



## ENVIRONMENTAL EFFECT OF SAND MINING ON LIVEHOODS IN CALABAR AND ENVIRONS, CROSS RIVER STATE, NIGERIA

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### Abstract

*This study examine the effects of sand mining in Calabar, Cross River State. Both the primary and secondary sources of data were used for this study. As ample of 324 respondents were used in the study, while data used were obtained via survey questionnaires and interviews. Data collected were analysed using descriptive statistics. The findings of the study revealed that, people in the study communities became part of the sand mining business for various reasons. In the first place, some farmers joined the sand mining activities because of some vulnerabilities associated with farming such as adverse weather conditions, pests and disease attacks on crops and the seasonality of agricultural activities. These situations coupled with the lack of employable skills amongst the youth, low productivity and poor pricing of agricultural produce compels them to become sand miners. These were the category of people who were pressured by difficult circumstances to become sand miners. Another group of people also became sand miners because of some opportunities they found in the work, including higher and quicker income. The positive effects of sand mining on livelihoods were found to be many. Sand mining activities create jobs for several people in the sand mining fringe communities. A lot of people are employed as diggers of sand, loaders of sand, drivers of tipper trucks, operators of excavators, food vendors and tally clerks. Sand miners also enjoy higher and regular income than most farmers. Sand miners engage in the construction and repairing of roads for their work. Most of these roads are the major means of transportation for the people in the sand mining fringe communities. Sand mining activities were also found to boost trading activities in the study communities. Based on these findings the study recommended that the drivers*

*that influence people into sand mining can be minimised when members of the sand mining-fringe communities are introduced to other livelihood activities. More so, All efforts must therefore be put in place by the district assemblies, in collaborations with the Environmental Protection Agency and the Ministry of Food and Agriculture; to restore the lands that are destroyed in the wake of sand mining activities. In like manner, livelihood challenges that arise from the activities of sand mining, adequate compensation must be paid by the sand miners to the land owners and land users who have lost their assets.*

***Keywords :*** *Sand, Live hoods, degradation, mining, Environmental*

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## **Introduction**

Mining Activity generates negative and positive externalities. It produces toxic emissions into the air, water bodies, soil and groundwater, affecting humans, animals and crops. Mining can also spoil beautiful landscapes, may cause deforestation, displacement of human settlements, and may have a negative impact in the cultural (the cultural impact of i.e., transforming an agricultural town in a Mining area) and social aspects (the increase of prostitution, the increase of immigration into a town) of local communities. It also can bring corruption in the different levels of government (Romero, 2004). All these account for the negative impacts of Mining activity that are originally external to mineral production and therefore constitute negative externalities.

Between 1995 and 2020, global population is expected to increase by 35 percent, reaching 7.7 billion people, of whom 84 percent will be in developing countries (Pinstrup-Vndersen et al, 1997). The population of Africa will almost double. By 2015, 94 percent of the world's rural population (3 billion people) will be in the developing countries (UN 1995 and 996). Demand for food and other products from cultivable land will increase, and per capita landholdings in developing countries will decline from 0.3 hectare in 1990 to 0.1-0.2 hectare in 2050 (FAO 1993), to particularly low levels in Asia and North Africa, which are expected to; as such a level of land pressure by 2025. Demand for land for non-agricultural purposes (homesteads, infrastructure, and so on) and vegetation and water resources to meet subsistence food, fuel, and raw material needs will also rise with increasing population.

