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SAND MINING IN WATARI RIVER: NEXUS ENVIRONMENT, ECONOMIC AND SOCIAL IMPLICATIONS

Ahmad Said Abubakar[1]
Nafeesat Hussaini Hassan[2]
Ali Hussain[3]
Nura Isyaku Bello[4]

ABSTRACT

The study aimed at assessing the implication of sand mining on environment and socioeconomic activities along Watari River. The study utilizes mixed method; where both qualitative and quantitative methods were used. Both primary and secondary sources of data were used. On the other hand, multi-stage sampling technique was used for this research. Descriptive Statistics (Univariate description) was used for data analysis where tabulation, percentage, bar chart and so on were used. On the other hand, the study reveals that majority of the respondents believed that they receive social benefit from sand mining activities, but all of them stated that they do not benefit from sand mining activity environmentally. Though, economically, majority of the respondent believed that they earn some income through engaging in sand mining activity. It is also identified that the most common social challenge that people face in the study area is death as a result of falling into some gullies or having accident as a result bad terrain they are having as a result of sand mining activity. The study recommended that It is recommended that the government should intervene directly into sand mining business by regulating the amount of sand should be mined every year in order to minimize the effect of creating gullies.

[1] Department of Geography, Aminu Kano College of Islamic and Legal Studies, asa99939@gmail.com
[2] Department of Geography, Aminu Kano College of Islamic and Legal Studies
[3] Department of Geography, Aminu Kano College of Islamic and Legal Studies
[4] Department of Geography, Aliko Dangote University of Science and Technology, Wudil

Government should also enforce the compliance with environmental agencies in order to protect the environment and life of people living in the area.
Keywords: Sand mining, environmental implication, River Watari

INTRODUCTION

Globally, mineral resources are the mostly mined material, with extraction sites located near nearly every city and town. UNEP (2014) it is estimated that between 32 and 50 billion tonnes of aggregate (sand and gravel) are extracted globally each year (Steinberger et al., 2010). Nowadays, the demand for sand increases in an alarming rate. The main source of sand mining is from in-stream in Nigeria. Due to the presently widespread availability of aggregate deposits, and the inexpensive methods required for extraction, transport is typically the limiting 'cost' for use, thus requiring a large number of sources located close to markets. However, rivers are a preferred source of sand and gravel for a number of reasons: cities tend to be located near rivers so transport costs are low.

There is rapid increase in urbanization worldwide which raise the demand for sand demand globally, especially in developing countries. This leads to unplanned and unsustainable sand mining from many illegal inland sand mining pits found in many parts of the country. This illegal and unsustainable sand mining cause environmental and socioeconomic problems such as pollution (noise, water and land), turbidity, truck traffic, stream-water, adverse impacts to living things, biota, vegetation and aquatic ecosystems, and so on (Hill & Kleyhans, 1999). Sand mining activity furnishes employment opportunity to the people living proximity to the sand mining site (Mwangi, 2007).

As a worldwide economic activity, pit and river sand mining and gravel extraction has both positive and negative impacts to the environment. Socially, sand mining create tension or confrontation with competing land uses such as farming, especially in areas where high-value farmland is scarce and where post-mining restoration may not be feasible. The most direct environmental impact of sand mining is the loss of agricultural land leading to soil erosion, land dereliction and ground water pollution (Peckenham *et al*., 2009).

Watari River is among the area where land is scarce based on the observation which make irrigation farming is difficult among the people living in the area. Chauhan (2010); Chindo (2011) were conducted their research on sand mining

in Nigeria. But limited researches were conducted on Watari River on implications of sand mining on environmental and socioeconomic activities. This is the bedrock which this research intends to fill.

