ASSESSMENT OF THE IMPACT OF SMALL-SCALE OPEN CAST MINING IN SOUTHERN KADUNA, KADUNA STATE, NIGERIA

BY

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M.TECH/SSSE/2007/1750

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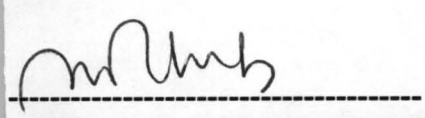
A THESIS SUBMITTED TO THE POSTGRADUATE SCHOOL, FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF TECHNOLOGY (M.TECH) IN GEOGRAPHY (ENVIRONMENTAL MANAGEMENT)

JANUARY, 2011

DECLARATION

I hereby declare that this thesis is an effort made by me and has not been submitted in any form for another degree or diploma at any University or Institution. Information derived from published and unpublished materials have been acknowledged in the text.



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CERTIFICATION

This thesis titled: An Assessment of the Impact of Small-scale Open Cast Mining in Southern Kaduna, Kaduna State, Nigeria by: KWASAU, Daniel Dogara (M.Tech/SSSE/2007/1750) meets the regulations governing the award of degree of Master of Technology (M.Tech) of the Federal University of Technology, Minna and is approved for its contribution to scientific knowledge and literary presentation.

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DEDICATION

This research I dedicate to God Almighty, my wife Veronica and my three sons Alfa, Abba and Adamu. To God be the glory.

ACKNOWLEDGEMENTS

With gratitude to God Almighty who has seen me through this rigorous session that entailed sometimes night trips to catch up with lectures. I specially thank my wife who gave me the moral and emotional support, while I travelled numerous hours/days for lectures. Gratitude goes to my school colleagues most especially Late Ephraim Kigbu who will always go to the motor park and collect my assignments to submit for me. We love you, but God loves you most. Rest in perfect peace, till we meet at Jesus feet where we shall part no more. I will not forget to thank the cheerful, colleague, Biodun who never got tired of putting me through and encouraging my efforts. Also Late Sunday Sidi for your ability to go with me to the field. I deeply appreciate the efforts and staff of Mining and Geological Survey, Kaduna; for all that they did to facilitate my work. Also the Chief librarian of the Ministry of Solid Mineral, Abuja, Mr.B. O. Awunando for your kind assistance. My appreciation goes to my supervisor Prof. J. M. Baba who took his time to guide me through this work. His personal commitment gave me the moral support needed for the success of the work. I appreciate everyone that one way or the other, directly or indirectly have helped me during the time of my degree.

ABSTRACT

Given that arable land or environmental resources are in short supply and essentially non-renewable and that the degradation of land has negative impacts on the well being of the population through the resultant decline in food production and the deterioration of water quality. The problem identified with small scale open cast mining in Nisama and the six communities was the impact (degradation) it did to the environment and also the health of the respondents. The aim of the research was to analyse the system of mining operations, to assess the impact of small scale mining on the environment and also to assess the social-economic impacts of small scale mining to Nisama and surrounding communities. Data obtained from the field, questionnaires, focus group discussions, keyman interview on the impact of small scale mining to the environment were used. Quantitative data generated were subjected to simple tabulation to simple tabulation for statistical representation. In each tabulation, simple percentage was used to obtain the results. The results generally showed that, averagely, 80% of the respondents in the six communities were involved in the mining activities during the mining period, while 89% of the respondents in the six communities were involved in farming before the mining. The result from the respondents also showed that deforestation and land degradation are the most prevalent effects on the environment. It was recommended that government should speed up on granting mining licence to professional miners. Also, there is the need to partner with the communities through NGO'S to sensitize the communities on the impact of their mining activities to the environment.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Statement of the Problem

Mining is a dynamic and risky operation. It needs timely and accurate information to monitor trends that indicate a change in risk status due to mining operations. Lack of such information has led to fatal accidents many a times. In fact around 200 lives were lost in the past two decades in mine accidents in the study area. Investigations into all underground mine accidents reveal that mine maps were not updated. This surely reflects on poor management and violation of safety norms. However it also points to the practical difficulty of manually managing huge data generated during mine operation, and regular updating of maps with the same. However, such pressure for more productivity increases the risk of operation, environmental degradation including social-economic impacts.

Huge amount of data are generated from mining operation. Yet they could not be managed and utilized in an effective manner. The routine operations in most of the small scale mining sites are still done manually. Such sites use the antiquated paper method for site investigation reports and maps. The information retrieval is done through different registers and record books. The communication is through post and fax. Although acceptable,

this method is time consuming, costly and also difficult to maintain and update. In spite of vast amounts of data generation, mine managers lack the information they need to make sound strategic decisions.

1.2 Purpose of the Study

The purpose of this research is to assess the impact of mining operations at Nisama mining sites and other neighboring sites where small scale mining activities were carried out, for the purpose of contributing to knowledge and making management inputs, using structured questionnaires and field survey.

1.3 Specific Objectives

1. To analyze the system of mining operations of small scale mining and its risk
2. To assess the impact of small scale mining on the environment
3. To assess the social-economic impact of small scale mining to Nisama and surrounding communities.

1.4 Significance of the Study

The problem of environmental degradation is particularly urgent given that arable land or environmental resources are in short supply and essentially non-renewable, and that the degradation of land has a negative impact on the well-being of the population through the resultant decline in food production and the deterioration of water quality. New policy measures on small scale open cast mining and conservation practices are therefore needed to reverse this adverse trend. However, reversing environmental degradation will not be possible if the extent of the problem is not known and if policy makers and practitioners are not well informed about the problem.

This research about small scale open cast mining would be able to help in developing a concept for land conservation and environmental management in the study area and some parts of the country affected by this problem. In addition to providing data and information on small scale open cast mining in the study area, the findings of the study will be useful for project planning (improving policy analysis and decision-making), implementation and evaluation at local and national levels towards declining agricultural productivity and food insecurity which are aftermath of environmental degradation.

The results of the study will be discussed among policy makers and practitioners for proper awareness and implementation of the recommendations therein to ensure and encourage an integrated approach to environmental resources management for sustainability.

1.5 Scope of the Study

The scope of this research is to focus specifically on identifying the possible indicators of environmental degradation; through examining the operations of small scale mining and its risk and the social-economic impacts of small scale mining to Nisama community, in Jama'a Local Government Area of Kaduna State while trying to understand the factors that influence the problem looking at the area's existing land management practices.

1.6 Limitations of the Study

The major weaknesses or constraints to be experienced will be that of time. This research is being carried out almost 20 years after the small scale open cast mining activities in Nisama and environs took place, hence, data might not be accurate. Secondly, sufficient money to be used will also be a problem because the study will require a lot of funds for effective collection of data and analysis putting into consideration the geographical spread and the sample population to be studied.

