



Sand Dredging and Environmental Hazard in Eleme Local Government area of Rivers State, Nigeria.

Nathan Udoinyang¹, Nsikan Udoinyang² & Veronica Enewa Nathan Udoinyang³

^{1,2,3} Department of economics, faculty of social science, Ignatius ajuru university of education, port harcourt, rivers state, Nigeria, Email: nathannathanudoinyang@gmail.com, udoinyangnsikanjames@gmail.com veramighty25@gmail.com

ARTICLE INFO

Article History:

Received:	February	15, 2023
Revised:	March	15,2023
Accepted:	March	30,2023
Available Online:	April	20,2023

Keywords:

Sand, dredging, sand dredging and environmental hazard

ABSTRACT

Sand dredging will continue to be a significant source for land reclamation purposes and building materials for housing development in Nigeria, a developing nation whose metropolitan cities, particularly Port Harcourt metropolitan city, of which Eleme Local Government Area is a part, are growing at a high rate. Therefore, sand dredging activities is crucial to Eleme LGA's construction sector in realizing its goal of building a mega metropolis and would do so for a while due to population growth. Using the Aletto River in Eleme Local Government Area of Rivers State, Nigeria, as a case study, this research aims to examine sand dredging and environmental hazard. In order to conduct its examination, the study used 4 Likert scale survey technique with the used of taro Yamane formula; a sample size of 400 was achieved, of which 386 samples were returned. Purposive sampling methods were used for this research project because they provide non-probability samples that are chosen depending on the traits existing in a particular demographic group and the overall study. Additionally, it aids researchers in recognizing the extreme viewpoints that exist among each demographic group. In an effort to meet man's insatiable wants, rivers are extensively exploited for resources found in river beds, such as sand, which has led to sand dredging being one of the major environmental issues facing the world in recent years. The aforementioned predicament has put the residents of Eleme Local Government Area of Rivers State in danger on both an economic and environmental level. This essay aims to demonstrate the economic benefits of sand dredging which include creation of jobs, increase in the pace of home construction, the building and filling of roads, the promotion of local development, and source of income for the local populace. Sand dredging poses a number of environmental risks, including damage to nearby homes, loss of farmland, bridge damage, loss of lives, damage to streets and community roads, and tensions between locals, farmers, and sand miners that result in land degradation. The study recommends that environmental agencies should strengthen and develop binding and enforceable standards and specifications for the efficient regulation of the sand dredging and small scale mining industry, and that different villages, clans, and Municipalities should make sure that bylaws are created, monitored, and enforced as this may require the creation and execution of reclamation plans and bonds. The study concluded that government should adopt the above recommendation in order to mitigate the environmental hazard of sand dredging in Eleme LGA f Rivers State, Nigeria.



© 2023 The Authors, Published by AIRSD. This is an Open Access Article under the Creative Common Attribution Non-Commercial 4.0

Corresponding Author's Email: nathannathanudoinyang@gmail.com

INTRODUCTION

Sand dredging will continue to be a significant source for land reclamation purposes and building materials for housing development in Nigeria, a developing nation whose metropolitan cities, particularly Port Harcourt metropolitan city, of which Eleme Local Government Area is a part, are growing at a high rate. Therefore, sand dredging activities is crucial to Eleme LGA's construction sector in realizing its goal of building a mega metropolis and would do so for a while due to population growth. Nigeria's Rivers State contains the local government area of Eleme. It is a component of the metropolitan metropolis of Port Harcourt. It has a 138 km² area and 190,884 people according to the 2006 Census. The primary indigenous ethnic group of Eleme is called the Eleme people. Ten (10) clans—Akpajo, Aleto, Agbonchia, Alesa, Alode, Ogale, Egbu, Onne, Eteo, and Ekporo—make up Eleme LGA, which was established in 1996. Nchia and Odido are the two groupings that make up the LGA. Ogale serves as the LGA's capital and seat. Before the discovery of oil and the creation of refineries and other businesses in the LGA, the residents of Eleme LGA were engaged in the farming of food crops such cassava, yam, vegetables, etc. As of the time this document is released, Hon. Obarillomate Ollor is the LGA chairman as of when this paper was published. The primary spoken language is Eleme, an Ogoni language belonging to the vast Niger-Congo language family's Cross-River branch.

