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Sand Mining Intensification and Sustainable Land Resource Development: Insights from Abak LGA of Akwa Ibom State, Nigeria

by

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Abstract

This study aimed at assessing sand mining intensification and sustainable land resource development in Abak LGA of Akwa Ibom State, Nigeria. Attempts were made to identify and describe the common methods of sand mining used in the area, estimate the volumes of sand mined on daily basis and between 2008 and 2018 as well as assessing the effects of sand mining on sustainable land resource development in the study area. In the study, 13 sand mining sites were purposively selected on land while seven (7) were sampled along water courses, making a total of 20 mining sites for direct observation and measurements during field surveys. In addition, a social survey method was adopted in order to extract relevant information from the people. Here, a total of 382 copies of the questionnaire were administered to respondents who were residents of the sampled villages. Meanwhile, findings from the study revealed that the people use two methods of sand mining - strip mining on land and diving in water. However, findings also revealed that 316 trips of sand are mined from over 89 mining pits with the depths ranging between 8.11 and 27.50 metres on daily basis in the area. It was also estimated that a total of 4,179.99 volumes of sand were mined and trucked away from the area between 2008 and 2018. It is important to note that the area had lost about 2,237 m² (2.4 km²) of land surface to sand mining, implying that the area had been subjected to acute infertility of agricultural land use, destruction of roads and residential buildings over the years. By implication, this means that issues relating to sustainable land resource development in the area are totally in jeopardy. Based on these findings, public sensitization and awareness campaign on the dangers of indiscriminate sand mining is highly recommended. At the same time, appropriate government agencies should not only develop relevant laws governing sand mining and land reclamation, but should also

develop appropriate measures to enforce such regulations and ensure utmost compliance, while environmental monitoring and evaluation should be carried out on regular basis to detect environmental changes and promote sustainable land resource development in the area.

Key words: Sand mining, intensification, sustainable, land resource and development

1. Introduction

Sand mining is the process of extracting sand in abundance mainly through an open pit and sometimes from beaches and inland dunes or dredged from river beds and ocean (Mills, Ryan, Staats & Eric, 2016). The process involves the physical removal of sand from the earth's crust frequently in large quantities for the recovery of desired product (James, 2017). Although this process occurs at different scales, but then, an increase in demand for sand product brings about immense pressure on sand production, thus, resulting to sand mining intensification. Sand mining intensification therefore is concerned with exhaustive extraction of a large quantity of sand materials over time.

Oftentimes, sand, when mined in appropriate quantities, is used in the manufacturing of abrasive, building and road construction among others. Absolutely, in spite of its economic potentials, it is noticed that its intensification is not unconnected with diverse processes of land degradation. Undoubtedly, issues of surface erosion and subsequent development of gullies have substantially hampered sustainable land resources development. Sustainable land resource development here refers to the process using available land space to meet the needs of the present generation without jeopardising the needs of the future generations. Although not many people may come to this realisation, it is important to note that civilisation and modern industrial age depend solely on available natural resources. Man, by his ability to utilise sand resource of the earth has made a tremendous effect on land and polluting sources of water in the rural communities.

According to Pitchaiah (2017), mining operations, whether on a small or large scale, are inherently disruptive to land and water that is in operation in all the continents of the Globe. There is no doubt that some destruction of the environment is largely attributed to any form of mining activities regardless of how efficient is the method used. Noticed also, is the fact that, sand mining intensification tends to generate communal land conflicts among neighbouring communities due to its negative effects including pollution, truck traffic and rugged topography. As pointed out by social and environmental activists, there are potential linkages between natural resources and the environment where they are found in abundance which are mined on a large scale around the world (Pearce, 2019). Some of the environmental effects of sand mining involve wasteland resulting from surface mining, streams pollution and siltation, massive landslides and loss of useable agricultural lands (Pitchaiah, 2017). Absolutely, issues relating to sand mining and its impact on sustainable land resources development, as identified above may not be dissimilar in Abak LGA of Akwa Ibom State in Nigeria subject to cases of sand mining intensification in the area. Saddled with this development, this study attempted to investigate the intensive operations of sand mining and its impacts on sustainable land resource development in Abak LGA of Akwa Ibom State.