The problem of the literacy level of the population may also be a constraint in understanding the concept of the study and some terminologies that will be employed when administering the questionnaire or during verbal interview. The indigenes resentful attitude towards government policies and programmes may have some effect on the data to be collected; most of the populace may think this study is one of those government programmes because most of the sample population will be peasants who haven't benefited from any government programmes. These constraints may affect the accuracy of some data or relevant information to be gathered might be withheld. A list of recommendations is made on how to minimize the effects of these constraints.

1.7 Study Area

Kaduna State occupies part of the Central position of the Northern part of Nigeria (with Kaduna as its capital) and shares common borders with Zamfara, Katsina, Niger, Kano, Bauchi and Plateau States. To the South-West, the State shares a border with the Federal Capital Territory, Abuja. The global location of the State is between longititude of 30'' east of the Greenwich meridian and also between latitude 0900 and 11 30'' North of the Equator. The State occupies an area of approximately 48,473.2 square kilometers and has a population of more than 6 million (National Population Commission, 2006 census figures)

Jema'a Local Government has an area of 1,661 km² and a population of 278,735.

Nisama and environs are situated along Gwadogwado – Jos road, before a place called forest in Jema'a Local Government Area of Kaduna State. The inhabitants are mostly peasants and artisans whose major occupation is farming.

The 1991 census gave a figure of 22,000 as the population of the community

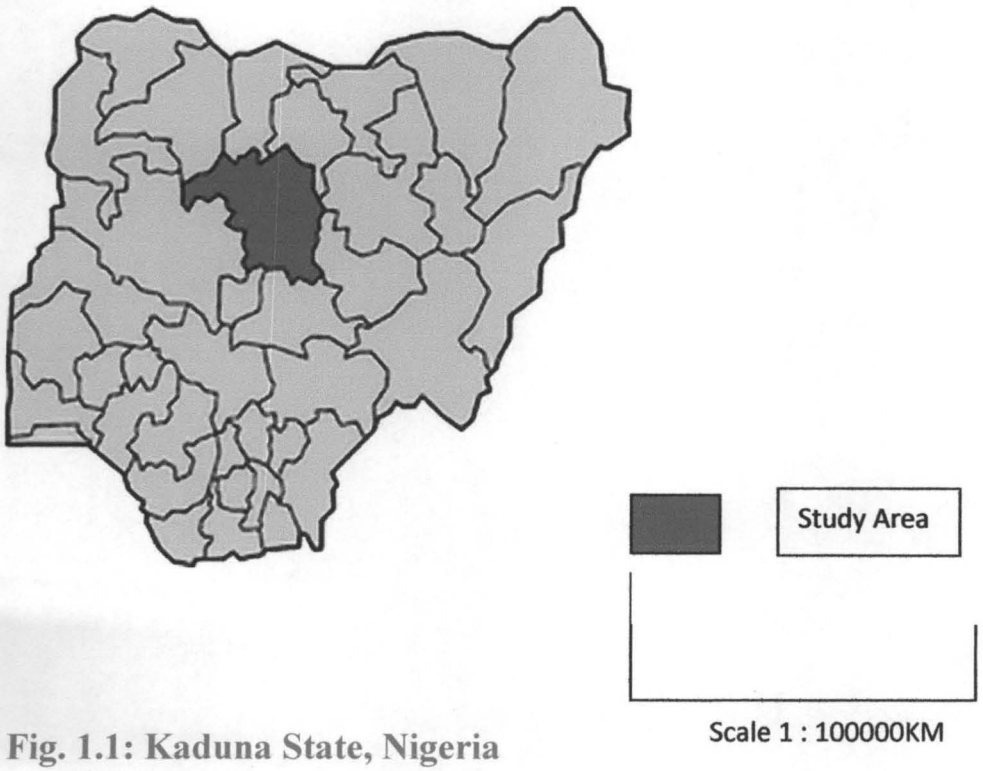

Fig. 1.1: Kaduna State, Nigeria

CHAPETR TWO

2.0 LITERATURE REVIEW

Nigeria ranks low on the human development scale of the UNDP. Poverty remains widespread, with a higher percentage of poverty concentrated in the rural, rather than urban areas. The stagnation of the non-oil part of the economy during the last two decades has been a principal factor in the persistence of poverty within Nigeria. The contraction of export agriculture, low productivity in subsistence agriculture, and the lack of non-farm income generating activities in rural areas have meant that rural populations have had limited opportunities to secure, let alone increase, cash income.

2.1 The mining industry

Prior to the emergence of the petroleum industry 30 years ago, solid minerals and agriculture were the key sectors of Nigeria's economy. Until 1960, coal and tin were mined and exported on a large scale. Poor management, changing economics and the country's neglect of this sector led to a decline in existing operations; hence a situation in which little new investment was made in mineral exploration and development.

From neither foreign nor domestic investors could be attracted. Most active mining in the country today is being undertaken by local entrepreneurs and artisans, working smaller deposits of precious, semi-precious, construction and industrial minerals that are not licensed at all or are operating outside of the parameters of the license they hold. They adhere minimally or not at all to safety and environmental standards, and are carried out in an ad hoc manner with little or no supporting infrastructure (physical or institutional).

The national economy of Nigeria is critically dependent on products and services generated by the natural environment. The majority of the poorest Nigerians depend directly on natural resources. Thus, sustainable use of Nigeria's natural resources is fundamental to poverty reduction and long-term development. Focus on private sector development in the non-oil sector is crucial to the country's long-term economic health.

2.3 History of mining in Nigeria

In Lagos - disused pits dug by illegal gold miner's dot the expanse of land which once served as farmland. Before the gold rush, the villagers in this sprawling farming community, called Igun, used to produce cash crops like cocoa, coffee and cola nuts. When International Public Society (IPS) visited the village in western

Nigeria, the illegal gold miners had already left and had moved on to other locations in search of the precious gem.

''As you can see, the pits have been deserted after the miners had finished collecting the gold here. They have moved further to new areas leaving the lucrative farming business in the village in shambles,'' says Kola Olabisi, acting as IPS guide.

According to Olabisi, the illegal miners are mostly foreigners from neighbouring Niger and Chad.

Pointing to some abandoned rusty excavation equipment left behind by the state-owned Nigerian Gold Mining Company (NGMC), a subsidiary of the Nigerian Mining Corporation, Olabisi explained: ''The activities of illegal miners became more pronounced in the last seven years when NGMC, folded up and abandoned its mining activities here. With its exit, the illegal miners took over and unleashed havoc on any land suspected to contain gold deposit.

For more than 12 years of its operation at the mines near Igun, the company dug up trenches which now form pools of undrinkable brackish water that constitute health hazards to both villagers and livestock.

The illegal miners followed in the company's footsteps digging up trenches in search of gold, creating more pits.

While the illegal gold diggers make thousands of dollars through their business, the locals get peanuts. And they are continuously faced with the dangers of environmental degradation to their farmlands and other hazards resulting from the open pits.

''We are suffering. The illegal miners have dug up our farms, posing dangers to our lives. Our crops have been destroyed because of their activities. Whenever we tried to question them, they showed us papers (mining rights) which they claimed were obtained from government,'' complains Olu Ibikunle, a farmer.