Considering the high rate of Mining in the study area which has attracted many miners from different places, large tracts of land is needed to satisfy the objectives of the Mining companies. The Mining activity in the area comes with a lot of worrying issues which include the following:

- a) Conversion of agricultural Landuse to Mining (industrial Landuse)
- b) Distortion of the natural ecosystem of the place, rapid deforestation (including economic trees)
- c) Shift of labour from agricultural farming to aggregate Mining
- d) Reduction of Soil fertility through erosion
- e) Reduction of the productivity of farmers by way of abandoned pits which become death traps and breeding grounds for mosquitoes, thus increasing the incidence of malaria in the study

Expansion means growth in infrastructure, construction of new roads, commercial malls and residential areas (Wokorach, 2002). There is need for use of various soil components such as pit sand, river sand and gravel from various sites surrounding the city. People seem to be extracting these soil components excessively without considering the impact on the environment. Most likely, there is overexploitation of soil leaving deep pits on bare ground while rivers are widening daily. Soil mining has become a daily sight with tipper trucks carrying pit sand, river sand and gravel from rivers and open fields. It seems there are no strict rules to govern soil extraction.

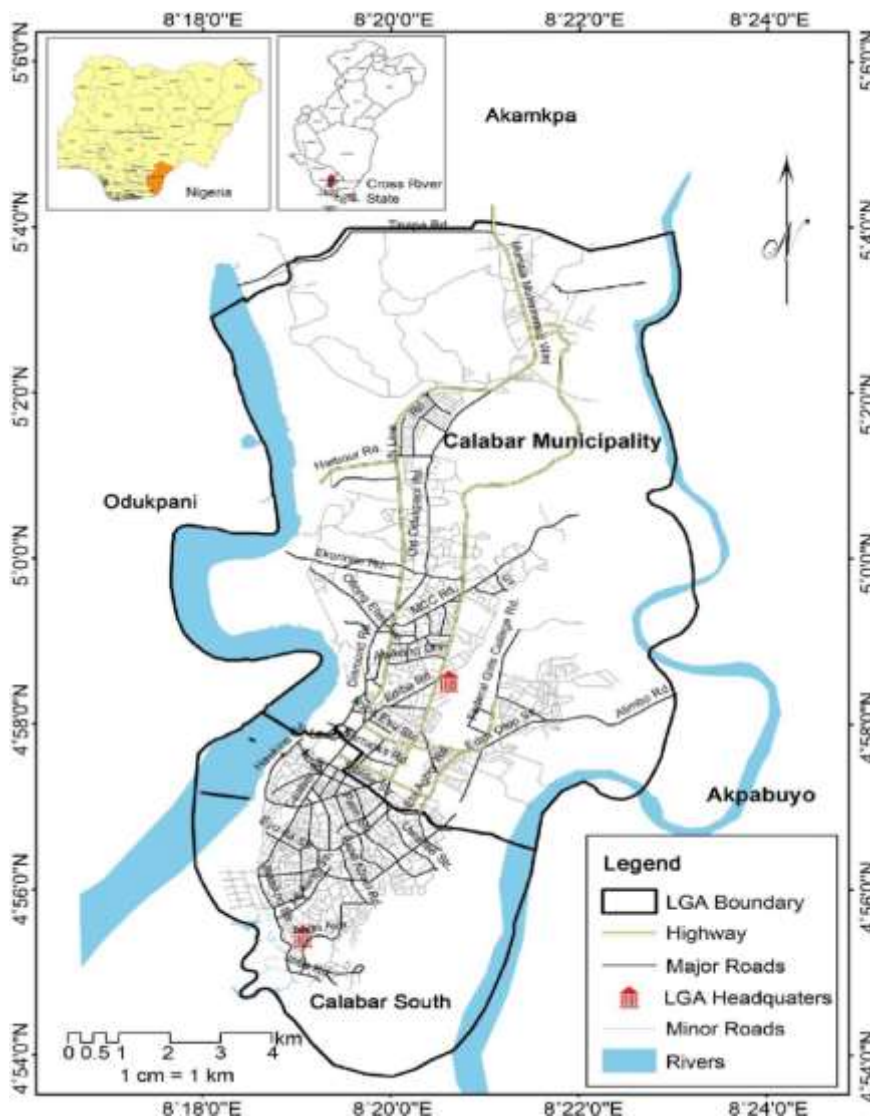
There seemed to be a problem of environmental alteration, ecosystem and agricultural land destruction as well as riverbed and bank degradation due to excessive removal of pit sand, river sand and gravel which prompted the researcher to investigate the depth of these environmental impacts.