Aim and Objectives

The aim of this study is to assess the implication of sand mining on environment and socioeconomic activities along Watari River

The above aim would be achieved through the following objectives, to:

1. Identify areas where sand mining activity is taking place along Watari River
2. Quantify the amount of sand mined in the study area per day
3. Identify the method of mining and loading to truck commonly practiced in the study area
4. Find out the environmental as well socioeconomic implication of sand mining to people in the study area

On the other hand, spatially, the scope of this research is concerned and strictly limited to the Watari River which cuts across the Local Governments of Tsanyawa, Bagwai, Shanono, Bichi, Dawakin-Tofa, Tofa, Ungoggo, Makoda and Rimin gado. The selection of the whole basin will afford the opportunity for having a systems approach to the study. Textually, this research tends to cover implication of sand mining on environment and socioeconomic activities along Watari River. While temporally, the study covered three (3) months (from February to April, 2022). The reason for selecting February to April is in order to cover two seasons out of four in Kano State.

Location and Size

Watari River situated between Latitudes 11^0 50’ 22’’ and 13^0 01’ 38’’N and between longitudes 7^0 81’42’’ and 8^0 26’26’’ E with an estimated area size of 3,667 km². The study area is bordered to the North by Kunchi Local Government, to the South by Gwarzo and Kabo Local Governments, to the East by Minjibir Local Government (all in Kano State). Though, to the West, it is bordered by Musawa and Kankia Local Governments in Katsina State (Fig 1).

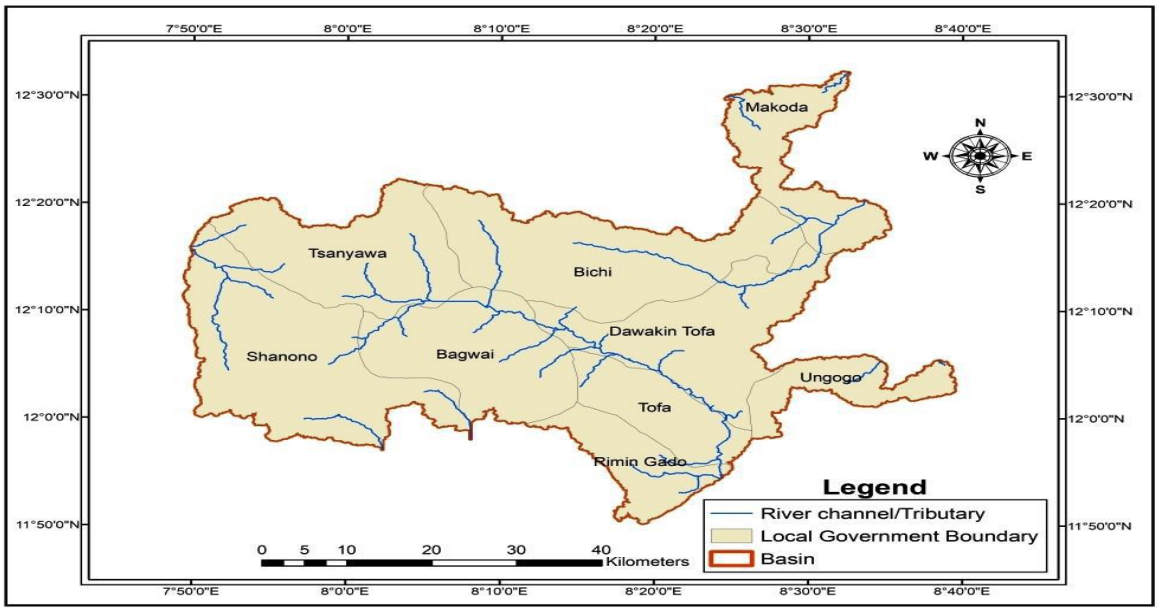


Fig. 1: Showing the Study area

LITERATURE REVIEW

According to Ashraf *et.al* (2011), sand mining is the removal of sand from their natural configuration usually for use in construction projects of economic and social benefits. Sand and gravel winning undertakings are small-scale industrial mining activities with widespread environmental and socio-economic implications in most developing countries (Alhassan, 2010). Sand mining refers to the scooping of sand from portions of the earth surface for building construction and other developmental purposes (Peprah, 2013: 185). This paper explores the environmental and socio-economic implications of these two small-scale open-mining activities from the perspective of stakeholders in the industry in the Watari River and its environs.