''Instead of being a blessing, the discovery of gold has become a curse to us. We no longer have enough good farming land, while our fresh waters are now polluted,'' he says.

As a result, women and children now walk long distances in search of clean drinking water.

Part of the problem seems to be rooted in poverty. IPS has learnt that the illegal miners pay - or bribe - some unsuspecting poor farmers to allow them prospect for

the gem on their land. A lucky miner, who hits some good quantity of gold, could become an instant Naira millionaire as an ounce of gold fetches as much as 40,000 naira (about 400 dollars) in the market.

Femi Adefila, a senior government official in Osogbo, the capital of Osun State, where Igun is located, told IPS: ''Because of the large deposit of gold in the area, the illegal miners have seized the opportunity to perform their illegal acts.''

''We recently arrested three illegal miners. They told us they work for a businessman. But when we tried to get to the businessman, he bolted. The three men have been charged for economic sabotage,'' Adefila said. Each of the men risks five years jail term on conviction.

Adamu Hassan, one of the apprehended men, said: ''I work for a big man. Our bosses are businessmen from both Nigeria and abroad. Most of us do this as a means of survival. We sometimes melt the gold and sell to goldsmiths in Osogbo,'' he said.

So far, local officials are powerless to stop the illegal miners. Osun State officials say mineral resources fall under the federal government in the capital Abuja, making it impossible for Nigeria's 36 states to stop the miners.

''We are helpless. It is a shame that some of those who are stealing our resources through illegal mining and constituting a nuisance to the people are not even Nigerians. But we can hardly do anything because of the policy of government which places natural resources in the exclusive list of the federal government,'' complains one government official.

Sections 1 and 221 of Decree 34 of 1999 vested the ownership and control of all minerals, including the power to issue licenses, collect rents, fees, and royalties, in the federal government. This power is exercised through the Ministry of Solid Minerals Development, established to boost non-oil exports.

Since the creation of the ministry in 1995, officials say investors – both local and foreign - have shown interest in Nigeria's gold deposits found almost throughout the Western and North-western regions.

Former Kaduna State Governor, Ahmed Makarfi, while receiving the National Steel Raw Materials Exploration Agency officials, expressed concern over the activities of illegal miners in the state. He urged the agency to assist the government in checking the menace.

There have also been reports of physical attacks on persons who tried to obstruct the activities of illegal miners. About two years ago, a traditional ruler in Osun state was attacked in his palace by hoodlums for daring to obstruct their activities.

In the tantalite-rich Kogi state, central Nigeria, investors were driven out of some fields by illegal miners who felt threatened. Similar incidents of harassments, or ejection of investors, have also been reported in the northern states of Plateau, Nasarawa and Jigawa. New Nigerian Newspaper (August 8, 2000) Illegal mining in Northern Nigerian. Pp 22. In 2001, the Mining Association of Nigeria, led by Dabo Zang, urged the Nigerian government to do something about the illegal miners.

While government is losing revenue, and environments are being destroyed, the illegal miners are smiling all the way to the bank. Odion Ugbesia, a former then Minister of Solid Minerals Development, said that exploitation of tantalite alone in a village in Kwara state, central Nigeria, was fetching the miners an average of six million Naira (about 60,000 dollars) a week.

Ugbesia announced that government plans to put in place programmes for accelerated and orderly exploration and exploitation of the vast solid minerals to curtail the activities of illegal miners. His permanent secretary then, Aboki Zhawa,

said last that informal mining activities would be formalised to make them economically viable and environmentally friendly.

''Although the informal miners provide massive self-employment especially in the rural areas, their activities constituted environmental degradation due to abandoned pits, polluted rivers, high exposure of radio-active and hazardous minerals. Informal mining is an impediment to the orderly development of solid minerals sector in the country,'' Zhawa said. Daily Trust News Paper (October 16, 1996) Deforestation effect on environment. Pp18-19.

He said government would formalise mining by reviewing the current legislation with emphasis on consultation and interactive discussion with mining communities on mutual preservation of interests.

''Formalising the sector would yield revenue to government and provide sustainable self-employment for at least 500,000 people. Other benefits included minimising environmental degradation and social and health problems such as child labour,'' he said.

2.3 Mining around the World

It is important to clarify that small-scale gold-mining activities are not unique to Ghana, and are, in fact, widespread throughout Africa, Latin America and Asia. Small-scale gold mining can only take place where mineralization occurs near the surface and within unconsolidated rocks, the most frequent being deposits contained in river bed alluvium and colluvium, and altered upper portions of quartz veins (Casalis, 1991). As Lacerda and Salomons (1998) explain, generally, small-scale gold-mining activities are grouped into one of two categories.

The first, recuperation, describes processes that emphasize the direct removal of large quantities of metal-rich material -- generally, soils containing quartz veins or sulphides -- from the ground. The recovered ore is then passed through grinding mills, and is centrifuged to produce gold concentrate. The second category, dredging, is the process by which gold is extracted from river sediments. Material is sieved through iron nets of different mesh sizes, and is eventually placed in barrels for mercury amalgamation in a process that can be either carried out by hand or using mechanical stirrers. The extraction processes employed throughout each phase of operation are typically crude. With the exception of perhaps diamonds and precious stones, gold is most commonly mined on a small scale because of its propensity to generate wealth quickly. In recent years, a number of regional governments, having realized fully the socioeconomic value of small scale

gold mining - namely, its potential contributions to national mineral output, foreign exchange earnings and rural employment have undertaken a series of initiatives to formalize operations and minimize illicit marketing.

2.5 Effects of Mining on the Environment

Nigeria has one of the worst environmental records in the world. In recent years, the country has seen the execution of a Nobel Peace Prize nominee, widespread social and environmental problems stemming from oil operations in the Niger River delta, and the world's highest deforestation rate.
In late 1995, Nigeria's execution of eight environmental activists, notably Nobel Peace Prize nominee Ken Saro-Wiwa, made international headlines and brought worldwide recognition of the serious environmental degradation in Nigeria.

The Niger River delta of Nigeria is home to coastal rainforest, mangrove forest, and rich oil deposits. Petroleum exploration in this region by Shell Oil began in 1958, and the company has since extracted tens of billions of dollars worth of oil and natural gas. While Nigeria has seen tremendous amounts of revenue from these operations, oil has had a high cost to the country. Locals, like the Ogoni tribesmen, have seen relatively little revenue from operations but plenty of problems including pollution and deforestation, and today many of these people

live in miserable poverty.