Globally, in the past few decades, the demand for sand for building, construction and manufacturing purposes has been on the increase due to rapid economic development. This, has engendered indiscriminate sand mining which, in turn, has resulted in severe environmental degradation. Common among these problems include noise, water and air

pollutions, traffic disruption, loss of agricultural lands and many other negative impacts even in developed countries like USA, India, Australia, Italy (Stronberg, 2017). In Nigeria, the situation might not be dissimilar. Observations indicated that the intensification of sand mining operations, though a reliable means of employment and income generation in Abak LGA of Akwa Ibom State has generated concerns over the years. As a result of this activity, issues relating to the effect of sand mining in the area can never be imagined. Specifically, it is difficult to ascertain incessant cases of landslides, soil erosion, water shortages, stream siltation and pollution of sources of drinking water considered to be promoted by sand mining intensification in Abak LGA of Akwa Ibom State. A critical search of the existing literature (World Wide Fund, 2018; Adebayo, Adedeji & Sotayo, 2019; Mills, Ryan, Staats & Eric, 2016; Pitchaiah, 2017; Dash & Patro, 2019 & Ituen, Whyatt, Blackburn & Inyang, 2008) revealed that no research efforts had been directed to examine the extent of sand mining intensification and its impact on sustainable land resource development in Abak LGA of Akwa Ibom State and probably to profess lasting precautionary measures aimed at promoting sustainable land resource development in the area. It is considered appropriate therefore to investigate sand mining operations and its impact on sustainable land resource development in Abak LGA of Akwa Ibom State, Nigeria.

This study was aimed at examining sand mining intensification and its impact on sustainable land resource development in Abak LGA of Akwa Ibom State. To achieve this aim specifically, the study was structured and guided by specific objectives including but not limited to: (1) examine the common methods of sand mining adopted in the area, (2) determine the volume of sand mined on daily basis and approximate the total volume of sand extracted from the area between 2008 and 2018 and (3) determine the total surface area of land lost to sand mining between 2008 and 2018. Above all, an attempt was made to suggest precautionary measures that could possibly lead to the reclamation of lost land as well as ways of achieving sustainable land resources development in Abak Local Government Area of Akwa Ibom State.

2. The Study Area

Abak LGA is one of the ten Pioneer LGAs created when Akwa Ibom State was created in 1987. Prior to the creation of Akwa Ibom State, this area was founded in 1904 as a District under the leadership of Mr. Flesher as a District Officer. During the Local Government Reforms of 1976, Abak District became Abak Division and later became the Headquarters of Abak LGA, the status as of today (Abak Local Government Council, 2014). The area has an area of 190km² located on latitude 45° 9' North and Longitude 7° 47' East as shown in Figure 1.1:

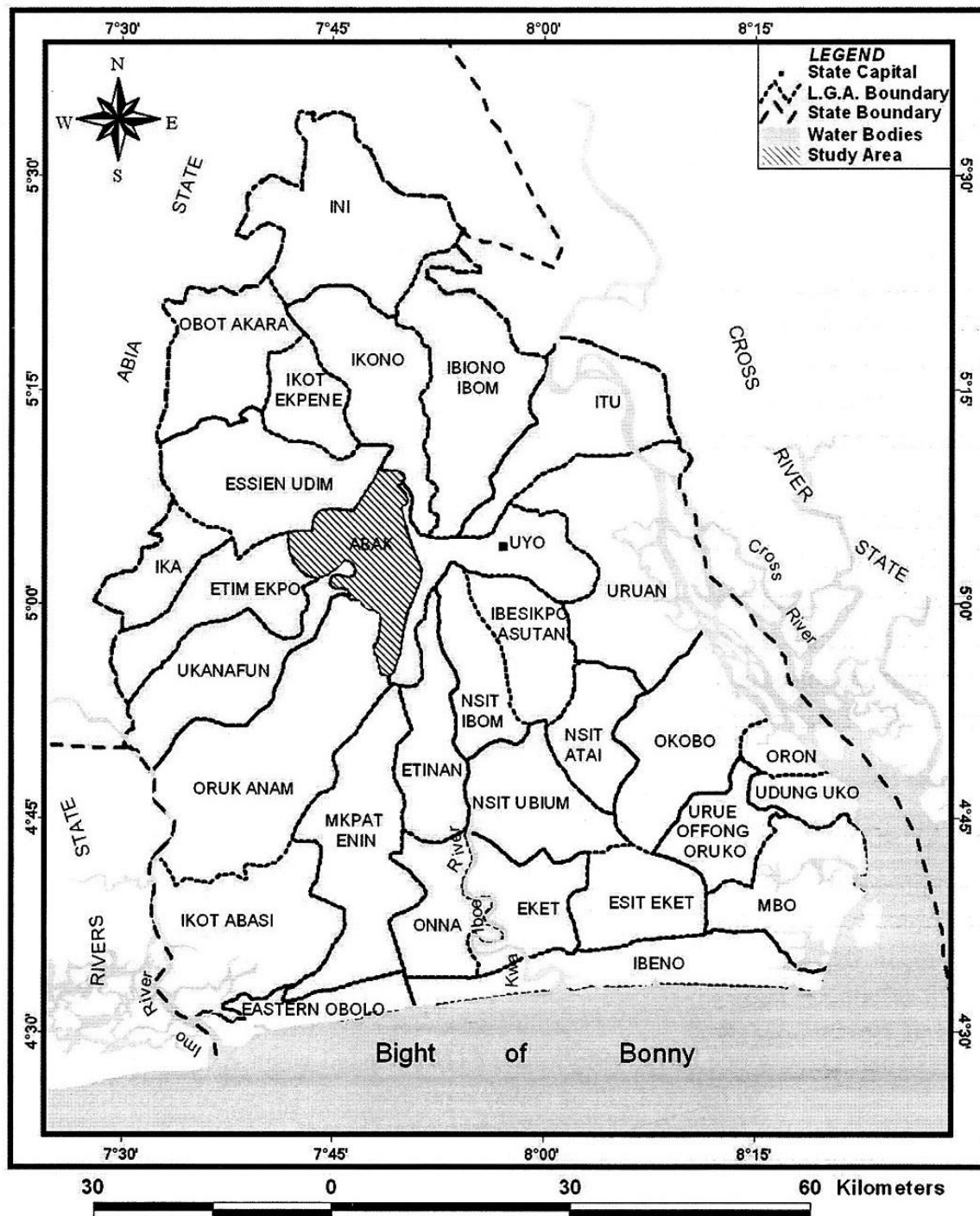


Figure 1.1: Location of Abak Local Area in Akwa Ibom State

In recent years, observations indicated that a greater percentage of sand used in the construction of residential buildings, roads and other engineering constructions in Abak and its environs, particularly Uyo - the Akwa Ibom State Capital was supplied from Abak LGA. Specifically, the Uyo-Ekom Iman-Abak road dualization project, Abak-Ikot Ekpene road dualisation, Victor Attah International Airport, Idoro-Uyo-Ekit Itam road dualization, Uyo-Ikot Ekpene road dualization among other major construction projects in the state cannot be forgotten in a hurry. However, although it is acknowledged that sand mining is the major source of family income at the local level in the area, its intensification has become a major source of concern, thus generating research interests in this direction. In a global perspective, it was considered appropriate

to review the conceptual considerations and empirical studies earlier established in this field of study and to gain adequate knowledge about the subject matter.

Effects of Sand Mining on the Physical Environment in Nigeria

The activities of sand mining continue to occur both on small and large-scale in major parts of Nigeria. With the estimated 16 million housing deficit and infrastructural development in the country, the demand for sand will continue to be on the increase (Lawal, 2011). According to Atejiaye and Odeyemi (2018), “the increasing rate of urbanization across Ado-Ekiti has brought with it several challenges ranging from physical, economic, social to environmental among other issues”.

Although it is expected that the activities of sand mining should be regulated by relevant laws, but then, it is done many times illegally in Nigeria. The environmental degradation resulting from indiscriminate sand mining on land includes, but not limited to destruction of the natural landscape, promotion of agriculturally unproductive terrain, creation of pools of water for breeding pests, deforestation and general degrading of the ecosystem with air/land/water pollution (Whitehead, 2007). Environment as mentioned in this context, has three components including (i) the sum total of external conditions in which the organisms exist, (ii) the organisms themselves include the floral and faunal community, and (iii) the physical landscape. All these components including water, human and geo-morphological features are adversely affected as a result of sand mining (Bashir & Adebayo, 2002). Also, Alexander and Hansen (1983) listed some negative impacts on the environment, to include: (i). disturbance to aquatic ecosystem, (ii) increase in turbidity which in turns can affect aquatic species metabolism and interfere with spawning and (iii) tertiary impacts to fauna. Moreover, the deliberate deforestation of an area for the purpose of promoting sanding mining destroys the vegetation and exodus of animal/bird species that feed on such plants or depend on them for cover (Bayley & Baker, 2000). In many localities, sand mining intensification and extensification continually promote changes in water components and sometime siltation which, according to Martin (2003) and Bashir and Adebayo (2002), leads to considerable variations in the concentration of geo-chemical and bacteriological pathogens in the water. Similarly, Kondolf, Smeltzer and Kimball (2001), posited that extensive sand mining brings about the lowering of alluvial water tables, channel destabilization and loss of aquatic and riparian habitat. In essence, the review exercise was significant to provide appreciable understanding of issues associated with sand mining in a global perspective. It provided opportunities for identification of knowledge gap as a guiding principle through which the objectives and method of this study were structured as detailed in the next section.