Effects of Sand Mining

It is widely reported in the literature that sand and gravel mining have both positive and negative effects (Mireku-Gyimah & Tsidi, 1996; Peprah, 2013; Jonah, Adjei-Boateng, Agbo, Mensah, & Edziyie, 2015; Narh, 2016; Baba, 2017). Some of the negative impacts reported include environmental degradation, water pollution, destruction of the soil structure, facilitating soil erosion with abandoned pits acting as breeding grounds for water-induced diseases and death-traps (Jonah et al., 2015; Narh, 2016; Baba, 2017; Bello,

2021). Nature in its benevolence has clearly made it manifest that rivers are part of the life supporting systems it has offered mankind. Over time human activities have altered the pattern of river flow by damming river courses and overexploit both non-renewable and renewable natural resources found within the river like sand and gravel and in return use rivers as waste dumpsites. These actions portend threat to the river ecosystem and other marine species including humans who depend on these rivers as their source of livelihood. Sand is a natural resource, and a consequence of natural process of weathering which is a key constituent in the construction and allied industries are found in abundance in most oceans, rivers, streams, flood plains and hills. The increased demand for sand has placed rivers where sand is found vulnerable to the vagaries of anthropogenic activities. Among which uncontrolled and continuous sand mining is the most disastrous because it portends great threat to the existing bionetwork and waterways.

The increased demand for sand has placed rivers where sand is found vulnerable to the vagaries of anthropogenic activities. Among which uncontrolled and continuous sand mining is the most disastrous because it portends great threat to the existing bionetwork and waterways (Kondolf, 1997). The dynamics of emerging urbanization with its attendant growth in population, settlements, industrialization and associated changes have also contributed in the uncontrolled and overexploitation of sand around in-stream locations. Padmala *et al.,* (2008) assert that uncontrolled in-stream mining of sand is fallout of: effortlessly available social housing scheme, swift economic development and improved foreign exchange earnings of a country.

RESEARCH METHODS

Research Design

Mixed method was used for this research work; where both qualitative and quantitative methods were used. Quantitative method deals with questionnaire and observation to generate numerical data about volume of sand mined daily in kilogram (KG). Non-numerical data which is qualitative data was generated using interview method. This research work is descriptive research in nature.

Research Population

There are three (3) sand mine sites crossing four (4) local government areas (Bagwai, Rimin Gado, Tofa and Ungoggo). This is the research population where participants were selected from these numbers of sand mine locations in the study area. While for the participants, sand miners and those live close to the sand mining sites were sampled.

Sample and Sampling Techniques

For the sand miners, 20 personnel were selected from each site while 50 people living close to mining site were selected for answering questionnaire. Interview was conducted to management or leadership of the miners. On the other hand, multi-stage sampling technique was used for this research work. Firstly, snow bowling sampling technique was adopted for sampling sand mining sites. Similarly, secondly, purposive sampling was employed to those living close to the sand mining area. This purposive sampling technique was used in distribution questionnaires. This is because respondents have some common knowledge about environmental, social and economic effects of sand mining activities to them.

METHOD OF DATA COLLECTION

Different methods of data collection were utilized for this research as follow:

Interview: Structured interviews were used in collecting data from sand miners' management on the method commonly used in mining the sand as well as loading the sand on truck together with the quantity or volume of sand generated daily.

Questionnaires: questionnaires used in this research for data collection comprises of two sections: bio-data of the respondents and subject matter. This subject matter questions include do you notice so change in your environment in terms of soil degradation or soil regeneration, what is the quality of water in the area? Do you have crises in your community as a result of water shortage? Furthermore, this questionnaire is to be used in collecting data from people reside close to sand mining area. The questionnaire was administered to people reside close to sand mining area.

INSTRUMENTS FOR DATA COLLECTION

Camera was used in capturing real condition of the environmental condition in order to pictorially show effects of sand mining to the environment.