## **Materials and Methods**

### **The Study Area**

Cross River State is a coastal state in South Eastern Nigeria, named after the Cross River, which passes through the state. Located in the Niger Delta, Cross River State occupies 20,156 square kilometers. It shares boundaries with Benue State to the north, Enugu and Abia States to the west, to the east by Cameroon Republic and to the south by Akwa-Ibom and the Atlantic Ocean.

During the European scramble for Africa, Queen Victoria signed a Treaty of Protection with the King and Chiefs of Akwa Akpa, known to Europeans as Old Calabar on 10 September 1884. This enabled the United Kingdom to exercise control over the entire territory around Calabar, including Bakassi. The territory subsequently became de facto part of the Nigeria, although the border will be never permanently delineated. However, documents released by the Cameroonians, in parity with that of the British and Germans, clearly places Bakassi under Cameroonian Territory as a consequence of colonial era Anglo-German agreements.



*Figure 1: Map of the study area*

*Source: NAGIS, 2020*

### **Data Analysis**

Quantitative and qualitative data analysis methods will be used. Throughout the research, data will be collected through observations of affected sites, taking photographs, measurements of depth, width, length of the river, pits and trenches once per fortnight and per month. The services of a statistician will be sought to analyse data in this research process. Descriptive statistics will be used to compare and contrast data collected on degree of extraction. The measurements and data collected from sample points where pit sand, river sand and gravel extracted will be analysed using Statistical Package for Social Science (SPSS version 17). The demographic data of mean age, distance of home from extraction site and the mean of involvement by villagers in extraction activities will be calculated. Further analysis will be done to find approximate volume of sand and gravel extracted considering sizes of pits, trenches and widening of the river. Data collected will be further presented on tables, pie charts and histograms. These are easy to interpret and simplify the results. The information collected will be used to suggest solutions and make recommendations for mitigating negative impacts. Plates will be used to show primary data collected on visits to sample sites. Secondary data will be collected from related literature sources.

### **Results and Discussion**

#### **Effects of Sand Mining on Livelihoods**

With reference to the adapted conceptual framework (Figure 1), the activities of sand mining have effects on the environment and livelihoods of people. These effects could be positive, negative or a combination of both (Akabzaa, 2009). The section that follows presents the results of the fieldwork on the positive and negative effects of sand mining on the livelihoods of the study communities.

#### **Positive Effects of Sand Mining on Livelihoods**

Sand mining activities are increasingly becoming alternative job creation avenues for many people in the developing world. This is particularly so because of the fact that, it has become very difficult for governments in developing countries to create employment opportunities for the population.

The value chain of sand mining activities offers employment to people in the sand mining fringe communities and beyond. Majority of the farmers (91%) and all the sand miners sampled for the study agreed to the view that, sand mining creates more employment opportunities as shown in Table 1. The reason is that, sand mining offers both direct and indirect jobs to people living in the sand mining fringe communities.

**Table 1: Positive Effects of Sand Mining on Livelihoods**

Positive Effects from Sand Mining	Respondents	Strongly agree (%)	Agree (%)	Strongly Disagree (%)	Disagree (%)	Percent (%)	Frequency
Sand mining has created more employment.	Farmers	44 (43.1%)	31 (30.4%)	15 (14.7%)	12 (11.8%)	100%	102
	Sand miners	33 (34%)	29 (29.9%)	16 (16.5%)	19 (19.6%)	100%	97
Sand mining provides improvement in roads infrastructure.	Farmers	27 (26.5%)	49 (48%)	12 (11.8%)	14 (13.7%)	100%	102
	Sand miners	28 (28.9%)	37 (38.1%)	13 (13.4%)	19 (13.4%)	100%	97
Sand mining brings higher income.	Farmers	43 (42.2%)	40 (39.2%)	11 (10.8%)	8 (7.8%)	100%	102
	Sand miners	30 (31%)	33 (34%)	16 (16%)	18 (19%)	100%	97
Sand mining brings increased sales	Farmers	40 (39%)	30 (29%)	14 (14%)	18 (18%)	100%	102
	Sand miners	37 (38.1%)	26 (26.8%)	19 (19.6%)	15 (15.5%)	100%	97

