ASSESSMENT OF THE EFFECT OF CONSTRUCTION ON THE ENVIRONMENT IN BOSSO LOW-COST AND ESTATE,MINNA, NIGER STATE, NIGERIA

BY

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M.TECH /SSSE/2OO7/1627

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

DECEMBER 2010

DECLARATION

I, OYEKALE, Matilda Bolanle, solemnly and sincerely declare that the research degree in the Department of Geography, Federal University of Technology, Minna has entirely and wholly been my research effort and has not been submitted previously to the department for any degree. Materials used and quoted have been fully acknowledged.

M.B Oyekale 23/01/2011

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M.TECH/SSSE/2007/1627 SIGNATURE & DATE

CERTIFICATION

This thesis titled: **Assessment of the Effect of Construction on the Environment in Bosso Low-Cost and Estate,Minna, Niger State, Nigeria** by OYEKALE, Matilda Bolanle (M.Tech /SSSE/2007/1627) meets the regulations governing the award of the 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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ABSTRACT

This research focuses on the impact of post construction works on the environment with part of Bosso area of Minna Niger state for review. Due to the vast nature of land in the state the rate of deforestation, erosion is on alarming rate. The research therefore seeks to assess the physical and the socio-economic impact of construction works on the environment. The physical impacts include the deforestation, the destruction of the natural soil cover resulting in erosion and pollution: with the hope of advancing recommendations to mitigate and eliminate these impacts on the environment. The research was largely based on data gathered through field reconnaissance survey, the use of questionnaire and analysis of quickbird imagery. The research showed that deforestation actually took place resulting in erosion due to topsoil removal. The lifestyle of the residents have resulted in different forms of pollution; air, noise and water pollution. Recommendations were advanced to improve the affected environment by educating the citizenry through campaigns on the need to plant trees, construct drainages along the roads while the roads are reconstructed to avoid continued erosion. Combined efforts of the government, public and the professionals go a long way to improve on the environment. The results of this research will be useful in the future works of design, construction and implementation of good environmental practices.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

Construction is a procedure involved in the erection of various types of structures. The present state of building construction is complex, which has brought in a wide range of products and systems that are aimed primarily at different types of buildings and other forms of construction works. These products are civil engineering, architectural constructions, structural designs which all encompass developmental construction works in a society. This includes all building construction, roads, railways, canals, airports, harbours, docks, water supply, drainage, flood and erosion control, bridges, tunnels, pipelines, dams, irrigation systems, electricity generation, and industrial facilities.

Building construction however is an ancient human activity, which began with the purely functional need for a controlled environment to moderate the effects of climate on humans. Construction has always been inherently associated with the environment, often being the cause of a substantial impact, examples of which are many and varying. Constructed shelters were one means by which human beings were able to adapt themselves to a wide variety of climates and become a global species. The agricultural revolution, dated to about 10,000 BC, gave a major

npetus to construction. People no longer travelled in search of game or followed
ieir herds but stayed in one place to tend their fields.

Construction today is therefore a significant part of industrial culture, a
anifestation of its diversity and complexity and a measure of its mastery of
tural forces. This can produce a widely varied built environment to serve the
verse needs of society. (Britannica Encyclopaedia, 2010) .However, at the height
man's achievements and emotions or at the depth of his experience,
vironment is critical. The history of man's awareness of his environment is
erefore a continuous process where man seeks to control posses and improve on
iat exists (Holliday, 1977).

cording to Stoll and Evstratov (1987), construction has always been associated
n the environment, often being the cause of a substantial impact; examples of
ch are many and varying. Construction projects, whether commercial
elopments, housing estates, infrastructure or public-sector projects, all have the
ential to damage natural habitats, threatening wildlife and plant species.
nstruction businesses can have a number of impacts on the environment both
itive and negative.

Apart from positively affecting the environment in massive development and aesthetics, there are obvious negative effects such as: hazardous emissions, for example dust from earthworks or emissions from plant and equipment; land contamination, noise pollution, waste disposal, such as spoil, off cuts and other building materials, water discharges, for example dewatering excavations and pipe testing; deforestation, the valuable hardwood species of the tropical forests are being logged on an increasingly large scale, lack of planning ,which inhibits flow and circulation; Soil pollution; resource consumption; and local impacts such as erosion.

Sometimes man is not fully aware of the environmental impact his activities may cause on the environment, however, taking a cue from natural ecology, the study of interdependence between life and environment suggests principles which could be adapted in tackling our environmental problems. Creation, balance, conservation and control are all guiding principles which could be used to help (Holliday, 1977).