In 1990, Saro-Wiwa led the Ogoni to demand that Shell turned over more oil revenue to locals and clean up oil pollution. In response to these demands and an uprising among local communities, the government—then a military dictatorship—savagely put down the rebellion. Reports suggest that Shell played a role in arming the soldiers to quash the protests. In November 1995, the government executed Saro-Wiwa, while Shell responded a few weeks later by announcing it would take part in a new gas project in the delta. During the 1990s, locals learned that extortion pays. Villagers found that by sabotaging oil installations to collect oil-spill compensation from Shell they could earn more than by marginal subsistence farming on degraded lands. Attacks on oil facilities and pipelines became ever more relentless, and the Niger River delta was an increasingly bloody place. Environmental degradation from operations continued, and by 1999 the U.N. named the delta the most threatened in the world.

In early 2006, conditions worsened in the delta. The number of kidnappings of oil workers increased as did attacks on oil facilities. Kidnappers who usually wanted ransom payments began asking for the release of jailed militants and greater rights to the region's oil. A senior Shell security official told *The Economist* that Nigeria

was losing control of the region and oil traders began to price the risk of Nigerian civil war into future oil projections

While billions of dollars in oil revenue poured into Nigeria, most of the country's income was squandered, stolen, or spent propping up the ruling military government during this period. Despite a stipulation in the constitution requiring that 13 percent of oil revenues be channeled back into oil communities, locals saw very little money. Most community assistance in the delta actually come from Shell—not the government. In 1997, Shell spent some $36 million on community-assistance programs. Shell News Letter (November, 1997) Pp.31.

While oil has certainly had a social impact in the delta, the direct environmental effects from oil operations are probably, in general, overstated. Oil companies are easy targets because their operations are highly visible and villagers receive few benefits while shouldering the environmental and social costs. According to Moffat and Lindén (1995) there is relatively little evidence of widespread contamination from petroleum in Nigeria, partly because its crude is very light and evaporates rapidly. Moffat and Lindén say that pollution from oil activities should probably be given only a moderate priority in light of Nigeria's other severe environmental problems, namely deforestation resulting from road projects (often sponsored by

oil companies), subsistence activities, logging, mining, and dam construction. However, oil production in Nigeria does contribute to global warming because the country flares (flaring refers to the burning of excess gas that comes up with crude) more gas than any other country. The methane produced has a much higher global-warming potential than carbon dioxide (64 times as active a greenhouse gas as carbon dioxide).

Deforestation is a serious problem in Nigeria, which currently has one of the highest rates of forest loss (3.3 percent) in the world. Since 1990, the country has lost some 6.1 million hectares or 35.7 percent of its forest covers. Worse, Nigeria's most biodiverse ecosystems—its old-growth forests—are disappearing at an even faster rate. Between 1990 and 2005, the country lost a staggering 79 percent of these forests and since 2000. Nigeria has been losing an average of 11 percent of its primary forests per year double the rate of the 1990s. These figures give Nigeria the dubious distinction of having the highest deforestation rate of natural forest on the planet. Nigeria's new and more accountable government is concerned about rising deforestation and environmental degradation—which costs the country over $6 billion a year. Nevertheless, it has failed to curb illegal logging and other forms of

degradation, and only 6 percent of the country is nominally protected on paper. Timber concessions have been granted in national parks, and oil-palm plantations are replacing natural forest. Past governments have tried to stem forest loss through a ban on log exports, promoting of agroforestry and community-based conservation schemes, increasing energy and fuel efficiency, and encouraging plantations and reforestation programs to achieve a target of 25 percent forest cover. But the impact appears to be limited given Nigeria's astounding deforestation rate.

As its forests fall, Nigeria has seen wildlife populations plummet from poaching and habitat loss, increasing desertification and soil erosion. There has also been a drop in the productivity of coastal and inland fisheries, and mounting social unrest in parts of the country. It appears that Nigeria's swift economic development has exacted a high toll on its people and environment.
In Zambia there are a variety of mineral deposits such as gold, diamonds, zinc, gemstones and coal, the country has developed a comparative advantage in the production of copper. Mining has also been large-scale, concentrating on copper, cobalt and coal, while small-scale mining is concentrated in a variety of gemstones such as emeralds in Ndola Rural, amethyst in Southern Province and aquamarine,

tourmaline and garnets in Eastern Province and many other parts of Zambia. Emerald mining is however the most dominant form of small-scale mining. The variety of minerals available offers a great potential for providing resources for national development. However, the mining deposits are located in remote parts of the country which, are poorly linked. Consequently, there is need for development of access roads, telecommunication and other social infrastructure to mine these precious resources. There is also need to service the gemstone areas with social infrastructure such as clinics or health centres and recreation facilities.

2.6 Socio-economic Impact of Mining

Mining, especially when diversified to small-scale operations is critical to poverty reduction as well as to economic development of the country. Currently, mining contributes between 6 – 9 % of GDP and contributes about 40,000 jobs to the 470,000 in formal employment. The mining sector also provides forward and backward linkages to other sectors of the economy. The gemstone sector if fully developed, can also contribute to generation of employment both in the mines as well as the factories established to process these gems. Value addition and technology transfer and other attributes the mining sector possesses if fully developed. Mining also does link effectively to the agricultural sector. It can

provide essential agricultural in-puts such as lime which, is essential in neutralizing soil acidity. It also has the potential to support cottage industries that are related to pottery making, brick making and increase the demand for skills and essential mining equipment and machinery.

This baseline study concentrates on small-scale mining with a bias to the gemstone sector. The main objectives of the study are to understand the operations of small scale mining operations, the impact of small scale mining on environmental degradation and social-economic impacts of small scale mining to Nisama and surrounding communities.

CHAPTER THREE

3.0 MATERIALS AND METHODS

This study covers the Nisama and surrounding communities mining area of Jama'a Local Govt. This was the most organized area in terms of open cast mining at the time. The area was mined illegally by thousands of artisanal miners some from Senegal and Mali using small implements.

A major gravel road through the communities to the area from which subroads branch to the various mining sites traverses the area. There was however, need to obtain permission to enter particular mine sites from particular operators. Since not all parcels of land are actively being mined and since some parcels have undergone consolidation to make them economic to mine, the researchers intend to visit some mines sites. The distances between the mine sites will also dictate the number of mine sites that will be visited. The researcher intends to get the map of the mine sites to show the number of plots and indeed their range in hectares and sq km.

The methods adopted in gathering and analyzing data collected for the purpose of this research is discussed in this chapter

3.1 Data Sources

There are principally two data sources for this research work, which are:

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3.2.1 Secondary Sources comprising existing data directly available in libraries offices, and archives e.g. official document of the State and Federal levels, academic literature as well as research reports relevant to specific issues in the study.

3.2.2 Primary Sources comprising empirical data gathered in the field by the researcher, these include the following:-

(a) Focus Group Discussion;

(b) Key informant's interview and

(c) General Questionnaire administration

(d) Field Survey

The 4 (four) approaches were applied being that Focus group discussion was guided by open-ended questions which encouraged exploration of issues, interactions and overall perception of how the communities felt about the entire mining operations.