Source: Field survey, 2021



For instance, sand loaders, diggers, tipper truck drivers, and excavator operators are among the people who are directly employed by sand mining in the communities. Other people whose services are needed by sand miners include tally clerks, food vendors, water sellers, truck mechanics, fuel operators, and vulcanizers. In support of the view that sand mining creates more employment, a local chief in an interview at Atimbo said:

*Before sand mining became a prominent economic activity here, unemployment and crime rates were high. Most of the unemployed young people engaged in smoking Indian hemp, stealing of livestock and food crops. Many of those youth have now found jobs with the sand miners and as a result are able to acquire their basic needs legitimately.*

This view is consistent with the findings of Asha (2011), that the activities of sand mining employed millions of people in India. The view also confirms the survey of the „The Sand Times (8<sup>th</sup> September, 2010) which showed that, sand mining was the main employment avenue for the majority of the people in the North Stradbroke Island. The consistency of this finding, with that of previous studies, could be attributed to the limited job opportunities for many people in rural communities across the world. It is however important to understand that, when sand mining becomes the major employment source for people, it has the potential of causing great damage to the environment and also eroding certain livelihood activities such as agriculture.

It is also worth noting that, not all the study communities experienced the same levels of benefits with respect to employment generations by sand mining. For instance, it was observed that, sand mining had created more jobs for people at Calabar in the Sunyani West District than the communities in the Atimbo, and Ikot Omin Municipalities. The reason is that, whilst sand mining in Calabar is mostly done using manual tools, those at Duke town and Esukutan Municipalities are carried out mainly with the aid of excavators and other mechanical instruments. The use of these mechanical tools required few labour force in the sense that, one machine with a single operator can work far more effectively and greater than several people put together. On the other hand, the use of predominantly simple tools for sand mining at Calabar required many people at various stages of mining the sand, hence lots of people are engaged.

It should however be noted that, mechanical sand mining has started gaining grounds at Calabar too. As time goes on, many of the manual sand miners at this place could also be laid off by extensive use of machines in mining the sand. Another positive effect of sand mining on livelihoods is the construction of access roads by the sand miners. Sand miners construct these unbarred access roads in order to access sand mining sites, and also transport sand to intended destinations. Besides sand miners, residents in sand mining fringe communities access such roads for their livelihood activities. The results from the study confirmed the position that, sand mining provides improvements in road infrastructure. This is because all the sand miners (67%) and majority of the farmers (74.5%) agreed to that assertion as shown in Table 1. The reason is that, most of the sand mining sites are found in remote and undeveloped areas in the study communities, with little or no access to feeder roads. The private roads constructed by the sand miners are therefore invaluable in these places because such roads link the people there to other areas. It was observed that, without the construction of new roads and repairing of existing ones by the sand miners, a lot of agricultural produce would have been destroyed in the bush, due to the inaccessibility of roads in most parts of the communities. It was also observed that, many hamlets had been connected to the main feeder roads in the communities through the operations of sand miners. The maintenance and construction of these untarred roads are made easy for the sand miners because of the availability of excavators for the sand mining. This finding is however, not consistent with that of Mensah (1997), that sand tipper trucks have caused considerable destruction to community roads including the creation of potholes and collapse of culverts. The possible reason for the divergent views is that, whilst this study examined the influence of sand mining on roads in the hinterlands, that of Mensah (1997) considered the effects of sand mining on urban highways and roads. Indeed, many of the roads which were considered for this study are private roads in remote locations and are not managed by local or national authorities. These new roads have facilitated the movement of goods and services in the study communities. The study found majority of the farmers (81.4%) and 65% of sand miners agreeing to the assertion that, sand mining brings higher income to the communities as shown in Table 1. This supports the views of Thomas and Donovan (2013), that sand mining activities for most part pays high wages relative to other local employment opportunities. It is also