Weight Scale: to calculate the amount of sand mined in the site every day in kilo gram (KG), weight scale is used in measuring the weight of all sand mined.

Statistical Package for Social Science: Version 22 of this software was used for the analysis of all objectives except for the first one which GIS Software was used.

DATA ANALYSIS

Data collected using questionnaires, GPS and interview will be analysed through the following methods:

Descriptive Statistics (Univariate description): this research work employed simple statistical bunch such as tabulation, percentage, bar chart and so on; to analyse the data collected mostly from questionnaire and interview. On the other hand, to determine the volume of sand mined daily in the study area tables were used. Tables and bar chart were used in identifying the method of mining practiced and methods of loading truck commonly practices in the study area.

DATA ANALSIS

Introduction

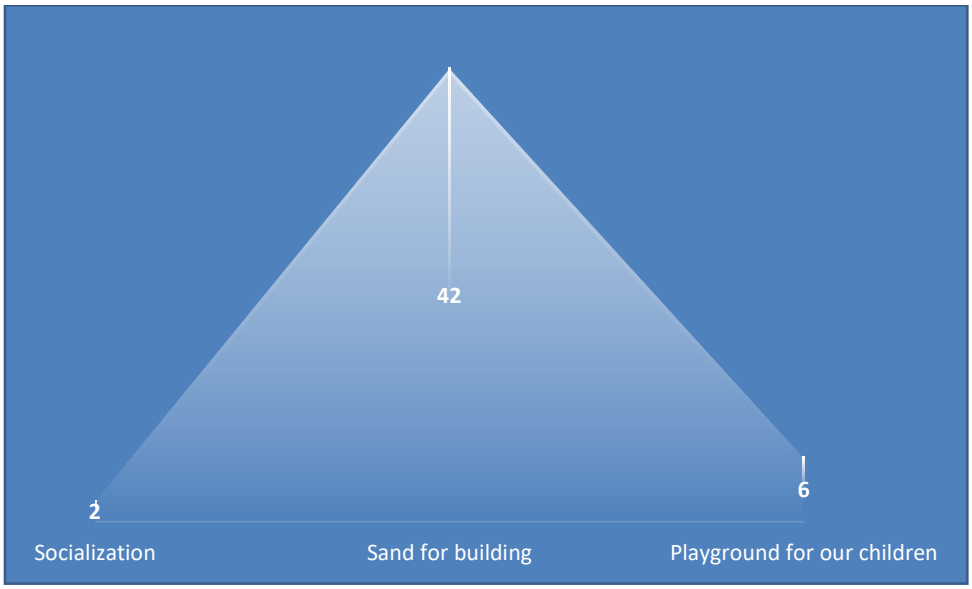
This chapter analysed the data that was collected in the field using questionnaire survey and interview method. The data was divided into two: quantitative and qualitative. The quantitative data was collected using questionnaire and used descriptive statistics for data analysis such as table, frequency, bar and pie charts and so on. On the other hand, description using word expression was used in analysing qualitative data (i.e. data generated from in-depth interview).

Table 1: Social benefit derive from sand mining by the respondents

Response	Frequency	Percent
Yes	45	90
No	5	10
Total	**50**	**100**

Source: Field Survey, 2022

Table 1 indicates that 90% of the respondent s believed that the benefitted from been engaging into the sand mining business while 10% has the opinion that they do not earn any social benefit.



Source: Field Survey, 2022

Fig. 2: **Types of social benefit derive from sand mining activity**

Fig. 2 shows that 84% of the respondents have sand for building easily; they also use the area to serve as playground for their children which constitutes 12%. The lowest social benefit derive from sand mining activity is having socialization with those engage in the business which are only 4%.