Focus Group Discussion:- The village heads of the communities that the researcher carried out his research (Nisama, Antan, Gidan Waya, Godogodo, Jagindi and Dogon Fili) were informed about the intention of the visit prior to the date fixed so as to mobilize the communities well ahead of time. Cluster sampling technique was used and communities' members were grouped into 4 clusters. Discussions were held in sessions of four groups of youths, women and men of between 8 to 15 individuals each. The members were heterogeneous in nature with different views that made them express themselves the way they saw the mining operations. Discussions were held with each group separately so as to allow respondents to participate freely without interference by husbands or parents.

The focus group discussion allows discussions and interaction within group unlike the key informant's interview. This discussion is supported by photographs documentation captured during the visits to each community and used as part of the result (see Appendix 2)

Key informant's interview:- This interview involved major stakeholders in the mining operation, whose source of livelihood directly depended on the mining operations. These key informants were interviewed individually with the help of

structured questions that helped guide the researcher (see Appendix 3). The essence of the key informant was to support findings from other methods. The aim here is to get information on how the mining operations directly influence their livelihood. This method has advantage of bringing out historical information that would help reveal environmental circumstances that led to certain developments. This session is supported by pictures captured during the survey in both communities.

(c) General Questionnaire Administration:- The method for the survey applied was Simple Systematic Sampling Design. A sampling frame of 50 for each of the six communities was calculated respectively. This calculation was based on a primary sampling size of three groups of 15, 20, 15 for each of the six communities chosen to enable adequate coverage of opinions of categories of people between ages 18-25, between 26-50 and 51 and above. The questionnaire was structured to gather information on occupation, mining activities, and methods of mining among others. A copy of the questionnaire can be found in appendix I. A total of 300 questionnaires were administered to six villages for the purpose of the research.

(d) Field Survey:- A detailed field survey was carried out on mining sites. This was done to give the researcher first hand information on the activities at the

site and help in making precise and correct decisions concerning activities that took place at the mining sites, and draw logical conclusions. Also photographic pictures were taken.

3.2 Computational Technique

The quantitative data generated from the survey were subjected to simple tabulation for statistical representation of the methods of mining, environmental effects, occupation, death rates and health. In each tabulation, simple percentage (%) was used to obtain result on the system of mining used, the most environmental degraded effects and the occupation engaged by the communities.

CHAPTER FOUR

4.0 RESULTS

In line with the specific objectives of this research, the researcher tabulated the quantitative data obtained in respect of the three specific objectives of the research, which are;

1. To analyze the system of mining operations of small scale mining and its risk
2. To assess the impact of small scale mining on the environment
3. To assess the social-economic impacts of small scale mining to Nisama and surrounding communities.

Table 4.1 System of mining in the six communities by % of respondents.

Name of Village	Manual Excavation %	Semi mechanized Excavation %	Mechanized Excavation %	Total %
Nisama	79	21	0	100
Antang	70	30	0	100
Gidan waya	88	12	0	100
Godogodo	77	23	0	100
Jagindi	89	11	0	100
Dogon fili	66	34	0	100

Source : Authors field survey, 2009

Table 4.1, shows data in percentages of the respondents in respect to the system of mining used in the six communities. Each of the communities have different methods of mining, some use only one method while others use a combination of more than one method. The systems of mining are shown in table 4.1

Table 4.2 Environmental hazards present in the six communities

(By % of number of respondents affected)

	Deforestaion %	Air pollution %	Land degradation %	Erosion %	Water pollution %	Total %
Nisama	40	10	31	10	5	100
Antang	41	10	30	5	4	100
Gidan waya	30	15	50	10	9	100
Godogodo	25	15	40	15	10	100
Jagindi	38	12	30	10	5	100
Dogon fili	40	10	35	10	5	100

Source: Authors field survey, 2009.

The activities of the miners have generated environmental hazards in most of the communities, the hazard experienced by each community is shown in Table 4.2

Table 4.3 Primary occupation of inhabitants of the six communities

(By % of number of respondents) before the mining activities.

Communities/ Occupation	Farming %	Mining %	Trading %	Civil servants %	Education %	Total %
Nisama	44	5	20	6	25	100
Antang	41	6	15	5	33	100
Gidan waya	40	2	15	3	40	100
Godogodo	50	10	10	10	20	100
Jagindi	44	5	5	16	30	100
Dogon fili	30	10	20	20	20	100

Source: Authors field survey, 2009

Most of the miners had occupations before mining activities started. After it started, the miners diverted to mining because it is more lucrative. The occupation of the people before mining activities started is given in Table 4.3

Table 4.4 Primary occupation of inhabitants of the six communities

(By % of number of respondents) during the mining activities.

Communities/ Occupation	Farming %	Mining %	Trading %	Civil servants %	Education %	Total %
Nisama	25	44	20	6	5	100
Antang	33	41	15	5	6	100
Gidan waya	40	40	15	3	2	100
Godogodo	20	50	10	10	10	100
Jagindi	34	40	5	5	16	100
Dogon fili	20	30	10	20	20	100

Source: Authors field survey, 2009

Occupation of the people after mining activities had started as extracted from the questionnaire is highlighted in Table 4.4

Table 4.5 Most prominent sickness as after effect of mining activities

Communities/ Sickness	Nisama %	Antang %	Gidan waya	Godogodo %	Jagindi %	Dogon fili %	Total %
Asthma	5	5	30	35	10	15	100

Source: Authors field survey, 2009

Other results obtained and relates to the six communities has to do with the health of the people and death as a result of the mining activities.

Table 4.5 Death in the six communities during the mining activities.

Communities/ Death	Nisama %	Antang %	Gidan waya %	Godogodo %	Jagindi %	Dogon fili %	Total %
No. of Death	10	5	35	25	15	10	100

Source: Authors field survey, 2009

The data shows that respondents at Gidan waya and Godogodo communites suffer more number of death with 35% and 25% response, these is attributed as shown in table 4.4 that these communities were the most involved in mining activities. The respondents from Jagindi and Nisama communities has 10% response respectively, while Antang community has the lowest death with 5%, also reflecting that they were communities with less mining activities.

Plate III: Laterite soil brought out to the surface as a result of mining operations

As a result of the mining activities, digging of pits took place and laterite soils from under the earth surface were brought up to the surface.

CHAPTER FIVE

5.0 DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion

5.1.1 System of mining operation used

The result from the respondent shows that manual excavation was the most used system of mining within the six communities; this was followed by semi mechanized system. While mechanized system was not used at all.

The researcher found out that 89% of the respondent used the manual excavation at Jagindi community and 66% of the respondent used manual excavation at Dogon fili community. These being the highest and lowest community that uses manual excavation out of the total respondents of 100% in the six communities.

The major system of mining in the selected villages in Jema'a Local Government area as seen from the result in table 4.1 is the manual excavation. Most of the mining agents do it on a very small scale and very few of them can afford the semi-mechanized tools, none can afford the mechanized excavation instruments and do not have the technological know-how to run them even where available.