Statement of the Problem

Africa is widely seen as a "devastated continent," where inappropriate human use of land has caused deforestation, desertification, and soil erosion on a massive scale. These adverse impacts on the environment affected a lot of countries in the

continent of which it is worthy to note that it is true of Nigeria and her states as well.

The nature and extent of each effect of human activities on the environment is both divers and varied throughout the country that the policy documents used in times past have been deficient in tackling each problem the society had been faced with. The study of post construction effect on the site is necessary to assess the effect of the construction activities on a previously undisturbed land and how it affects the environment physically and man socially and economically. It is important to note that no construction work begins without prior deforestation which has led to a massive loss of forests in many regions.

However, the spate of deforestation in Niger state is alarming with most of the reserved forests and plantations either logged, used as fossil fuels or for agriculture while habitats are being destroyed and man seems oblivious to the impending danger this portend.

Without human activities such as construction, losses of soil through erosion would probably be balanced by the formation of new ones but with continued human activities our environment is persistently being depleted.

Nigeria a lot of settlements have been lost to erosion due to excavation for nstruction works especially the use of laterites for filling and manufacturing of icks. Most of these land have become irreparable due to the nature of their being pital intensive financially to repair. From the east to the west, north to south the vironment is being depleted. The protective canopies of vegetation have been tially or wholly destroyed through massive excavation, deforestation, erosion other human activities that have resulted into the environment not being tained.

ter supply and sanitation is set within the context of measures taken to reduce incidence and prevalence of the effect of construction activities on the ronment. The problem of citing of water sources in close proximity to the c tanks cannot be overlooked in construction works. Contamination from on-sanitation can reach groundwater supply by a range of pathways. These types ntamination of water supply occur through pathways introduced by the design construction of boreholes, dug wells or even springs of water. It is therefore mount to address issues for sanitary protection at the place of construction as (Lawrence et al., 2001).

1.3 Aim and Objectives of the Study

The study was aimed at assessing the physical and the socio- economic impact of constrguction works on the environment. To achieve this, the specific objective would be to:

determine the extent of deforestation in the study area as a result of the construction activities carried out;

assess the destruction of the natural soil cover caused by construction activities on the environment;

establish causes of pollution and infer their potential impacts on the environment;

advance recommendations to mitigate and eliminate post construction impacts on the environment.

1.4 Significance of the Study

This research work hopes to elicit within the industry stake holders; the professionals, the government and the public a control and balance in the construction industry in relation to the environment. The results of the research will significantly highlight the effects of construction on the environment, recommend necessary impact reduction strategies and prevention techniques in future construction works.

1.5 Research Scope

The focus was concerned and limited to the aftermath effect of the construction activities on the environment using the Bosso estate and the low cost housing within the Bosso area as a case study to assess the effect of deforestation which paved way for the existing structures. This was expected to allow a better understanding of the cause of erosion. Different forms of pollution arising from construction either from the actual construction works or social habits of the residents was also expected to be established through the study such as the sanitary conditions of the estate, effect of construction waste and the effect of design and construction on water supply in relation to the location of septic tanks, as forms of pollution.

Study Area

The research was carried out within Bosso and low cost estates in Bosso local government area of Minna, Niger state Nigeria.Niger state is located between latitudes 8° 20'N and 11° 30'N and longitude 3°30'E and 7°20'E. The state is bordered to the north by Zamfara State, to the northwest by Kebbi State, to the south by Kogi State, to southwest by Kwara State; while Kaduna State and the Federal Capital Territory border the state to the northeast and southeast, respectively (fig.1.1).

Currently the state covers a total land area of 76,000 sq. km, or about 9 percent of Nigeria's total land area. This makes the state the largest in the country. The state is named after River Niger. Two of Nigeria's major hydroelectric power stations are located in Niger State: the Kainji dam and the Shiroro dam. Kainji National Park is also situated in Niger State. It contains the lake formed by the Kainji dam. It is the largest National Park of Nigeria, ***but a lot of the wildlife has disappeared***.