3. Materials and Methods

Among the materials used in this study were 382 copies of the questionnaire were developed to extract information on the methods of sand mining adopted in the area, the number of trips of sand carried out in the area on daily basis. Measuring tape and ranging poles as well as Lands at images of the area for 2008 and 2018. In addition, a total of 20 villages out of the thirty-nine sand mining villages were purposively sampled for the study as shown in Figure 3.1:

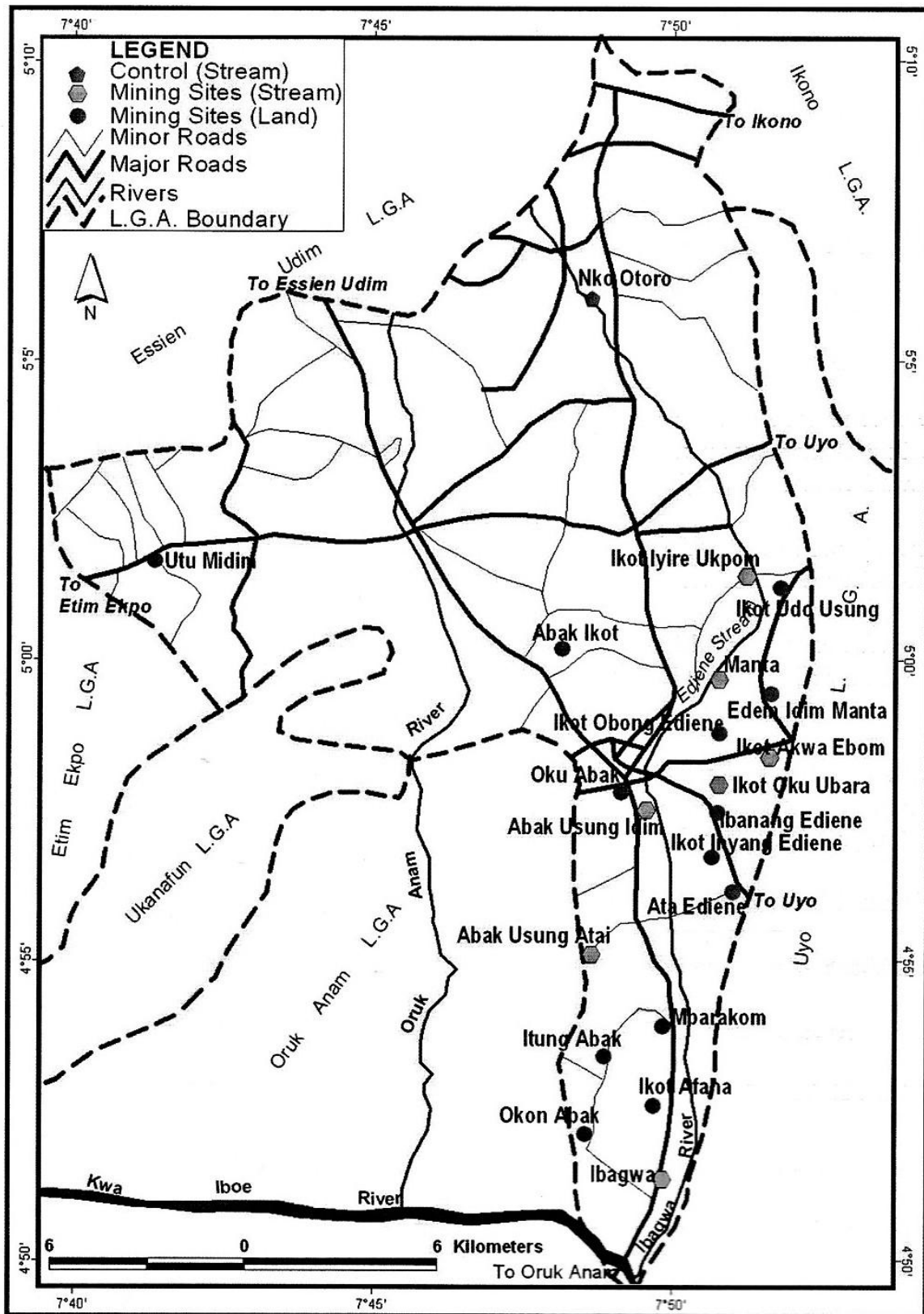


Figure 3.1: Location of mining sites in Abak Local Government Area

Source: Akwa Ibom State Surveys, 2018

In the study, 20 local communities including Oku Abak, Mbarakom, Utu Midim, Edem Idim Manta, Itung Abak, Ata Ediene, Ikot Obong Ediene, Ibanang Ediene, Ikot Udo Usung, Ikot Oku Ubara, Okon Abak, Ikot Afaha, Abak Ikot were sampled in order to extract the true picture impacts of sand mining intensification on sustainable land resource development in the area.

3.1 Data collection and analysis

Data for this study was obtained from social surveys using the questionnaire as the study instrument and field measurements using measuring tapes, field notebook and pen. The design of the questionnaire and its subsequent administration was based on extensive preliminary qualitative inquiries, and in-depth discussions with local sand mining operators in the area. However, a total of 382 respondents comprising household heads- a majority of who were sand miners were sampled to extract useful information on the impacts of sand mining intensification in the area. On the other hand, data on number of sand mining pits, total depth and width of pits, total volume of sand mined daily, and total area of land lost to sand mining were generated through field measurements and analysed using conventional methods. In addition, snapshots of devastated areas were taken using still cameras during site inspections for the purpose of confirmation and clarity.

4. Results and Discussion

4.1 Sand mining methods adopted in Abak LGA