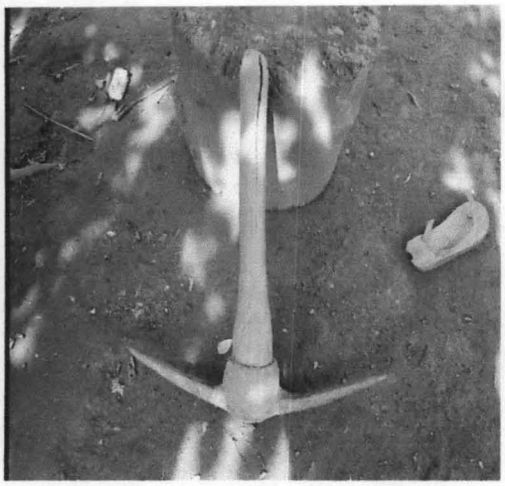

Plate II: Digger used to excavate

Plate III: Shovel used to pack the soil

The manual excavation is a localized and crude method used by local miners to dig the ground and bring out the minerals. The researcher found out that Plate I & II are the basic tools used by these local miners to carry out the mining operations. This method is basically a try- an- error method, where the miners look at a portion of the land and guest if there will be minerals there. Semi mechanized methods of mining operation involved the use of rigs for drilling and trucks for parking waste. Some of the methods under semi mechanized system that can be used are stripping and terrace methods. The mechanized methods involve the use of high technological and computerized machinery. In this method before mining is done, survey must have been carried out, location and quantity of minerals deposit are known. Therefore, the risk of the manual excavation done by the miners is on their lives and health. The researcher found out through questionnaires and key

informants interview that a lot of these local miners died as a result of pits collapsing and covering them alive. This is shown in table 4.5. Also, these miners work under heavy sun and dust, resulting that today a lot of them are suffering from Asthmatic attack (Table 4.4)

Plate III is a picture showing a pit on the mining site. These pits are 100 per hecter in each of the communities, this is supported by plate IV. Pits vary in depth, width and length depending on how deep the minerals are beneath the earth. The researcher's survey and measurement show that the pit is 12ft wide, 20ft length and 30ft depth.

Plate IV. A typical example of a mining pits.

These pits could be square, rectangle or oval in shape and the miners called them padup. Channels are also dug at the bottom of this padup at the four corners of the pits to a length of about 8 – 10ft. This, the miners called lotos.

The stones are taken out together with the sand when found, and are taken to a close by river for washing and sieving. The process of washing and sieving enable the miners to get the stones clean from any dust or dirt.

Few respondents used Semi mechanized system in the six communities. 34% of the respondent used semi mechanization at Dogon fili community, while 11% of the respondent at Jagindi community used semi mechanized system. This is a mining system were better technology is used to mine the minerals, instead of using digger and shovel. Mechanized system of mining is the use of high level technology and computerization of the entire mining process.

Plate V: Deforestation & mining pits as a result of mining activities

The data for the second specific objective which is, To assess the impact of small scale mining on the environment is tabulated below as seen in table 4.2. The researcher looked at six factors (Deforestation, Air pollution, Land degradation, Erosion and Water pollution) as they impact the six communities, as a result of small scale open cast mining.

The major system of mining in the selected villages in Jema'a Local Government area as seen from the respondents result in table 4.1 is the manual excavation or open pit mining. Most of the mining agents do it on a very small scale and very few of them can afford the semi-mechanized tools, none can afford the mechanized excavation instruments and do not have the technological know-how to run them even where available.

There is a wide variety of methods of extraction which one can choose from as the minerals have shapes and sizes. The orientation and shape of minerals, the strength of the minerals and the surrounding rock and the form in which the valuable materials are distributed are different for each mineral area. These factors among others are what will influence the selection of a mining method and the overall plan for developing the minerals.

Operating mines vary in size from small underground operations (some of these operations have only a few levels of production and may produce less than 100 tonnes of minerals per day) to the large open pits (some of which move thousands of tonnes or minerals and waste rock per day).

The primary opening into an underground mine can either be a shaft, a ramp (which can also be called a decline) is driven down into the earth, or an adit which

is a horizontal opening that is driven into the side of a mountain or hill. They all have the same purpose – to provide access for people, equipment and materials and to supply a way of making mineral to be brought to the surface.

Most of the time, shafts are vertical, but they can also be inclined, they are equipped with headframes and hoists, the headfames are the structures at the top of the hoist which enclose it.

On the other hand, ramps, most of the time spiral downward at a gradient of about 15% to permit access into the mine by mobile equipment which are rubber-tired. In few cases, the ramps are driven in straight lines to accommodate conveyor belts, or they have straight runs with switch back points. Ramps are in most cases cheaper than shafts when it comes to developing. But the total cost might be higher than the cost of developing a shaft to reach the depth desired when it is dependent on the angle of the decline, the size of the opening and the encountered ground conditions.

Level or horizontal mine workings are called drifts and crosscuts (lotos). At times it is useful to open vertical workings between levels in a mine which is underground; they are called winzes or raises (padup).

The least expensive type of mining is an open-pit mine, and is always the very first choice of every developer where a mineral is located close to the surface, is large enough and has little overburden.

Open-pit mines seem simple, but every pit has to be taylor-made. The pit walls have to remain up first and foremost, so an engineer in rock-mechanics has to determine a secure slope for the pit. There is also a delicate balance between how much waste rock can be mined in order to gain access to the mineral that is valuable and the possibility of the pit's deepness.

The location and size of the first bench of any open-pit mine is critical. It is excavated well into the waste rock that surrounds a mineral. And since each successive bench is a smaller size than the last one taken, the depth to which the pit can be mined is determined by location and size of the first bench or cut.

The stripping ratio is the name of the amount of waste rock mined relative to the quantity of minerals in most cases; this ratio is high for the first bench and decreases steadily with each successive bench. A stripping ratio of 3 to 1 signifies that during the pit's lifetime there will be three times as much waste rock mined as minerals. An open-pit mine must be designed so that the cost of mining the waste rock does not exceed the value of the mineral to make it profitable.

The principal cost advantage of open-pit mining is that the miners are able to use bigger and more powerful trucks (diggers) and shovels – the equipment is not restricted by the size of the opening it has to work in. This permits quicker production, and the lower cost permits lower grades of minerals to be mined too.

If a mineral is large, and it extends from great depth to surface, it is very common to start mining close to the surface from an open pit. This gives some early revenue while preparations are being made for mining underground of the mineral's deeper parts.

5.1.2 Impact of mining on the environment

The second specific objective the researcher looked at is assessing the impact of mining on the environment as it relate to the six communities. Table 4.2 refer, deforestation is the major factor impacting on the communities as a result of the mining activities. Large-scale mining operations, especially those using open-pit mining techniques, can result in significant deforestation through forest clearing and the construction of roads which open remote forest areas to transient settlers and small-scale miners. These settlers and miners are probably a greater threat to the tropical rainforest environment than industrial mining operations. Wildcat miners enter regions rumored to have gold deposits and clear forest in search of riches. They hunt wildlife, cut trees for building material and fuelwood, and trigger

erosion by clearing hillsides and detonating explosives. Miners can also bring diseases to local indigenous populations (where they still exist) and battles over land rights. One well-documented example is the conflict between the Yanomani Indians of Northern Brazil and Venezuela and garimpeiros—illegal Brazilian miners. Reports indicated that Yanomani populations have fallen significantly since the first incursion of miners in the 1980s. (Peterson, G. D. and Heemskerk, H. (2001) Deforestation and forest Regeneration following small-scale gold mining in the Amazon: The case of Suriname. Environmental Conservation: Pp: 117-126).