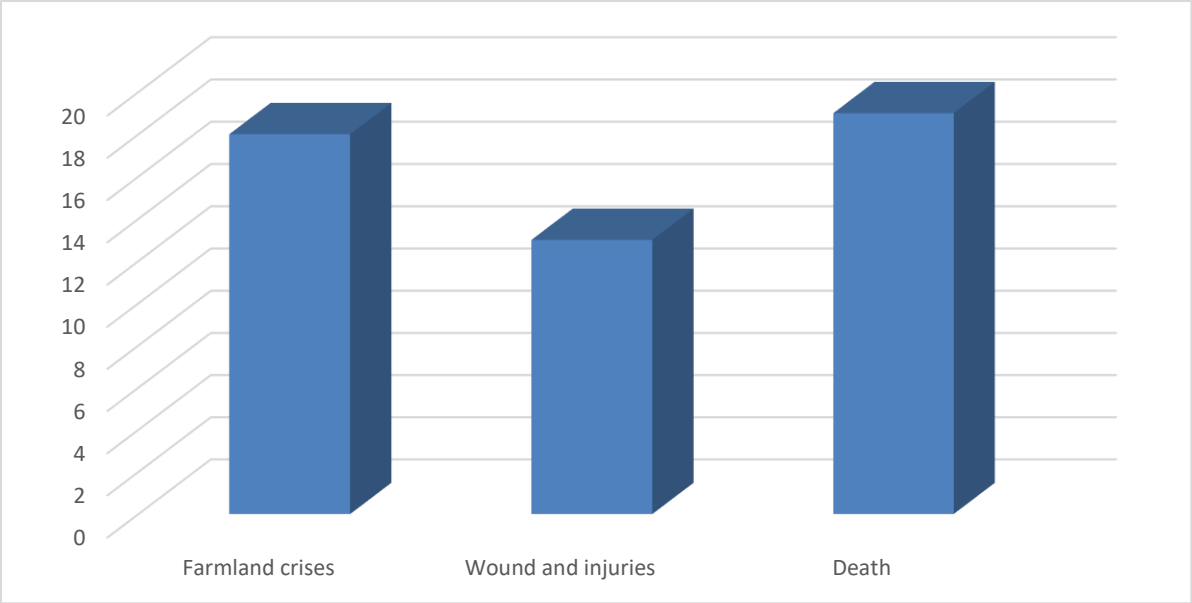


Fig. 3: Type of social challenge experienced as a result of sand mining in your area

Based on the fig. 3, the most social challenge that people face in the study area is death as a result of falling into some gullies or having accident as a result tempering the terrain. The second issue related to the social aspect is farmland crises which constitutes 36% of the respondents. This means that most of farmland border is destroyed by either the trucks that evacuate sand or by the sand miners. Wounds and injuries are also happen which constitutes 26% of the respondents.

Table 2: E**nvironmental benefit of sand mining to the people in the study area**

Response	**Frequency**	**Percent**
No	50	100.0
Yes	0	0
Total	**50**	**100**

Source: Field Survey, 2022

All of the respondents unanimously believe that they do not benefit environmentally from sand mining activity (100%).

Table 3 Do you get any economic benefit from sand mining in your area

Response	Frequency	Percent
Yes	49	98.0
No	1	2.0
Total	**50**	**100.0**

Source: Field Survey, 2022

Economically, people neighbouring sand mining site benefitted as it was revealed in table 3. Only 2% do no not earn any economic vale for been neighbour to sand mining site.