The outcome of the study identified two main methods of sand mining commonly adopted in the study area. 58% of the respondents identified strip mining on land while 42% of the respondents identified diving as a method of sand mining from water sources. Strip mining is a method of mining that is used when sand particles are deposited near the surface and underground passages are not needed. It is the practice of first removing the long layer or string of overlying soil before mining a seam of sand particles from beneath the surface.

4.2 Daily estimates of sand mined and loaded out

Based on field observation, daily trip counting and measurements, the daily estimates of truckloads of sand mined in the area are as contained in the Table 1:

Table 4.1: Daily estimates of sand mined and loaded out from Abak LGA

S/N o	Sampled communities	Location of mining sites	Daily truckloads of sand			Tons per day (cm ³)
			Single trip	Double trip	Total	
1.	Oku Abak	Land	15	-	15	180
2.	Mbarakom	Land	16	13	29	504
3.	Utu Midim	Land	14	-	14	168
4.	Edem Idim Manta	Land	8	4	12	192
5.	Itung Abak	Land	11	2	13	180
6.	Ata Ediene	Land	10	3	13	192
7.	Ikot Obong Ediene	Land	13	2	15	204
8.	Ibanang Ediene	Land	8	3	11	168
9.	Ikot Udo Usung	Land	12	3	15	216
10.	Ikot Inyang Ediene	Land	17	-	17	204
11.	Okon Abak	Land	12	1	13	168
12.	Ikot Afaha	Land	11	-	11	132
13.	Abak Ikot	Land	16	-	16	192
14.	Ikot Iyire Ukpom	Stream	11	1	12	156
15.	Manta	Stream	14	-	14	168
16.	Abak Usung Idim	Stream	18	4	22	312
17.	Abak Usung Atai	Stream	15	-	15	180
18.	Ibagwa	Stream	18	4	22	312
19.	Ikot Akwa Ebom	Stream	17	2	19	252
20.	Ikot Inyang Ediene	Stream	18	-	18	216
Total			274	32	316	4,296

Note: Single trip of sand = 12 tons; Double trip of sand = 24 tons

Source: Researcher's fieldwork, 2018

Data in Table 1 reveals the tons of sand mined and loaded out on daily basis in each of the mining sites sampled. Meanwhile, there were some sites that volumes of sand were still loaded out. Since they were not sampled in the course of this study, they could not be visited. Generally, it is indicated that the total volume of sand produced in the area was large enough for 274 single and 32 double truckloads making total 316 trips of sand a day. This amounted to a total of 4,296 tons of sand mined and carried away on daily basis. A further probe into the intense sand mining operations based on available data on daily mining revealed the total surface area of land resources lost to sand mining operations between 2008 and 2018.