While deforestation and chemical pollution from mining can impact the rainforest environment, downstream aquatic habitats fare worse. Increased sediment loads and reduced water flows can seriously affect local fish populations.

Mining companies give us the metals and minerals that humanity uses for shelter, survival, work and pleasure, as well as the expansion into space and interplanetary endeavors. At the same time, they want to conduct this business in an environmentally responsible manner. Yet mining by its very nature requires that land, air and water systems be disturbed. While the economic benefits of the industry are as important today as they ever were, the public has become increasingly concerned about the impact that mining is having on the natural environment.

e metals and industrial minerals that mining produces can find their way into the vironment and become pollutants. The byproducts that occur with the metals, ch as sulphur and arsenic, can be dangerous to the environment if they are eased. The fuels and chemicals the industry uses to do its job are potential llutants too. Mining creates and employs hazardous substances that must be ndled with a lot of care.

her pollutants produced by the mining industry are of more concern to the orkers in the industry than to the public which is at large. Dusts, for example, hich are most of the time hazardous hygienically, are produced by a lot of mining tivities. Noise, too, is a form of pollution of concern for those in the environment work. In uranium mines, the products of radioactive decay are a principal oncern.

he challenge for industries is to find, extract and process mineral resources with e least possible environmental disruption. To be able to meet this challenge, they dopt an expanded range of protective measures, including: sensitive treatment of he land during exploration; environmental and aesthetic management of land nder development; environmentally sustainable production procedures during the mining and metallurgical processes; and decommissioning and reclamation ractices aimed at restoring the land.

countability and environmental performance are important issues for the mining mpanies, their share-holders and the public. Most companies now include a cussion of environmental topics in their yearly reports so as to keep areholders and the public informed about the measures they are taking to protect land, water and air quality at their operations.

1.3 Socio economic impact

ble 4.3, is the result from the respondents which shows that before the mmencement of illegal mining in the six communities, farming was the major cupation of the people of the six communities with Godogodo being the highest ith 50% while Dogon fili being the lowest with 30%. Education was next socio-conomic activity the communities were involved. The result of the respondents ows that Gidan waya with 40% was the highest involved in education and was so doing well in farming with 40%. While respondents at Godogodo and Dogon li were the lowest with 20% respectively. Trading was next primary occupation f the communities. Respondents shows that Nisama and Dogon fili were the ighest with 20% respectively in trading, while Jagindi was the lowest with 5%. Mining and white colar jobs were the least socio-economic activities.

Table 4.4 shows the result of respondents for the six communities in respect to the primary occupation during the mining activity period. The result shows that the

espondents in the six communities were engaged in mining activities than any ther primary occupation. The respondents in Godogodo had 50% as the highest ommunity involve in mining while Dogon fili community had the lowest responce f 30%. Farming was the next occupation the communities got involved. Respondents in Gidan waya were the highest with 40% while Godogodo and Dogon fili communities responded lowest with 20% each. Trading was next socio-conomic activities and the respond from Nisama community with 20% shows hey are the highest most trading community while Jagindi responded lowest with %. Education and white colar jobs were the least socio-economic activities, hough responds from Jagindi and Dogon fili communities had 20% each in ducation and white colar job.

The third specific objective is to assess the social-economic impacts of small scale it mining to the six communities. Table 4.3, show result of respondents that arming and education were the primary occupation of the communities before the mining activities. Godogodo, Nisama, Antang and Gidan waya are highest communities in farming while Gidan waya, Jagindi and Antang are highest communities in mining. The others occupations such as trading, education and civil service job were less engaged. Very few children of school age in the six communities go to school and this has affected them educationally today. They have few persons with skilled labour in the communities. Most of them have

ttled for jobs that are available because they do not have the qualification for tter ones. However, in recent times, haven seen the negative impact of pit ining, they are sending their children to school and as a result most of their ung ones are gaining employment in the cities now.

1.4. Winners and Losers: Mining is a large, vital and lucrative business. s rewards are spread across a wide cross-section of our population. But not all ining ventures are successful. Risks are high and they take many forms.

ne process of discovering and developing any mineral deposit involves dozens of ried people with a variety of skills, and the expenditure of many millions of llars. But the question to ask when evaluating a deposit is always the same one: oes it hold enough recoverable and marketable metal or gems to be dug out of the round, transported to the market and sold at a profit? Obviously, there are risks hich are involved in each of the steps, and one calculation wrongly made can be sastrous.

he most serious risks in any mining project are those associated with geology (the tual size and grade of the mineable portion of the mineral), metallurgy (the mount of the metal which can be recovered) and economics (metal markets, terest rates, transportation costs). But there are many others, such as problems

rising from unforeseen political developments, new restrictive regulations or the availability of workers, to mention a few.

One of the features which distinguish a mining enterprise from many other businesses is that during production, the company's asset (for example, the mineral) is progressively consumed. Someday, the assets of the mine will be gone; hence, a mine is referred to as a wasting asset. This has important implications for the justification of allocating capital to any new mining project.

The time value of money plays an important role here. To put it simply, the annual profits generated by a mine must be sufficient to pay back (within a reasonable time) the money invested in the mine. It is the job of mining engineers to estimate the "payback period" in what is called a study of feasibility.

One of the important elements in a feasibility study is the estimate of costs of mine operating. It is impossible to suggest what the costs might be for a particular mine without looking at all the details of the planned operation, and reasonable estimates can only be made when precise information is available. The final estimate will only be as dependable as the information used to arrive at the individual cost estimates from which it is derived.

ll factors that influence the capital cost of a mining project are the prices the ining company will have to pay for labor, electrical power, supplies and shipping ıt of its concentrate.

ach country has its cost-related advantages and disadvantages. For example, ining in the vast, undeveloped regions of Canada makes the construction of oads, railways and airstrips much more expensive than in developing countries. lso, miners in both Canada and the United States demand higher wages than their ounterparts which are in countries that are in development.

)n the other hand, mining companies working in many developing countries can ncounter problems such as high tax and tariff costs, and the corruption of civil ervants such as customs officials, without whose help they would have difficulty etting their project off the ground. The overall political instability of some ountries can be a great deterrent to the development of mines.

Iowever, somewhat perversely, the existence of any combination of negative actors leads to less exploration in that region or country, which, in turn, can ncrease one's chances of discovering an economic mineral. In mineral exploration, omething is always better than nothing.