Eleme LGA have one of the three oil refineries in Nigeria, one of the busiest/biggest seaport in West Africa are situated in Onne, Eleme a well-known town with a variety of businesses. This research work is delimited to only Aleto clan which comprises of Alorte, Chumu, Echaepere, Egbe, Ekorokoro, Ewuu, Konwi, Obineta, Okerewa, and Ngofa communities which are the ten (10) communities that make up Aleto clan. The reason for this delimitation is because of the river situated under Aleto bridge in Eleme LGA. Before sand dredging activities began in the Aleto stream which was known as Okulu but now known as Aleto River, the stream serves as the major source of drinking water and fishing in the clan. The then Aleto Stream (Okulu) now Aleto river cut across parts of the Ekorokoro and Okerewa Community which has led to loss of lives, lands, farmlands, bridge, roads and properties in these communities and the clan as a whole due to excessive sand dredging activities going on in the river. The rivers are extensively exploited for river bed resources like sand as the clan (Aleto) develops due to population increase, human settlements, industry, urbanization, and other activities. Due to the fast economic expansion and concomitant rise in construction activity over the last several decades in the clan, there has been an increase in demand for construction grade sand in Aleto which has led to the destruction of lives, lands, properties and loss of habitat within and around the environs of the river. This has often led to indiscriminate instream sand dredging and floodplain regions, which have seriously harmed the ecosystem in the river basin. Unchecked instream sand mining from the river beds have caused a number of variables, including the rapid speed of economic growth, an increase in foreign remittances, and liberalized housing programs for building projects, mostly from the banking industry (Padmalal et al, 2008). Many individuals (sand miners) in Aleto clan have created many methods of obtaining sand from the river as it has become an increasingly significant role in the growth/development of the communities and clan. Artisanal mining, according to WiseGEEK (2003), is a small-scale mining business that is not connected to major corporate organizations. The employment of several hand tools and techniques is typical in the developing countries of which Nigeria is part of and Aleto clan is one of the clans in Nigeria which this kind of subsistence sand mining activities is practice. The majority of the time, it is done by people, and it is an unscientific, haphazard method of sand dredging that often results in serious environmental issues in river basin ecosystems that need

prompt attention and remedial action. Large-scale dredging operations, on the other hand, employ powerful gear, explosives, and chemical treatment. Due to the significance of sand in the natural environment and the effects of excessive sand dredging in river, the sand dredging activities has come under more attention as its economic and environmental effects have been more known in recent years over the world. Various research has been carried out by researchers on sand mining in various part of the world but none of these work was done using Aleto river in Eleme LGA as a case study to see the economic and environmental effect of sand dredging to the people of the area. Base on this, the researcher tends to carry out this study using Aleto River in the Eleme Local Government Area of Rivers State, Nigeria, as a case study, this research aims to demonstrate the economic and environmental effects of sand dredging in Rivers State. Thus, the research is split into five parts: the introduction, the definitions of key terms, the theoretical framework, the economic and environmental effects of sand dredging, and finally, the potential recommendations and conclusion.

Concepts Definitions

Sand is a cohesive mass of mineral components created by natural processes including weathering and abrasion of pre-existing rocks (aggregates of minerals). Sometimes sand is described as a loose, naturally occurring material composed of little pieces of crushed rock. Sediments having particle sizes larger than silt or clay but smaller than gravel are referred to as sand.

Classification of Sand

There are numerous different ways that sand may be categorized. The place of origin, the process used to make it, and the color of the sand are all classification factors.

1) Natural Sand: Natural Sand is extracted from its original location after being eroded from mountain rocks. The specific mineral makeup depends on the host rock, although silica, which is produced when quartz crystals are broken down, makes up the majority of sand.