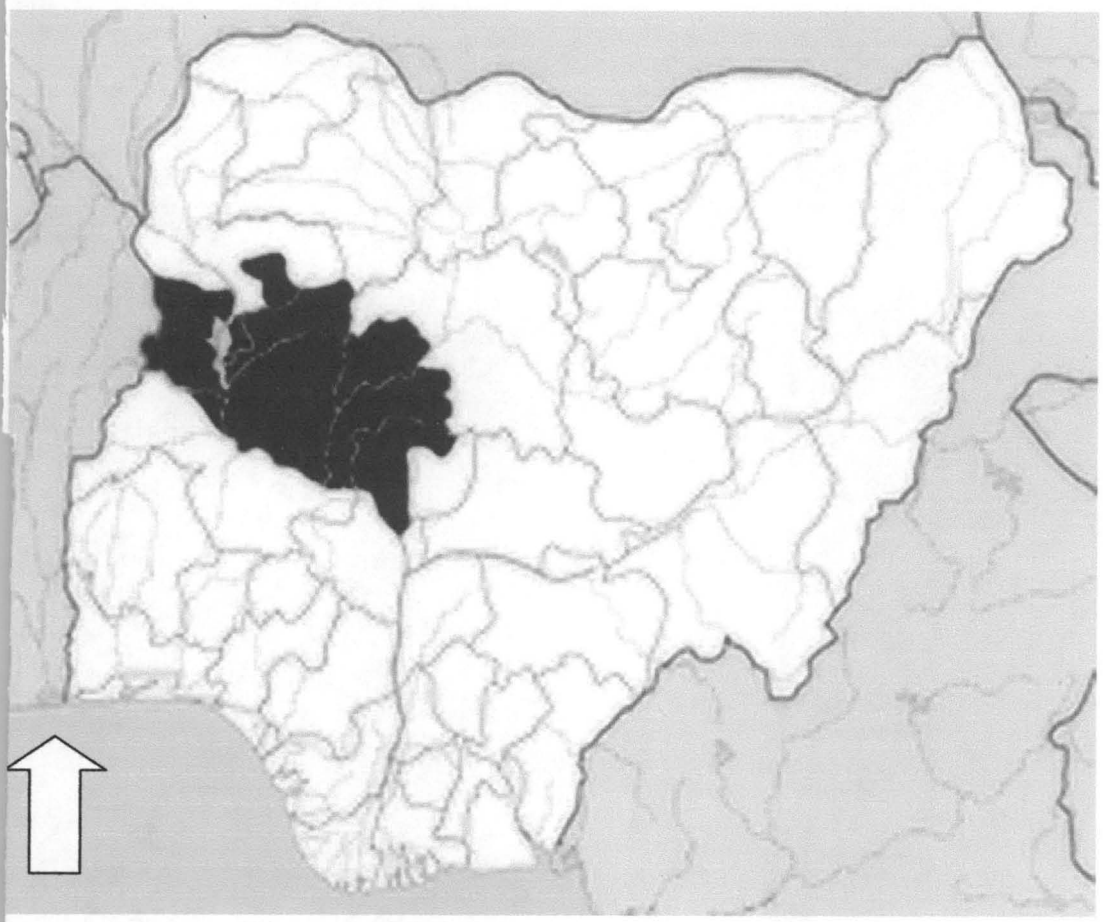


Figure 1.1 The Map of Nigeria with Niger State Inset

Scale: linear scale

Nigeria 9

For easy and effective administration, the twenty-five LGAs have been divided into emirate councils (figure 1.2). These include Minna, the state capital, Bida, Suleja, Kontagora and New Bussa.