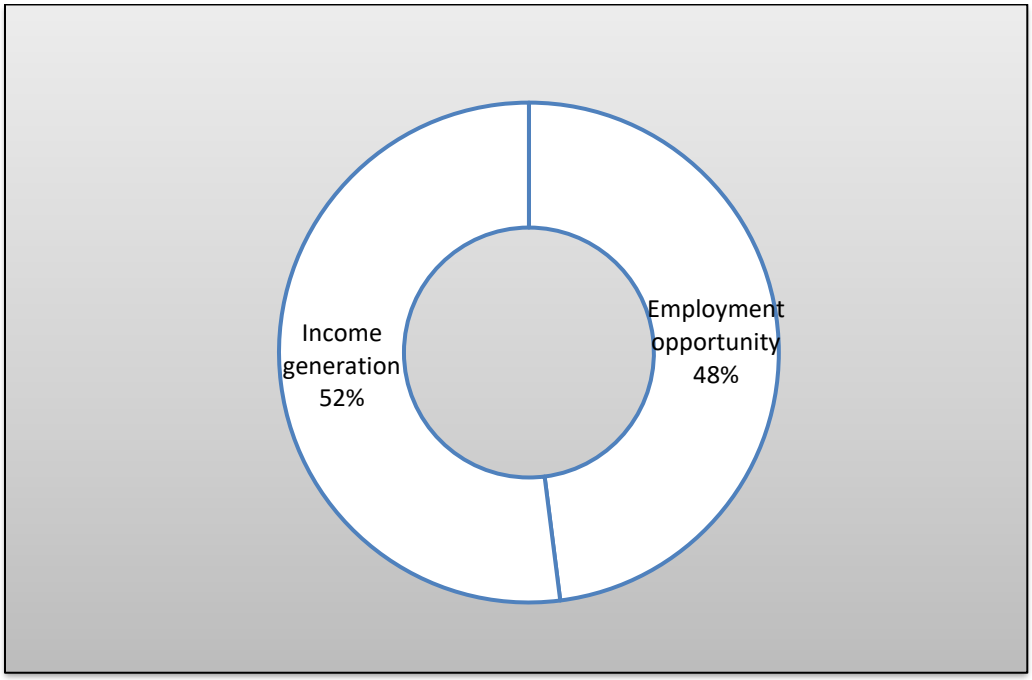


Fig. 4: Economic benefit of sand mining to the respondents in the study area

Fig. 4 showcase that sand mining provide direct employment (48%) to the people living close to the site. Whereas other respondents (52%) believed that they earn some income by engaging in a small business such as selling cooked food, sachet water, porridge, sugarcane, groundnut, etc.