Due of its chemical hardness, this sort of sand is particularly resistant to weathering and disintegration and will remain longer as arena footing. Water has moved and tumbled these hard sand particles, and the amount of time affects whether the grains are angular or spherical.

2) White Sand: The most prevalent form of sand is white, and it may be found mostly on beaches that stretch into the sea. Coral breakings and erosion caused by wave action produce white sand.

3) Black Sand: Although predominantly around river mouths, black sand may also be found on beaches. It results from rock breakings, often from flowing river waters.

4) Manufactured Sand: Sand that has been manufactured is sand that has come from rock quarries. The tiniest fragments of crushed rock are known as fines and are sold as manufactured sand, man-made sand, crusher fines, or stone dust by rock quarries. These sharp particles, which vary in size from 5 mm to tiny dust, will compress firmly if utilized alone. These particles may be softer and disintegrate into dust more quickly because the mineral composition may vary greatly and they do not include the strong quartz grains that have survived the force of tumbling rivers.

Dredging is an activity required for the construction of infrastructure that comprises the removal of material from the bottoms of streams, lakes, rivers, or oceans and moving it to another area. It also enhances water and flood control, the construction of new lands and

habitats, and the extraction of minerals from underwater deposits, all of which are essential for the sustainable development of natural resources, economic values, and quality of life.

Sand dredging and Sand Dredging Methods

Sand dredging is a technique that involves taking sand out of an open pit or from places where it is more abundant, including rivers, streams, and lakes. Sand is also removed from its native structure during sand dredging (Ashraf et al, 2010). The actual technique of removing sand from a location where it occurs is known as "sand dredging" (Langer, 2003). Sand may be dredged or mined using a variety of techniques, according to (Marc V. Hurst, 2002) in his research on hydrologic impacts on sand mining. The sort of procedure to be used for dredging a certain sand deposit relies on a number of variables, including the thickness and depth of the deposit, the level of the water table, and environmental variables like the proximity of a specific type of flora or riparian habitat.

1) Open Pit Methods: In order to mine resources from high, well-drained ridges with deep water tables, the easiest way is excavation from dry open pits. Burrow pit operators in the Eleme LGA's Aletto, Akpajo, Ogale, and Onne clan often use this mining method to extract sand for business purposes. Using standard wheel- or truck-mounted earth moving machinery, such as pan excavators or loaders, materials are immediately loaded onto trucks as they are moved into dry pits. The depth of the water table determines the maximum mining depth. Because there is no need to change groundwater flow, this approach has little hydrologic effects when used correctly with the right erosion controls. Reclaimed dry open pit mines may be ecologically sound and visually appealing pieces of land if proper mining and reclamation strategies are followed. Once the vegetation has fully recovered, they typically blend in with the surrounding properties. Since most commercial sand deposits are found in green swamp regions with shallow water tables, they are too thick and buried to be extracted entirely without breaching the surface water table. Groundwater from the surface aquifer system leaks into pits that have been dug to depths below the water table and fills them nearly immediately after being dug. It is necessary to install sizable pumps to drain water from the pit as it seeps in order to maintain a dry excavation while using traditional wheel or truck mounted earth moving equipment to dig below the water table. Dewatering is the procedure involved, and it may cause draw down (a reduction in the water table) next to the dewatered pit, which might harm the riparian vegetation. Additionally, if the water from the pit is not properly discharged or stored, it might cause floods. When improperly treated and released, pumped water may contaminate and degrade the quality of the water.

2) Dredge Mining: Sediment that has been moved and deposited from moving water bodies is mined using dredges. The major sediments are sand and gravel. Typically, a floating excavation tool called a dredge uses suction to draw silt up from the water's surface. Similar to an underwater vacuum cleaner is a dredge. It draws water and sand from the bottom of an excavation filled with water, known as a dredge pool. Water does not need to be removed from the excavations since dredges are built to float in ponds above the regions they mine. Slurry is often pumped via a pipeline to a processing facility where the sand products are separated and sized. Depending on whether the sand that is sucked by the dredge is returned to the dredge, dredging may be either an open-loop dredge or a closed loop dredge process.