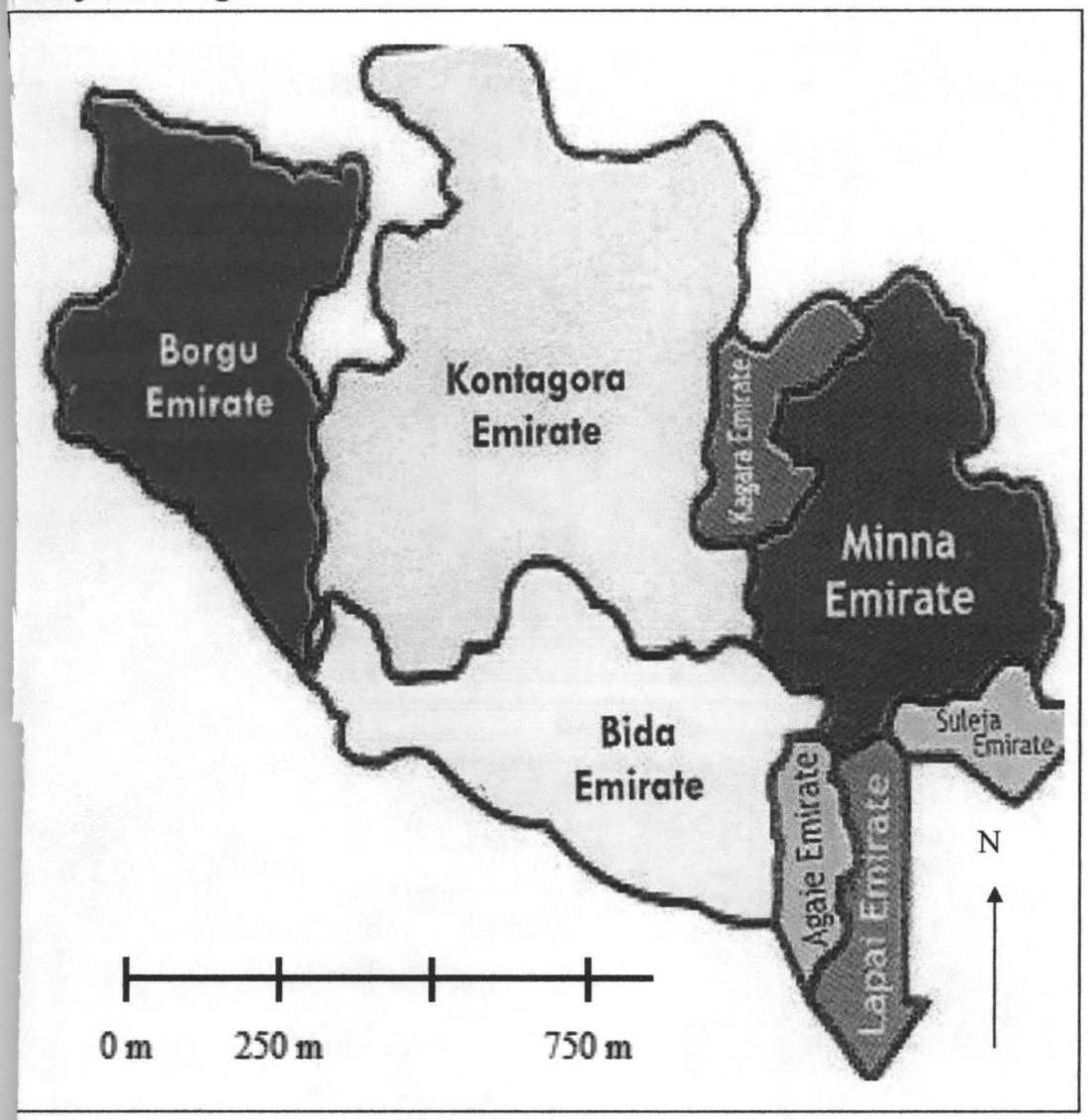


Figure 1. 2. The emirate councils of Niger state.

Minna is a city (estimated population 304,113 in 2007) in the west central Nigeria. Archaeological evidence suggests settlement in the area dates back to

bout 47,000-37,000 years ago. It is the capital of Niger State and the headquarters f Chanchaga Local Government area.

ccording to an indigenous respondent, pre-colonization era in Minna metropolis osso in particular had the people living on the mountains for security against the vading forces of the enemy. They lived in fenced cities on these mountains lics of which are still visible on the hills) before the coming of the white ssionaries. Their descent into the plains brought about the present day Minna h its subsequent development.

e present day Bosso area was said to be primarily farm lands most of which was ama (marshy and water logged).Bosso estate and the low costs housing (fig) lie within Bosso Local Government Area of the Minna zone in Niger state. LGA was carved out of Chanchaga LGA, Minna. It lies on longitude06°28 E latitude 09° 41 N and has a land mass of about 338.4 hectares with population 47,361 [2006 estimates]. Bosso LGA is divided into ten wards namely: Bosso tral1, Bosso central ii, Beji, Chanchaga, Ganatu, Kampala, Kodo, Maikunkele, itumbi, Shatta (see fig.1.4).