4.3 Total surface area of land lost to sand mining (2008-2018)

Within the period under consideration and based on field measurements on land across the 13 mining communities, data obtained was used for the computation of the total land surface lost to sand mining intensification as shown in Table 4.2:

S/No	Communities sampled	Total number of mining pits	Total depth of mining pits (m)	Total width of mining pits (m)	Total volume of sand mined (m ³)	Total surface area lost to sand mining (m ²)
1.	Abak Ikot	8	18.50	39.30	348.69	154.72
2.	Ata Ediene	8	14.47	42.55	310.85	181.20
3.	Edem Idim Manta	7	9.79	43.04	293.44	208.39
4.	Ibanang Ediene	6	15.90	40.90	612.04	221.67
5.	Ikot Afaha	6	12.60	32.10	288.21	137.27
6.	Ikot Inyang	9	15.80	36.90	210.09	119.50
7.	Ediene					
7.	Ikot Obong	7	10.14	38.13	236.01	165.89
	Ediene					
8.	Ikot Udo Usung	10	27.50	33.80	281.75	95.64
9.	Itung Abak	5	8.11	37.73	387.87	226.00
10.	Mbarakom	5	10.00	28.11	260.07	127.46
11.	Okon Abak	7	8.40	45.60	280.26	237.40
12.	Oku Abak	6	11.70	38.40	378.67	194.04
13.	Utu Midim	5	8.24	32.01	292.04	168.12
	Total	89	171.15	488.57	4,179.99	2,237.30

Source: Researcher's fieldwork, 2018

Data in Table 4.2 contain information about sand mining activities in Abak LGA. Almost all the local communities were involved in sand mining activities. But this study covered the prominent ones as contained in the table. The number of pits covered in each of the communities did not include those below eight metres depth. The depth of pits sampled ranged between 8.11 and 27.50 metres. However, the total volume of sand mined in each community was calculated as shown in the table. This, invariably led to the computation of the total surface area lost to sand mining which amounted to 2,237.30 square metres within the period under investigation.

4.4 Effect of sand mining on sustainable land resources development

Sequel to the volumes of sand excavated from land and the expanse of surface area involved, particularly within the areas occupied by the local people, the activities of ravaging gullies which are growing in size and length are currently inevitable as shown in Plate 4.1:



Plate 4.1: A Gully site at Oku Abak

Source: Researcher's fieldwork, 2018

The gully site at Oku Abak measured an average depth of 13.16 metres. Resulting from the devastating gully activities, issues of landslide have become more prevalent depicted on Plate 4.2:



Plate 4.2: A cross section of landslide occasioned by intensive sand mining at Manta community

Source: Researcher's fieldwork, 2018

Data in Plate 4.2 reveal the nature of landslide affecting a residential building at Manta community in Abak LGA. The occurrence of persistent landslide renders access roads to most local communities more devastating except by tipper operators as shown in Plate 4.3:

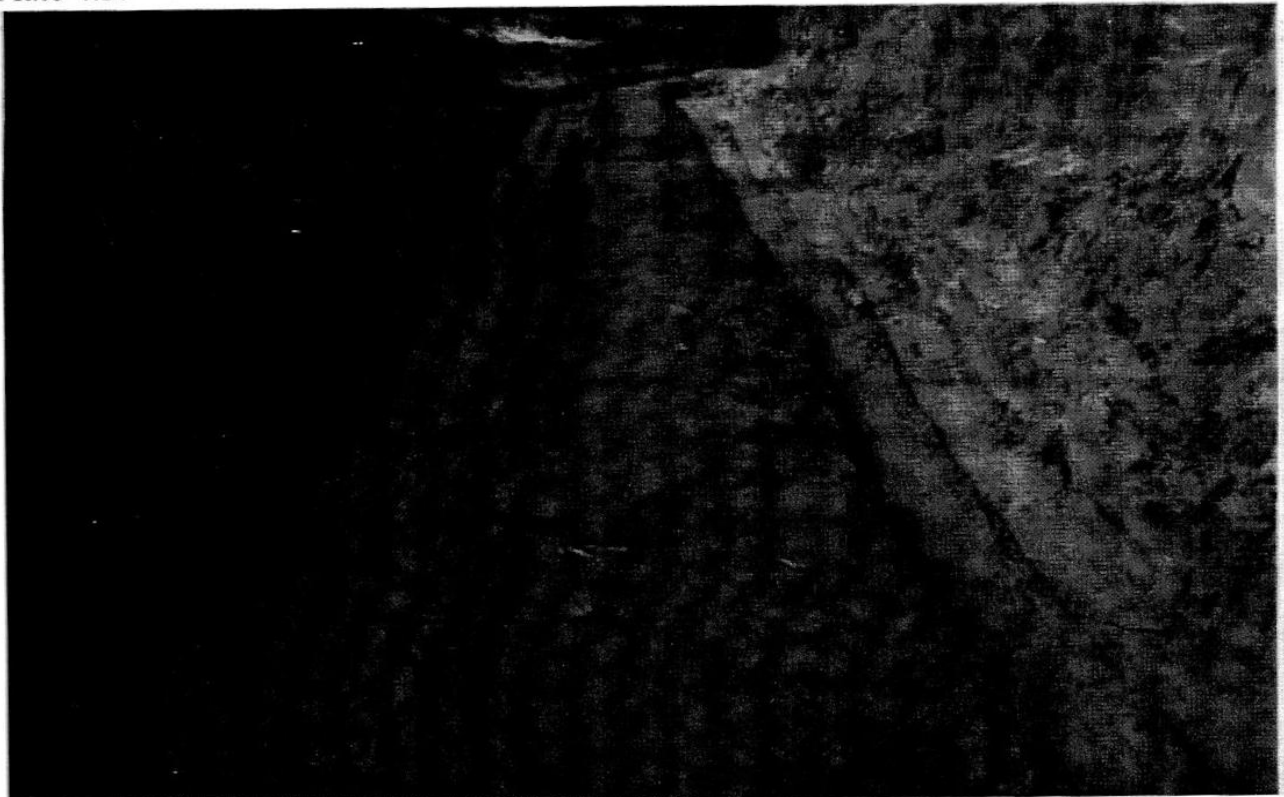


Plate 4.3: A cross section of access roads used mostly by Tipper Operators
Source: *Researcher's fieldwork, 2018*

5. Findings and Discussion

Based on the purpose for which the study intended to achieve, the common methods of sand mining used by the people in the area were strip mining and diving mostly from water courses. The strip-mining method is usually manual in nature, involving the removal of the long layer or strip of overlying soil before mining sand particles from beneath the surface using spades, buckets or head-pans. With this method, the vegetative cover in a particular area of land will be completely removed to pave way for the excavation of pit and subsequent extraction of sand in overwhelming quantities. This revelation corroborates the finding of Pitchaiah (2014), Stronberg (2017) as well as Adebayo, Adedeji and Sotayo (2014) that strip sand mining is commonly used in Ogun and Ondo States. Being that the strip mining method seems to be the simplest compared to the diving or the hydraulic method, it is important to note that the sand mining particularly when used on community land is always very devastating and aids environmental degradation.

Although the volume of sand mined on daily basis varies relatively depending on the depth and surface area of land affected, but in a long run, with sand mining intensification a reasonable volume of sand is extracted from the surface land on daily basis. Take for instance, the spread of over 89 sand mining pits each with a depth ranging between 8.11 metres and 27.50 metres, producing a total of 316 trips (3,792 tons) of sand on a daily basis. These are transported to different destinations within and

outside the area. Considering this in the past ten years (2008-2018), and a reasonable 2,337.30 m² surface area lost to sand mining, one could imagine the effect of sand mining intensification on land resources development within the period under review. Although there may be variations in the volumes of sand mined, but considering the rate at which sand is currently mined in the area, a greater percentage of the surface area of land resource would be lost to sand mining intensification in the nearest future. At the moment, sand mining has posed significant adverse effect on the natural environment and agricultural land use in the area. Satellite imageries of the area between 2008-2018 has confirmed, to a large extent, that this activity has drastically reduced productive agricultural lands in the area. In support of this assertion, about 88 percent of the respondents revealed agreed to the fact that the recent loss of farmlands in the area was as a result of intensive operation of sand mining activities over the years. This activity usually scares the natural landscape with human excavated pits, leaving behind unsightly views which as well render the land unsuitable for any productive purposes. Although the severity of this impact varies accordingly among the communities depending on the quantity of sand embedded in their localities. Surprisingly, the development of land resources for agricultural production in the area has become a mirage due largely to the continuous reduction in the size of farmlands resulting from sand mining intensification.