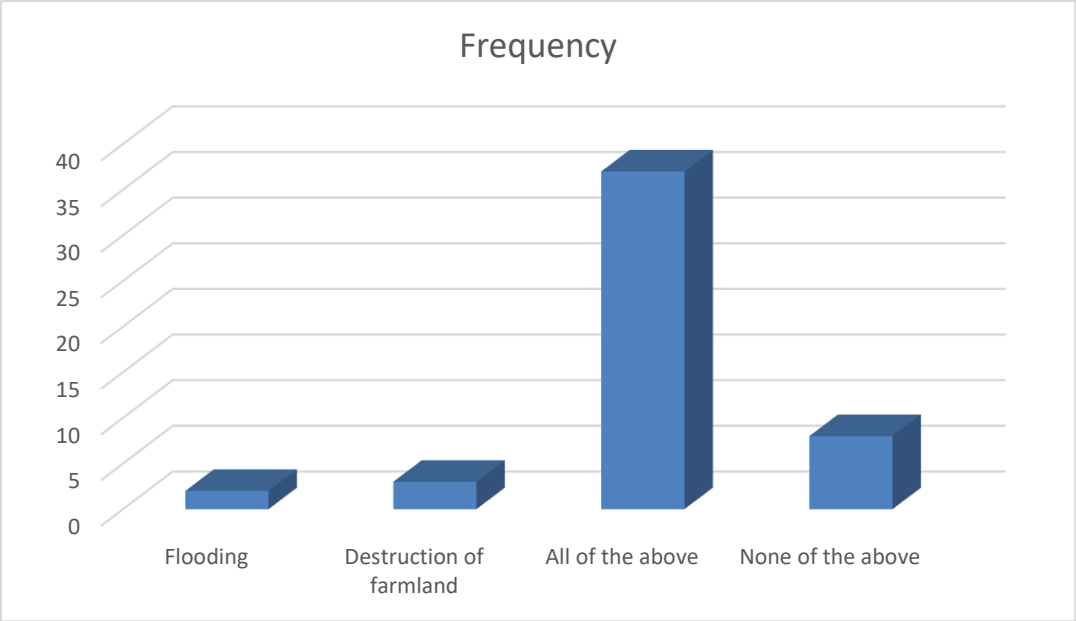


Fig. 5: Environmental problems experienced in the study area

Fig. 5 shows that flooding and destruction of farmland constitutes the highest percentage of environmental problems that occur as a result of sand mining which 74%. While 16% of the respondents are in the view that there is no any environmental problem occur in the area as a result of sand mining. Destruction of farmland as well as flooding constitutes 6% and 4% of the respondents respectively. This corroborates the findings of Rovira et.al. (2005); Rinaldi et.al. (2005); Nabegu (2012) which say that sand mining has severe negative environmental impacts that are not reversible.

Based on the interview conducted by the researchers, it is indicated that 22 tippers are loaded every day. This shows that every year 8030 tippers are extracted which is huge amount of sand mined. This can affect plot of land which should be used for residential area. And also the agricultural productivity might be reduced. On the other hand, the methods used in mining is manual where human labour is required than machine one. As stated by some respondents that:

> "Youths every day dive into this river to mine sand especially after rainy season; i.e. warm and dry season. But during hot and dry season (Bazara) we extract sand from the bank of the river since the river dry up in some area."

The method used in loading sand on trucks is traditional where human efforts are used (human labour). This indicates that many labourers have to present based on the amount sand needed as in indicated that every day 22 tippers are

extracted. This business provides employment opportunity to about 66 people to load sand on tipper. That is every tipper has three person assigned to load it and everyday some load 1-3 tipper, depends on how lucky and agile you are as a labourer.

In terms of time spend for loading on tipper; it takes three people to load fakas, Man Diesel and ten-wheel 16 minutes, 26 minutes and 50 minutes respectively. These times depend on season of the year where hamattan season takes equal to the above time while summer season takes more than the above times. Another factor for fastening the loading of tipper is agility and energy drug they use to take. This is stated by one of the respondents as:

> "We give work to those they can load our tipper within short period of time. That is why some workers take energy drug before they start work in order to have more energy to work".

In terms of the instruments used in mining sand are also crude as highlighted by one of the respondents during an interview:

> "We use traditional instrument such as shovel, canoe, bowl, sacks, bucket and so on. We also use only shovel in loading sand on tipper without using any modern lifter as we see in developed countries".

According to the respondents they pay ₦300 as a tax per tipper. This means every year local government secretariat generate ₦108,000. This tax they pay is government maintenance levy. They buy the plot of land from the owner, not from the government. But still they do not have good path as spelt out by some respondent:

> All foot-path you see here is provided by our own association. We pay ₦300 per each single tipper, but we do not enjoy any social facilities such as road for easy transporting sand from where we extracted here to the main road. This business employs more than 100 people directly or indirectly.

CONCLUSION AND RECOMMENDATIONS

With regards to the findings of this study, the researchers arrived at the following conclusions: the researchers concluded that, the most common environmental problems people experience in the study area is flooding and destruction of farmland. Though, some respondent are in the opinion that there

is no any environmental problem occur in the area as a result of sand mining. It is also arrived at conclusion that 8030 tippers of sand are extracted every year which is large number. And it is also concluded that the method they use in extracting sand and loading it on tipper is manual where instrument like shovel, bucket, canoe and so on are used. This research concluded that the most common environmental problem in the area is accident which leads to death as a result of bad terrain which sand mining activity causes.

Based on the findings of this research, the following recommendations are given:

- It is recommended that the government should intervene directly into sand mining business by regulating the amount of sand should be mined every year in order to minimize the effect of creating gullies.
- Environmental knowledge should be introduced into formal and non-formal education through campaign via media stations such radio, television and newspaper. And sometimes seminar should be organised to those working in sand mining activity in order to avert or minimize the negative effects of mining sand in the area.
- It is also recommended that some social facilities such as road transportation, hospital, tap bone water, etc need to be provided by the government and other philanthropists.
- Government should enforce the compliance with environmental agencies in order to protect the environment and life of people living in the area.

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