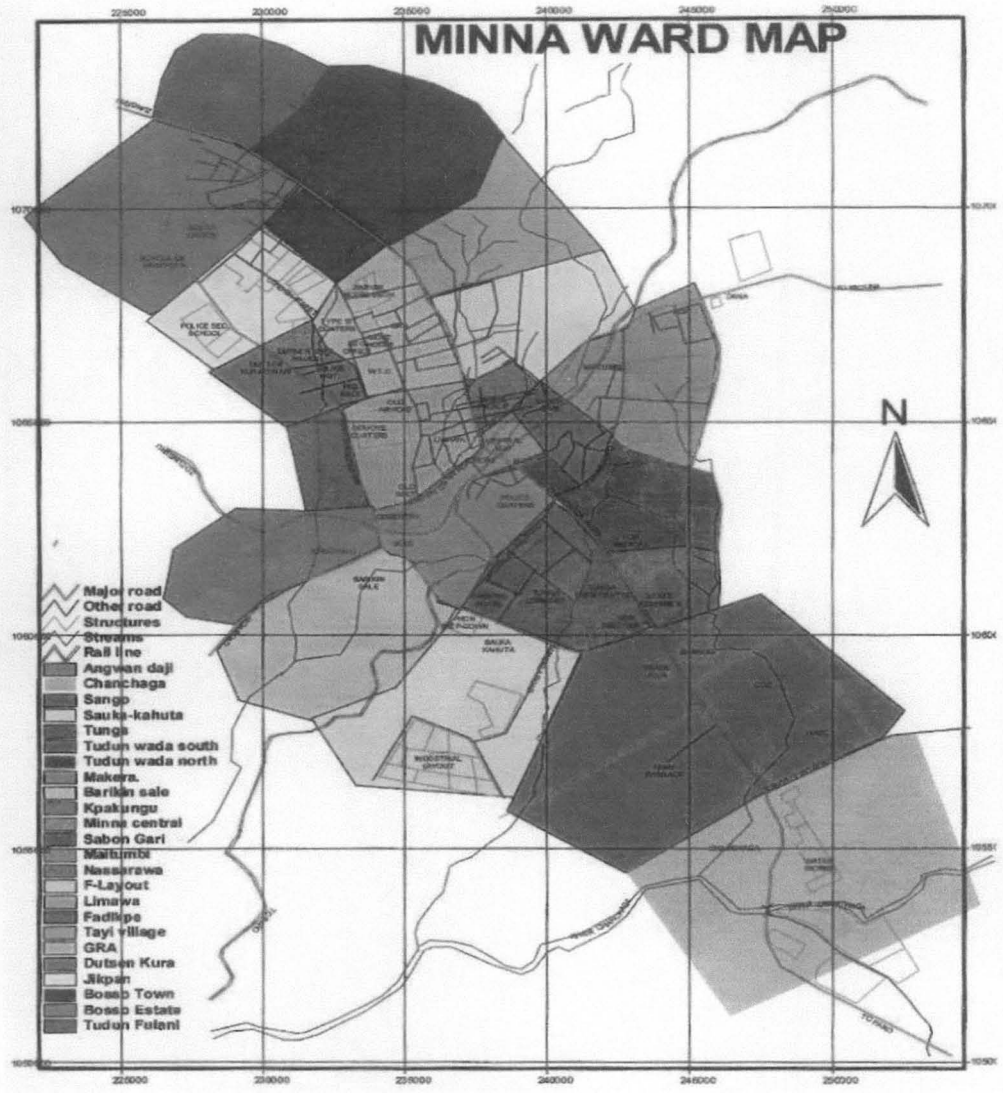


Figure 1. 3. Minna ward map showing the 25 wards

1.6.1 Climate

Bosso experiences distinct dry and wet seasons. The major wind direction is normally along the south-west and north- east axis. The rainfall is that of the

middle- belt of the country and lasts between 190-200 days [6-7 months] measuring about 1,350mm annually [54'] with September recording the highest rains of 300mm [11.7']. Mean monthly temperature is highest in March and June at 35°c and lowest in august at 25°C.

1.6.2 Socio-Economic Activities

Economically, agricultural activities form the mainstay of the people's livelihood which is engaged in directly or indirectly by more than 80 percent of the population. Cotton, guinea corn, and ginger are the main agricultural products of the city. The economy also supports cattle trading, brewing, Shea nut processing and gold mining. Traditional industries and crafts in Minna include leather work, metal working, and cloth weaving.

1.6.3 Vegetation

The vegetation of the area is closely linked with the climatic condition with the characteristic vegetation as a mixture of tall grasses and closely spaced trees.vegetation is especially done along courses,with trees lining the banks in gallery forests.shrubs and grasses are also dense in areas where intensive cultivation and past use of fire to clearvegetation have led to the degradation of once forested lands.shea trees occur widely,their ttough outer back is fire resistant

nd their kernels are a source of oil for cooking and other uses,which is why shea utter is part of their economic mainstay.