consistent with the findings of Stewart (2013), Musah (2009) and Mensah (1997) that sand mining results in high income accruing to the land owners, truck drivers and other people engaged in the sand mining work. The above finding further confirms the proposition that, the higher income associated with sand mining is a major positive effect of sand mining on livelihoods. The higher income enjoyed by the sand miners would encourage them to invite their friends and loved ones into sand mining. Also, some of the local residents who see the changes in the economic status of the sand miners might be attracted to join. This has the tendency of pushing all capable individuals into the sand mining trade regardless of its social and environmental consequences.

Another positive effect of sand mining on livelihoods is the increase in commercial activities in the sand mining fringe communities. Sand mining is closely associated with the influx of people to mining fringe communities. The demand for goods and services in such communities by the sand miners open up opportunities for more people to engage in various forms of commercial activities. This contributes to an increase in the sales of items in the area. The study found majority of the sand miners (64.9%) and that of the farmers (68%) supporting the above position as shown in Table 1. The reason is that, sand miners purchase several items in the communities to facilitate their work. Some of these items include foodstuffs, cigarettes, sachet water, and general provisions. They also employ the services of truck mechanics, vulcanizers and other artisans in the communities. All these series of demands for goods and services eventually boost the sales of items in the communities. This view confirms the findings of Asante *et al.*, (2014), whose study into stone quarry and livelihoods in Kumasi showed that individuals sold water, foodstuff and even operated taxi cabs near quarrying sites.



*Plate 1: Youth as Drivers and Manual Loaders Employed Themselves in Sand Mining*

*Source: Field Survey, 2021.*

Observation from the field showed that, sand miners patronised local restaurants (chop bars) especially in Calabar, Ikot Enebong and Ikot Ekpo. An opinion leader at Duke town in an interview said:

*'I come to this drinking spot every night. The sand miners spend huge sums of monies on alcoholic drinks, food, meat and women. Sometimes, they buy drinks for their friends and even strangers. The owner of this beer bar is making much profit from the sand miners'.*

Without sand mining, the customers of this bar operator, and those in similar businesses will decline. Obviously, this will lead to a reduction in their income levels. The view that sand miners contribute positively to the local economy imply that, the people would treat them well. This has the tendency of encouraging them to expand their operations without paying much attention to environmental and other issues arising out of their activities.



*Plate 2: A Sampled Villager who Mine Near his House to Make Blocks for House Construction*

*Source: Field survey, 2021.*

It is however important to note that, sand mining did not boost the local economies of all the study communities equally. For instance, the sales of goods and services through sand mining at Calabar and Ikot Ansa were higher than those at Esukutan and the communities in the Wenchi Municipality. This is because, many of the sand miners resided at Calabar and Atimbo and for that reason, were able to effectively trade with the members in those communities. It can be deduced from the above presentations that; sand mining activities support wealth creation; however, it has greater tendencies of subverting the wealth creation capacity of farmers whose main livelihood asset is land.

### **Negative Effects of Sand Mining on Livelihoods and Environment**

Sand mining removes the top soils needed for most agricultural activities. This leads to the destruction of such lands for the production of crops. Consequently, farmlands in sand mining fringe communities are always diminishing. Accordingly, in spite of the wealth creation capabilities of sand mining, it is also known to erode the foundation of people’s livelihoods, especially farmers. A significant proportion of sand miners (97%) and all the farmers agreed to the view that, sand mining leads to destruction or reduction of farmlands as shown in Table 3. The reason is that, sand mining is mostly done on farmlands in the study communities.

