15.0	15.70	15.80	16.20
Depth (m)	2.60	3.10	3.20	3.40	3.60	3.70	3.90
Weight (tons)	1098.57	1448.96	1576.68	1769.00	1980.38	2069.00	2263.96

Source: Field Measurement, 2021.

Table 4 shows the measurement of sand mining pit and the volume of soil loss in the study area for seven consecutive days. It can be seen from the result that the size (length, width and depth) of the pit increased progressively from day one to day seven. The length of the pit increased from 35.20m on the first day to 40.60m on the seventh day; the width increased from 13.60m to 16.20m while the length of the pit increased from 2.60m to 3.90m respectively. This work corroborates the work of Madyise (2013) who reported increase in depth, width and length of mining pit in Gaborone South Africa over six days. Consequently, the quantity of sand mined area also increased from 1448.96 tons in day one to 2263.96 tons in day seven. Continuous mining of sand will eventually lead to soil loss and land degradation.

Sand mining activity in the study area as seen in other places and localities is driven by the factors of urbanization such as urban housing, road and bridge construction (Aliu *et al* 2022); its risk to environmental sustainability (Gavriletea 2017) is a thing of concern. Hence, the perception and awareness of the people on the environmental effect of sand mining is also important in addressing the menace that emanates from such activities.

CONCLUSION

This study assessed the environmental effects of sand mining along Chibiri road in Kuje Area Council, FCT, Abuja. The study concluded that respondents were aware of the effect of sand mining on the environment, and there is loss of soil resources in the study area. Continuous mining activities if not monitored can eventually render the land to be marginal. In order to maintain the balance between the environment and sand mining, it is therefore imperative that the Government should regulate the mining activities where regulations are put in place

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