3) Hand Tools Digging: Sand is removed with this technique by digging it up using a spade or shovel from a stream, river, leak, etc.

Environmental Hazard

Environmental hazard are those activities or event of man that course threat to the environment or those economic activities of man that brings about destruction and depletion of the man's natural environment.

The Coase theorem

The Coase hypothesis, created in 1960 by British-American economist Ronald Coase, is the foundation of this book. When property rights are in dispute, the Coase Theorem is used. According to the Coase Theorem, where there is a dispute between property rights, the parties concerned may bargain or negotiate terms that fully represent the actual costs and underlying values of the relevant property rights, leading to the most efficient conclusion. According to the Coase theorem, private individuals (or businesses) are capable of negotiating a mutually beneficial, socially acceptable solution in the face of market inefficiencies brought on by externalities, provided that there are no costs involved with the negotiation process. No matter whether the polluter has the right to pollute or if the average impacted bystander has a right to a clean environment, the conclusion is predicted to hold.

LITERATURE REVIEW

Abam, T., Giadom, F. and Iduma, R. (2023) examine the Impact of Dredging on Coastal Infrastructure: Case Studies from Okrika and Port Harcourt, Niger Delta. He found out that sand excavations in river beds have compromised the safety of several bridges in recent years and that large scale sand mining from river beds is now common in the Niger Delta, due to the necessity of reclaiming land for development purposes and to meet construction needs in the region as there is currently no regulation as to where sand can be mined in river channels because of the lack of adequate understanding of the risks to coastal infrastructure involved with its abstraction.

Ali, Owais. (2023), investigate Environmental Impact of Dredging: Balancing Progress and Conservation postulate that dredging is vital for maintaining navigable waterways, supporting maritime trade, and removing contaminated sediments. However, it can disrupt ecosystems through increased turbidity, contaminant release, and habitat destruction. As a result, responsible management is needed to strike a balance between enabling economic progress through dredging and preserving the environment.

Nathan U. (2022) population dynamics brings about increase in sand dredging activities so as to provide shelter for the timing population which lead to various environmental degradation such as loss of biodiversity, deforestation, destructions of farmland, land pollution, shortage in fresh water. He went further to suggest for policies that will help in curtailing increase in the number of people in other to achieve sustainable environment for all.

Ohaeri et al., (2021). Sand mining activity is one of the serious environmental problems, as the rivers are widely exploited for river bed materials like sand resulting in land and river bed degradation as well as loss of riparian habitat. The results obtained show that there were major impacts of sand mining namely soil erosion, road destruction, loss of vegetation, noise pollution across the coastal communities engaged in this activity. The study therefore, revealed that in spite of its economic importance, sand mining activity is causing more harm than good, hence it is suggested that environmental legislations regarding sand mining activities must be put in place to check and ameliorate the impacts. Community stakeholders should seek constant interface between the sand miners to resolve issues arising from the activity and to proffer intervention measures to ensure sustainability.

Vince Beiser (2017), investigate 'sand mining: the global environmental crisis you've probably never heard of' that industrial-scale sand mining cause wildlife to die, local trade to wither and bridges to collapse. And booming urbanization means the demand for this increasingly valuable resources is unlikely to let up.

According to Mutisya (2006), Kenya's rapidly expanding urban populations have fueled an unprecedented need for sand to fulfill the industry's escalating demands for building materials. Sand harvesters have entered seasonal rivers in Kenya's dry and semi-arid regions, especially those close to the major towns, in pursuit of this "valuable" commodity in order to satisfy this demand. As a consequence, sand has been harvested in an unsustainable manner and beyond replenishing levels. The study reveals that sand mining has had negative economic and environmental repercussions. Aquifer drying, riverbank and bed erosion, water and air pollution, decreased water table, and extinction of priceless tree and animal species are some of the most noteworthy environmental repercussions. Sand harvesting provides revenues and job possibilities, making it a source of living from a socioeconomic perspective. Additionally, prostitution, drug and alcohol addiction, which endangers the safety of local inhabitants, and fatalities stemming from clashes between sand harvesters and the population are all linked to it. Sustainable sand harvesting is encouraged via participatory methods (Mutisya, 2006).