Apart from being a source of economic empowerment for both indigenes and non-indigenes who pose as contractors supplying sand for various uses, it is an established fact that the roads to and fro the mining sites are not useable to other motorists. They are mostly destroyed by the influx of tippers going in and out of the mining sites in the host communities. This corroborates the findings of WWF (2018), that sand mining is putting unprecedented pressure on land as a result of its demand thus, leading to land degradation. The area has become a rugged land with much truck traffic to conform with what Stronberg (2017) said that sand mining generates new tracks with much truck traffic rugged.

In addition, in one of the sand mining sites precisely at Manta, it was seen that landslide has rendered some people homeless by destroying their residential buildings, thus making the people to flee from their traditionally inherited area. Here, indications are that sand miners continually abandon old mining sites and create new sites and continue their mining activities without looking back. Hence, they create hollow depressions of economic insignificance with the proliferation of ravaging gullies which makes the physical aesthetic of the area unappealing. Based on these revelations, of what economic use(s) is the abandoned sand mining site(s) in Abak LGA? At the moment, of the total surface area of 190 km², a percent has been lost to sand mining over the years. The intensity of sand mining activities has become more worrisome to the extent that some residential buildings and road networks have begun to be engulfed by the ravaging gullies. At the moment, the total surface area of Abak LGA is 190 km² out of which about 2,237.30m² (2.24 km²) is lost to sand mining within a period of ten years. With the current pace of sand mining intensification and extensification (moving from one mining pit to another), if the total area of transportation land taken away, residential land use, public land use among others the implication is that, if drastic precautionary measures are not taken, a time will come when useable agricultural land use will be completely threatened in the wake of intensive sand mining operations on land. As 88 percent of the respondents who are mostly farmers cry out of drastic loss of farmlands to sand mining in the area, what is the fate of agricultural production and food security? With much reference to the ideals of the concept of sustainable development in the 21st century, it is

worrisome that sand mining intensification is not only a source of livelihood, but also a destruction to the physical landscape and a threat to sustainable land resource development in Abak LGA of Akwa Ibom State.

6. Conclusion and Recommendations

Based on the findings from the study, it was concluded that methods of sand mining adopted mostly on land was strip mining involving the use of manual and crude implements. Some of these implements include spade and head pan for excavation, parking and hiking prior to loading into a standby tipper(s) to be transported to respective destinations. Moreover, being that huge volumes of sand are mined and carted away thereby increasing the surface area of land, it is concluded from the study that apart from sand mining operations without recourse to land remediation and reclamation, the process continues to undermine other sustainable land resource developments in Abak LGA in Akwa Ibom State. Attempt therefore to change the situation and follow the path of sustainable development requires some precautionary measures and relevant recommendations.

This study was aimed at investigating sand mining intensification and sustainable land resource development in Abak LGA of Akwa Ibom State. However, based on the findings and conclusions drawn from the study that sand mining intensification poses severe threat on the physical landscape and loss of agricultural land uses in the area, the following recommendations have been suggested including but not limited to:

- (1) Promotion of public sensitization and awareness campaign on the dangers of indiscriminate sand mining particularly using the strip method on the physical landscape in the area. This can be carried out through village council meetings and town criers as a medium of reaching the people.
- (2) Appropriate government agencies should not only develop relevant laws and regulations governing sand mining and land reclamation, but should also develop appropriate measures to enforce such regulations and ensure their utmost compliance, while the use of Environmental Impact Assessment (EIA) is highly recommended before licenses are granted so that mining activities can be carried out within regulatory limits and reclamation.
- (4) Effective environmental monitoring and evaluation should be carried out on regular basis to detect environmental changes and support management decisions. This involves repeated visits to the sand mining sites for visual and direct observations to know if the sites have been naturally reclaimed or not.
- (5) Finally, since this study was concerned with sand mining activities and its effects on sustainable land resource development, coupled with the fact that mining activities are equally carried in the water courses in the area, it is recommended that further researches be carried out to assess the impacts of sand mining on water quality and promote the quality of sources of drinking water in the area.

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