**Table 3: Negative Effects of Sand Mining on Livelihoods and Environment**

Positive Effects from Sand Mining	Respondents	Strongly agree (%)	Agree (%)	Strongly Disagree (%)	Disagree (%)	Percent (%)	Frequency
<b>Lands for farming reduced/destroyed</b>	Farmers	40 (39%)	30 (29%)	14 (14%)	18 (18%)	100%	102
	Sand miners	37 (38.1%)	26 (26.8%)	19 (19.6%)	15 (15.5%)	100%	97
<b>Destruction of water bodies.</b>	Farmers	49 (48%)	27 (26.5%)	14 (13.7%)	12 (11.8%)	100%	102
	Sand miners	29 (29.9%)	33 (34%)	19 (19.6%)	16 (16.5%)	100%	97
	Farmers	43	40	11	8	100%	102

<b>Deforestation</b>		(42.2%)	(39.2%)	(10.8%)	(7.8%)		
		)					
	Sand miners	30	33	16	18	100%	97
		(31%)	(34%)	(16%)	(19%)		
<b>Loss of biodiversity.</b>	Farmers	27	49	12	14	100%	102
		(26.5%)	(48%)	(11.8%)	(13.7%)		
	Sand miners	28	37	13	19	100%	97
		(28.9%)	(38.1%)	(13.4%)	(13.4%)		
<b>Creation of gullies on farmlands</b>	Farmers	44	31	15	12	100%	102
		(43.1%)	(30.4%)	(14.7%)	(11.8%)		
		)					
	Sand miners	33	29	16	19	100%	97
		(34%)	(29.9%)	(16.5%)	(19.6%)		
		)					

Source: Field survey, 2021

During the fieldwork, it was observed that several acres of farmlands in Calabar and Atimbo, and the other study areas have been converted to sand mining sites. Some of the chiefs and land owners in the study areas often lease their lands to the sand miners without prior notice to the farmers working on such lands. On many occasions, the affected farmers go to their farms only to witness the destruction of their farms by the sand miners. This supports the position of Imoru (2010) that, chiefs and land owners give out lands to sand miners caring little about its effects on the environment and people's livelihoods. This widespread conversion of farmlands into sand mining sites, explains why farmlands in the study communities, particularly Esukutan in the Calabar have been greatly reduced. In this regard, an official from the Ministry of Agriculture and Mineral Resources in an interview said:

*'Many farmers in the sand mining areas are under constant threat of losing their lands to sand miners. Some go to their farms only to realise that parts of their lands had been removed over night by sand miners. Several acres of farmlands are lost daily through the activities of sand mining. This situation is not good for agriculture and food security in the communities and the region as a whole'.*

The view that sand mining leads to the reduction of farmlands is consistent with the findings of Peprah (2013) and Musah (2009), whose studies into the effects of sand mining in Wa in the Upper West region and East Gonja in the Northern region respectively, found the activities of sand mining to be associated with the reduction or loss of farmlands. The cumulative effects of all these negative practices are that, farmlands are lost leading to the destruction of food crops, thereby making the affected farmers desperate and poorer. The livelihood sources of these farmers are shaken leading to the deterioration in their living standards. The plights of the affected farmers are worsened by the fact that, on many occasions, inadequate or no compensations are paid to them for the destruction caused to their food crops. This situation leads to conflicts between the chiefs, the sand miners, land owners and farmers in the communities. This position confirms the findings of Willis and Garrod (1999) that, mining of sand frequently generates land use conflicts due to its negative externalities. The loss of farmlands to sand mining activities has the tendency of causing unemployment among farmers which could lead to increased poverty in the communities involved. Also, the issue of land grabbing for sand mining has the potential of degenerating into full scale conflict between the farmers, sand miners and their associates. More so, farmers whose farmlands are destroyed could be discouraged from engaging in farming. Some of these farmers could be influenced to commit crimes such as stealing or robbery for their survival. Another negative effect of sand mining on livelihoods and the environment is the damages caused to streams and rivers by sand mining. The activities of sand mining are directly responsible for the destruction of water bodies, especially when they are done in river valleys. 74.5% of farmers and majority of the sand miners (63.9%) sampled for the study supported the idea that, sand mining leads to the destruction of water bodies as shown in Table 3. The reason is that, sand miners expose the sources of streams to sunshine by clearing the vegetation cover in these places. Not only do the sand miners dig very close to streams for sand, but sometimes they also take their sand directly from the floors of water bodies. All these harmful activities lead to the drying up of water bodies or make them unsafe for human consumption. All the study communities have examples of water bodies that have been damaged by sand mining. A closer look at these water bodies showed that they have become turbid and can hardly be used for domestic consumption. The view that sand mining leads