THE ECONOMIC EFFECT OF SAND DREDGING

The Aleto Eleme population is affected economically in the following ways:

1) Provision of Employment Opportunities: Sand dredging has served as a source of work prospects for the children, men, and women who have a waste site nearby in the majority of the clans and localities (Akpajo, Aleto, Ogale, Onne) in the Eleme LGA. These sand dredging operations have helped most individuals who are unable to find white collar jobs and some people who were jobless find work.

2) Increase in the Level of Buildings: Sand availability, one of the essential elements that must be accessible before erecting any form of construction, is one of the factors contributing to the dramatic increase in the pace at which new buildings are being constructed in Eleme LGA.

3) Increase in the Level of Development: As the number of structures—including homes, churches, schools, factories, banks, and industries—increases in the region, so does the degree of development. If there were no sand dredging operations in the region, it may be impossible for growth to occur in the LGA or it might slow down the degree of development in the LGA, but Eleme LGA has been able to experience fast development because to the availability of sand dredging.

4) It serve as a source of revenue to the people: In the LGA, sand dredging has been a significant source of income production for the local population via the operation of a dump site, the sale of tickets to truck drivers, the sale of sand, and other means. Many locals, primarily young people, have become landlords and landladies thanks to the money made from sand dredging.

ENVIRONMENTAL HAZARD OF SAND DREDGING

Sand dredging benefits Eleme LGA residents economically, but it also has certain negative environmental effects on them, including:

- 1) **Treat to houses and properties within and around the sand dredging site:** Because of their proximity to the river, stream, or lake where the activity is being carried out, the homes at the sites of sand dredging operations are sometimes damaged.

Fig.1: *Showing the effect of sand dredging on houses and properties.*



Source: Field work 2023.

- 2) **Loss of Farm Land:** Farmlands near to the dredge site have suffered considerable damage and sometimes have been used as dump sites by sand miners.

Fig. 2: *Showing the effect of sand dredging on farm land.*



Source: Field work 2023

- 3) **It Lead to Damage of Bridge:** Aleto Bridge is in danger of splitting due to the work done by the sand miners; as long as sand is being dredged from the stream that the sand miners have now turned into a river, the river will keep growing every day, which will have an impact on the bridge constructed over the stream that is now known as the Aleto River.

Fig. 3: Showing the effect of sand dredging on Aleto Bridge.



Source: Field work 2023

- 4) **It leads to damage of inter street/communities road:** Heavy trucks that often utilize the route, such as those in the villages of Okerewa, Egbe of the Aleto clan, Agbi of the Ogale clan, etc., have destroyed the majority of the streets and settlements in the LGA.

Figure 4: showing how sand dredging affects roads.



Source: Field work 2023

- 5) **It brings about destruction of gas pipelines:** Sand dredging activities have caused the Aleto river, which was once far from the location of the then-Aleto stream but is now Aleto river due to dredging activities, to expand to where these gas pipelines are,

which were previously hidden underground by the Nigerian National Petroleum Company (NNPC) gas pipelines.

Figure 5: illustrates how sand dredging affects gas pipelines.



Source: Field work 2023

6) **It led to land degradation:** The extension of the river has affected the nearby dredging site, causing nearby lands to lose nutrients and value.

Fig. 6: Showing how sand dredging has brought about environmental degradation.



Source: Field work 2023

7) It causes friction between the communities and the sand miners: In many cases, the youth of these communities may block their local route in order to prevent the truck drivers from using it. Conflict between the two sides may result if the truck drivers

refuse to follow the youth's instructions and insist on using the community road instead.

- 8) **It causes conflict between sand miners and farmers:** Farmers whose land is close to streams that have been turned into rivers as a result of dredging activities on the stream will do everything in their power to protect their farm land from these sand miners, and occasionally their actions may cause conflict between them and the sand miners.
- 9) **Loss of lives and goods:** Many lives and goods worth millions of Nigerian naira has been loss in Aleto river as a result of dredging activities going on in the river which has led to dilapidated state of the East/West road and damage of bridge that is situated along the river which makes people traveling on private/commercial car and those carrying company goods a victim of this circumstance.