2 Summary

ıe purpose of this research which is to assess the impact of mining operations at isama mining sites and other neighboring sites where small scale open pit mining tivities were carried out. The researcher looked at this under the following ecific objectives;

1. To analyze the system of mining operations of small scale mining and its risk
2. To assess the impact of small scale mining on the environment
3. To assess the social-economic impacts of small scale mining to Nisama and surrounding communities.

he problem of environmental degradation is particularly urgent given that arable nd or environmental resources are in short supply and essentially non-renewable, nd that the degradation of land has a negative impact on the well-being of the opulation through the resultant decline in food production and the deterioration of ater quality.

his research was able to help in developing a concept for land conservation and nvironmental management in the study area and some parts of the country ffected by this problem.

The researcher was able to focus specifically on identifying the possible indicators of environmental degradation; through examining the operations of small scale mining and its risk and the social-economic impacts of small scale mining to Nisama community, in Jama'a Local Government Area of Kaduna State while trying to understand the factors that influence the problem looking at the area's existing land management practices.

The major weaknesses or a constraint that the researcher experienced was that of time. This research was carried out almost 20 years after the small scale open cast mining activities in Nisama and environs took place, hence, data obtained were purely response from the people as questionnaire was administered and researcher's field survey. Another problem was that of literacy level of the population which was constraint in understanding the concept of the study. These constraints may affect the accuracy of some data and information to be gathered might be withheld.

5.3 Conclusion

The researcher is concluding that the impact of small scale open cast mining (pit mining) has done more harm than good to the people of Southern Kaduna.

The world's tropical rainforests are threatened by short-term economic exploitation of their resources and pressures from the illegal miners and rural poor. These short-term demands incur long-term costs, which are still largely unrealized and

unknown. Because it is easier and appears more economical to clear the forest in the short run, our future quality of life is compromised.

New policy measures on small scale open cast mining and conservation practices are therefore needed to reverse this adverse trend. However, reversing environmental degradation will not be possible if the extent of the problem is not known and if policy makers and practitioners are not well informed about the problem.

In addition to providing data and information on small scale open cast mining in the study area, the findings of the study will be useful for project planning (improving policy analysis and decision-making), implementation and evaluation at local and national levels towards declining agricultural productivity and food insecurity which are aftermath of environmental degradation.

The results of the study will be discussed among policy makers and practitioners for proper awareness and implementation of the recommendations therein to ensure and encourage an integrated approach to environmental resources management for sustainability.

.4 Recommendations

To support the findings of this research, it will be worthwhile for further research o be undertaken in more communities around the ones done by the researcher to substantially come up with more generalized conclusion. Therefore, the following recommendations are appropriate to achieve better resource conservation:

(1) Government should speed up on granting mining license to professional miners, so that, they could partner with foreign professionals'. This will help in bringing better mechanized system of mining, hence reducing the death of bread winners of families. This will serve as a kind of regulation in the mining sector.

(2) There is the need to partner with the communities, through NGO'S (Non Governmental Organizations) to sensitize the communities on the impact of their mining activities to the environment, their health, etc. Since farming is largely their preoccupation.

(3) As a post mining measure, government should build more schools in these communities to encourage members send their children to school.

(4) Government should hasten in providing grants to miners, as an encouragement to them.

(5) Further study should be carried out, especially in the area of disease and health issue attributed to mining.

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APPENDIX I

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

ear respondent,

am a student of the above institution and carrying out a research on impact of nall scale open cast mining in Southern Kaduna. These questionnaires are to help e collect data for the research, thereby contributing knowledge in general.

SSESSING THE IMPACT OF SMALL SCALE OPEN CAST MINING IN OUTHERN KADUNA.

eneral Questionnaire

1. How old are you? ----------
2. What is the name of your settlement? ----------
3. What is your occupation? ----------
4. How old were you during the mining operation? ----------
5. How will you say the effect of the mining activities to you is today?
   (a) Better
   (b) Worse

6. Did the community do well during the mining activities?
   (a) Yes
   (b) No
7. How will you rate the community prosperity now?
   (a) Better
   (b) Worse
8. How far do you travel to the mining site in Km? ----------

9. What method of operation was used? ----------

10. How did the method used affect the people healthwise?

    ----

11. Did people lose their lives?
    (a) Yes
    (b) No
12. How many people died? ----------

13. Were the miners' indigenes? ----------

14. Were trees cut down before digging pits?
    (a) Yes
    (b) No

15. Were they economic trees? ----------

16. Were pits dogged collapse?

(a) Yes

(b) No

17. What are the size in height and width of these holes (m)?

---

18. How is the land now compared with the land before the coming of the miners?

---

19. How will you assess the impact of the mining activities then to the communities?

---

20. How did the mining activities impact to the communities today?

(a) Positively

(b) Negatively

21. Do the communities have enough farm land now?

---

22. During the mining activities times, do your children attend school?

(a) Yes

(b) No

(c) Fairly

23. How will you say the mining activities impact the communities educationally?

(a) Positively

(b) Negatively

APPENDIX II

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

Dear respondent,

I am a student of the above institution and carrying out a research on impact of small scale open cast mining in Southern Kaduna. These questionnaires are to help me collect data for the research, thereby contributing knowledge in general.

ASSESSING THE IMPACT OF SMALL SCALE OPEN CAST MINING IN SOUTHERN KADUNA.

FOCUS GROUP DISCUSSION

YOUTHS/AGED/MEN/WOMEN. Number: 15

1. What precious stones were you mining then?

   ---

2. What were the economic benefits of these precious stones?

   ---

3. What are the environmental problems as a result of open pit mining?

   ---

4. Today, will you say the open pit mining was beneficial?

   ---

5. Have you been tackling environmental degradation in your community?
---

6. Has any agency carried out environmental sensitization in your community?
---

7. When you were ask to stop illegal mining, what was your impression?

---

8. Why do you think you were asked to stop illegal mining?

---

9. How do you want to be help?

---

10. How do open pit mining affect your livelihood?

APPENDIX III

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

Dear respondent,

I am a student of the above institution and carrying out a research on impact of small scale open cast mining in Southern Kaduna. These questionnaires are to help me collect data for the research, thereby contributing knowledge in general.

ASSESSING THE IMPACT OF SMALL SCALE OPEN CAST MINING IN SOUTHERN KADUNA.

Key informant interview

Gender: ----------

Age: ----------

Primary Occupation: ----------

1. What benefits you got from open pit mining, but is not longer available?

   ---

2. What was your source of livelihood before the illegal mining?

   ---

3. Did you grow enough food after stopping you from open pit mining?

---

4. Do you think the situation of your family is improving, remaining the same or getting worse?

---

5. Did people lose their lives during the illegal mining?

---

6. How many?

---

7. Why?

---

8. How did the open pit mining affect you healthwise?

---

9. Was there any sickness as a result of the open pit mining?

---

10. What were the precious stones you were mining?

---

11. Did your children attend school during the illegal mining?

---

12. Why?