to the destruction of water bodies confirms the findings of Saviour (2012), whose study into the causes, consequences and management of sand mining in India revealed that, reduction of water quality and poisoning of aquatic lives are some of the negative effects of sand mining on water. Apart from the destruction of water bodies, an additional negative effect of sand mining on the environment and livelihoods is that, it creates conditions for deforestation. This is especially serious when sand miners operate illegally in the forest reserves. The view that sand mining leads to deforestation was confirmed by all the respondents for the study as shown in Table 3 The reason is that, before sand mining is done; all the trees on the site are removed. This makes it easy for the sand miners to dig and gather the sand. Consequently, a lot of trees or vegetation cover has been cleared in various places to make way for sand mining activities.

An opinion leader in an interview at said:

*'All the bare lands you see here were once occupied with vegetation cover.*

*These protected the streams and also preserved the fertility of our lands. Everything is gone now and the credit goes to the sand miners.*

This view corresponds to that of Aromolaran (2012), whose study on the effects of sand mining on land in agrarian communities in the Ogun State of Nigeria discovered that, the activities of sand mining leads to the loss of vegetation and forest cover. Hedge, (2011) also found the number of tresses lost to the activities of sand mining to be uncountable. This is not good to hear because; deforestation contributes to global warming (Philip and William, 2003). Again, when an area is deforested, almost all precipitation is lost as run-off leading to drier climates (Raven and Berg, 2006). Deforestation has also increased the rate of soil erosion in the communities, through heavy run-off at the deforested areas. It should also be noted that, deforestation can affect rainfall patterns negatively, in the sense that, some rains are induced by the presence of vegetation cover. Any widespread deforestation could destroy the livelihoods of farmers. The reason is that, most farmers in the study communities depend completely on rain fed agriculture. Absence of rains could hamper their work and productivity levels. In addition, deforestation in these communities could also affect their health care systems. This is because, many people in rural



communities use herbal drugs to treat some diseases. If these medicinal trees are cut because of sand mining, then there would be serious health problems, especially for those who depend on herbal medicines. The view that sand mining destroys vegetation cover also confirms the proposition that, deforestation is a component of the negative effects of sand mining on the physical environment.

This notwithstanding, the negative effects of sand mining on the forest cover were very high in the communities selected from the Ikot Ekpo and Atimbo Municipalities, where mechanical sand mining was dominant. The reason is that, the applications of machines in mining the sand at these areas enabled the sand miners to clear large areas for sand within short period of time. Hence more trees are uprooted on daily basis in Duke town, Esukutan, Ikot Omin and Ikot Ekpo. On the contrary, the destruction of vegetation cover at Calabar was relatively moderate because of the greater use of human labour for mining the sand. That is, it took longer period of time for sand miners there to cause widespread deforestation, due to their reliance on mainly simple tools. These tools such as shovels and mattocks failed to adequately facilitate effective and efficient digging for the sand.