RESEARCH DESIGN

This study used survey methodology. This kind of survey is used because the results are more reliable, less time-consuming, and less costly. In general, surveys are designed to provide two types of informational aids: data on current circumstances and data for improving current conditions.

POPULATION FOR THE STUDY

The whole population of the Eleme local government, which included Rivers State, is the population for this research. The Eleme local governments of Rivers State are made up of eleven clans. As of the 2006 census, a total of 267,200 people were expected to live there. Since then, there hasn't been another census.

SAMPLING SIZE AND SAMPLING TECHNIQUE

Sample Size:

Using the Taro Yamane formula, the sample size for this investigation was decided.

The Yamane (1979) formula is expressed as follows:

$$n = \frac{N}{1+N(e)^2}$$

Where :

n = population of study

e = degree of freedom/significance at 5% (0.05)

1= constant

Substituting numbers in to the formula we have:

$$n = \frac{267,200}{1+267,200(0.05)^2}$$

n = 399.9 = 400.

Sampling Techniques

The research used procedures for purposeful sampling. The Aleto clan of the Eleme local in Rivers State was specifically chosen as the study's sample in order to maintain clarity. Purposive sampling methods were used for this research project because they provide non-probability samples that are chosen depending on the traits existing in a particular demographic group and the overall study. Additionally, it aids researchers in recognizing the extreme viewpoints that exist among each demographic group.

Chiefs, natives, and non-natives of the Aleto village in the Eleme local government area of Rivers State, Nigeria, made up the population. Three hundred and eighty-six (386) of the four hundred (400) sample participants were returned.

Instrument for Data Collection

A questionnaire I created was the instrument utilized for data collection; it includes (A) responses based on respondents' personal information and opinions and (B) responses based on the research topic. The possibilities for the respondents' responses were SA MEANING STRONGLY AGREED, A MEANING AGREED, D MEANING DISAGREED, and SD MEANING STRONGLY DISAGREED.

Validation/ Reliability of the Instrument

Drafts of the questionnaire were supplied to a few professors in the Department of Economics for review and revision before it was delivered to the respondents in order to confirm the instrument's content validity. The researcher gave the lecturers explicit explanations of his objective in a letter together with the instrument to determine the exercise's efficacy. Based on the revisions provided by these professors, the questionnaire's items were rearranged. The sand miners, chiefs, indigenous people, and non-indigenous people were chosen, and the researcher personally administered the instrument to them. The researcher went up to the targeted group, made himself known, and explained the goal of the study. The researcher also instructs the respondents on how to complete the questionnaire. A single research assistant helped the researcher administer the gadget. The researcher and the helper completed the instrument administration procedure in six (6) weeks. The reliability coefficient of the instrument was determined using the Cronbach alpha technique and the Statistical Package for Social Sciences (SPSS) program after the researcher delivered the instrument to 15 participants.

Method of Data Collection

The researcher is not indigenous and was born and raised in the Aleto village of the Eleme local government region. As a consequence, he was able to compile the pertinent data required for this research investigation. Due of their familiarity with him, the chiefs, natives, sand miners, and non-natives all gave him permission to enter. He distributed copies of the questionnaire to each responder and then collected them after they had finished answering.

Method of Data Analysis

In order to examine the replies from the respondents, descriptive statistics and non-parametric statistical methods were utilized as the instruments of data analysis. Tables, percentages, averages, and other descriptive statistical tools were also employed to show the data. However, to analyze the three study topics, a 4-Linkert scale was employed in conjunction with Mean and Standard Deviation in the Statistical Package for Social Science (SPSS).

The research questions were assessed using a mean threshold of 2.50; a mean aggregate below 2.50 indicates that respondents do not agree with the stated research question, whilst a mean aggregate of 2.50 and above indicates that respondents do.