Another negative effect of sand mining on the environment and livelihoods is that, it causes damages to the habitat of living organisms leading to the loss of biodiversity. These damages are caused mainly through the removal of the trees or scooping of the top soils which serve as the home grounds for the animals. Habitat destruction is harmful to all animals, especially those that require specialised environment to thrive. Anything that causes harm to the habitat of living organisms therefore has the potential of destroying such animals. 74.5% of farmers and majority of the sand miners (67%) agreed to the view that, sand mining leads to loss of biodiversity. The reason is that, when trees are uprooted, all the birds and other animals which live on those trees are either killed or chased away. Again, when the sand is dug, especially with the aid of excavators, many animals such as rats, snakes, crabs and fish are also killed or forced to abandon their habitat. These displacements and killings of animals lead to the decrease or loss of biodiversity. An opinion leader at study area during an interviewed said:

*'Before the sand miners came here, I used to set traps and hunt for animals on this field. I used to catch many rodents*

*including rats and grass cutters. Crabs and fishes were always available when I had no meat from the forest. Things are different now, because the sand miners have chased all these animals away with their regular felling of trees, digging of the soils and the constant noise generated by their trucks and machines. Everything has been destroyed, it is finished'.*

The views expressed by the respondents is consistent with that of Saviour (2012) and Aromolaran (2012), that the major adverse effects of sand mining on the environment are habitat destruction and damage to biodiversity. It should be noted that, the loss of wildlife has negative repercussions on the livelihoods of several people in the communities. For instance, the livelihoods of professional hunters and people who depend on non-timber forest products such as snails, crabs, mushrooms and fish could be adversely affected. These people might become malnourished, poorer, and unemployed. All the necessary measures should be put in place by the local authorities in consultation with the Wildlife Department of the Forestry Commission to reduce the impact of sand mining on wildlife. For instance, sand mining could be banned during periods when the animals are considered vulnerable due to pregnancies or hibernations. An additional negative effect of sand mining on the environment and livelihoods is the creation of gullies in the wake of sand mining activities on farmlands. These gullies or large holes are made possible through the scooping of the sand from the ground with excavators or simple tools such as mattocks and shovels. All the respondents for this study agreed that, sand mining leads to the creation of gullies on farmlands, as shown in Table 3. The reason is that, many gullies created by sand miners can be spotted in some of the study communities on farmlands. Some of these gullies are very large and deep. This view confirms the findings of Tariro (2013), whose study into the environmental impact of sand mining on urban development in Gaborone found that, sand mining had created deep gullies and pot holes on grazing lands and crop fields.

In fact, not all the communities in this study had deeper gullies on their farmlands as a result of sand mining. There were several gullies in the communities at Atimbo and Duke town Municipalities where mechanical sand mining was predominant. Unlike these areas, most of the sand mining sites at

Calabar had fewer or no deeper gullies, because of the dominant use of simple tools for sand mining in that area. Meanwhile, the accumulated water in the gullies is now breeding grounds for mosquitoes and other harmful organisms. This could lead to health problems such as malaria outbreak especially in areas where the gullies are closer to human settlements. Such an outbreak of disease could affect the productivity of the people negatively. The reason is that health facilities are not uniformly distributed in the study areas. Moreover, these facilities and health personnel are inadequate especially in the remote parts of the district/municipalities.



*Plate 3: Sampled abandoned sand mined with lack of tree cover in Esukutan*  
*Source: Field survey, 2021.*





*Plate 4: Standing Water in Sand Mined in Ikot Ekpo*  
*Source: Field survey, 2021.*



*Plate 5: An Example of Human Destruction on Natural Habitats in Ikot Omin*  
*Source: Field survey, 2021.*

## **Conclusion**

The research has made substantial methodological contributions with respect to the study of sand mining and its effects on livelihoods and environment in forest vegetation areas. It has provided a framework for further studies into issues

relating to sand mining, the environment and other livelihood activities in sand mining fringe communities. The study has again provided a framework for future researches into the roles and challenges of local authorities in the sand mining industry.

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