Table 1. Research question on the economic impact of sand dredging in aleto, eleme lga of rivers state, nigeria.

Items	SA	A	D	SD	MEAN	REMARKS
Sand dredging has created employment opportunities for most youth in Aleto community of Eleme local government Area in Rivers state.	180	106	60	40	3.10	AGREED
More houses have been built in Aleto communities as a result of sand dredging in Aleto River.	176	75	40	95	2.86	AGREED
Most of the sand used in construction and filling of roads in Aleto community and Eleme as a whole is gotten from Aleto River through sand dredging.	225	66	33	62	3.18	AGREED
Sand dredging in Aleto River has brought about development in Aleto community and Eleme local Government Area as a whole.	90	65	55	176	2.18	DISAGREED
Sand dredging serves as one of the source of revenue to the youth and people of Aleto community.	195	148	28	15	3.36	AGREED
<i>Aggregate Mean</i>					2.83	AGREED

Source: Field work 2023.

The aggregate mean for respondents' responses to research question 1 is 2.83, which is higher than the criterion mean of 2.50. This indicates that respondents generally agreed that sand dredging has some favorable economic effects on the residents and environment of Aleto community in Eleme Local Government Area of Rivers State, Nigeria which is in line with the findings of Ali, Owais (2023) in the above literature review.

Table 2. Research question on environmental hazard of sand dredging in aleto eleme lga of rivers state, nigeria.

Items	SA	A	D	SD	MEAN	REMARKS
Sand dredging is one of the major treat to houses within and around Aleto River in Eleme Local Government Area of Rivers State.	213	147	6	20	3.42	AGREED
Farm lands around Aleto River have been damage/loss as a result of sand dredging activities in the river.	202	160	15	9	3.28	AGREED
Aleto Bridge is in bad shape as a result of sand dredging in Aleto river.	239	140	7	0	3.60	AGREED
Most of the communities/street road have been damage as a result of heavy trucks passing on them which carries sand from the Aleto river	143	113	83	47		AGREED
Sand dredging has led to conflict between farmers and sand miners in Aleto communities of Eleme local Government Area of Rivers state.	107	128	85	66	2.72	AGREED
Most of the Aquatic habitats have been affected because of the activities of sand miners on Aleto river.	169	116	55	46	3.06	AGREED
Sand dredging brings about air pollution during dry season in Aleto community as results of sand particles Falling out from uncover trucks that carry sand.	153	131	47	55	2.99	AGREED
Sand dredging have led to degradation of lands within Aleto river	222	158	6	0	3.56	AGREED
Aggregate Mean					2.83	AGREED

Source: Field work 2023.

According to the respondents' responses to research question 1, which are displayed in table 2, the aggregate mean is 2.83, which is higher than the criterion mean of 2.50. This indicates that the respondents all agreed that sand dredging poses a greater environmental threat such as loss of farmlands, destruction of roads, loss of habitats, damage of bridge, pollution etc to the community at large and the people of Aleto Community in Eleme Local Government Area of Rivers State, Nigeria which is in line with the findings of Abam, T., Giadom, F. and Iduma, R. (2023), Ohaeri et al., (2021), and Vince Beiser (2017) in the above literature reviewed.

RECOMMENDATION

In the Aleto clan of Eleme LGA, sand dredging operations have already had a significant negative economic and environmental impact. These issues include home loss, agricultural land loss, bridge damage, inter-street/community road damage, community conflict, farmer-sand mining conflict, loss of lives and land degradation. The following actions are recommended to mitigate the impact of sand dredging:

i) Environmental agencies should strengthen and develop binding and enforceable standards and specifications for the efficient regulation of the sand dredging and small scale mining industry. Environmental agencies are responsible for prescribing standards and guidelines to prevent all types of environmental damage, including sand mining. All landowners, operators of tipper trucks, and sand miners from different towns, clans, and municipalities should be consulted about and in agreement with this.

ii) The different villages, clans, and Municipalities should make sure that bylaws are created, monitored, and enforced. This may require the creation and execution of reclamation plans and bonds.

iii) To ensure that People are aware of what is involved in sand dredging and what mitigating actions are necessary, sensitization and awareness building should be included in this component. Chiefs, landowners, and other influential community members should be involved in the reclamation process because they can pressure sand miners to adhere to established rules when given the authority to do so within the framework, which will help to prevent future conflicts, lawsuits, and other environmental degradations related to sand dredging. Since Aleto River cuts across Aleto Bridge, which serves as a link to Port Harcourt Refinery, Onne Sea Port, Petrochemical Company, etc., and Eleme LGA is one of the backbones of Nigeria's economy.

iv) If all of the aforementioned measures are implemented and the environmental risk of sand dredging continues to increase dramatically, the government of Rivers State, Minister of Niger Delta, Minister of Energy and Natural Resources should stop all types of dredging activities in the area.

CONCLUSION

This research examined sand dredging and environmental hazard using Aleto river in Eleme Local Government Area of Rivers State, Nigeria as a case study. Sand dredging activities is crucial to Eleme LGA's construction sector in realizing its goal of development, building a mega metropolis and would do so for a while due to population growth. The aforementioned goal has put the residents of Aleto Eleme Local Government Area and Rivers State in danger on both an economic and environmental level. This research showed the economic benefits of sand dredging which include creation of jobs, increase in the pace of home construction, the building and filling of roads, the promotion of local development, and source of income for the local populace. Despite these economic benefits of sand dredging, it poses a number of environmental hazard, including damage to nearby homes, loss of farmland, bridge damage, loss of lives and goods, damage to streets and community roads, and tensions between locals, farmers, and sand miners that result in land degradation. The study recommends that environmental agencies should strengthen and develop binding and enforceable standards and specifications for the efficient regulation of the sand dredging and small scale mining industry, and that different villages, clans, and Municipalities should make sure that bylaws are created, monitored, and enforced as this may require the creation and execution of reclamation plans and bonds. Government should put the stated recommendation into practice in order to lessen the environmental hazard of sand dredging in Aleto community of Eleme local government area of Rivers State, Nigeria, notwithstanding the economic benefits it brings.

REFERENCE:

- Abam, T., Giadom, F. and Iduma, R. (2023) Impact of Dredging on Coastal Infrastructure: Case Studies from Okrika and Port Harcourt, Niger Delta. *Journal of Geoscience and Environment Protection*, 11, 349-362. doi: 10.4236/gep.2023.115021.
- Ali, Owais. (2023). Environmental Impact of Dredging: Balancing Progress and Conservation. AZoCleantech. Retrieved on November 16, 2023 from <https://www.azocleantech.com/article.aspx?ArticleID=1750>.
- Mutisya, D. N. (2006). Sand harvesting and its environmental and social-economic effects in arid and semi arid Kenya. Soil and water conservation. Kenyatta university, Kenya. pg. 82-90
- Nathan U. (2022). Population Dynamics and Environmental Hazard in Akwa Ibom State, Nigeria. *Global Journal of Environment and Alternate Energy Technologies Available @ <https://eurukajournals.com/GJEEAET.html>*
- Ohaeri M. C. A, David N Obgonna, Gobo A. E, Ngah Sabastine, (2021). Environmental Impacts of Sand Mining in Some Coastal Communities in Port Harcourt Metropolis Nigeria. *Journal of Applied Life Sciences International*.
- Padmalal et al (2008). Environmental Effects of River Sand Mining: A Case from The River Catchments of Vembanad lake, Southwest coast of India. *Environmental Earth Sciences* 54(4):879-889.
- R. H. Coase (1960). The Problem of Social Cost. *Journal of Law and Economics*. Vol. 3.1-44
- Vince Beiser (2017), investigate 'sand mining: the global environmental crisis you've probably never heard of' Available @ www.theguardian.com.
- WiseGEEK (2003). What is Urban Sprawl? Retrieved 06 04, 2013, from wiseGEEK: <http://www.wisegeek.com/what-is-urban-sprawl.htm>