5.4 Geology

he study area is part of basement complex of north-western Nigeria. (Truswell nd Cape, 1963; Ajibade, 1987). The Nigerian basement complex is subdivided nto three lithological suites namely the migmatite/gneiss complex, low grade chist belt and the older pan African granite. Granite/granodiorite underlain the udy area and outcropped in some places. Different types of soil such as clayey, sandy and gravelly soil overlain the area.

MAP

OSSO

AL GOVT. AREA

GER STATE

SCALE 1:1 150,000

1 Centimeter to 1.5 Kilometres

5 10 15 Kms

FERENCE

MAIKUNKELE

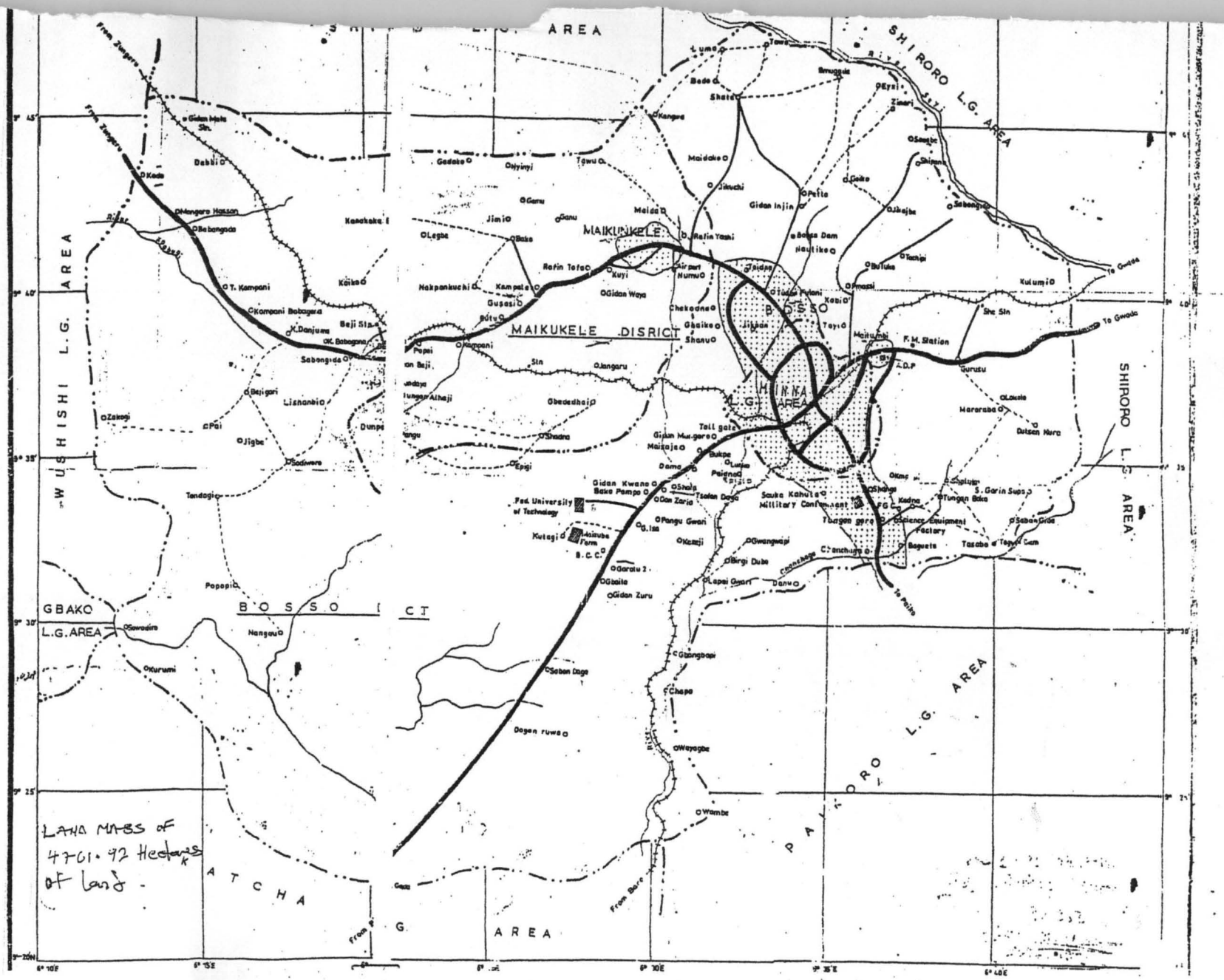
BOSSO

USERS NOTE

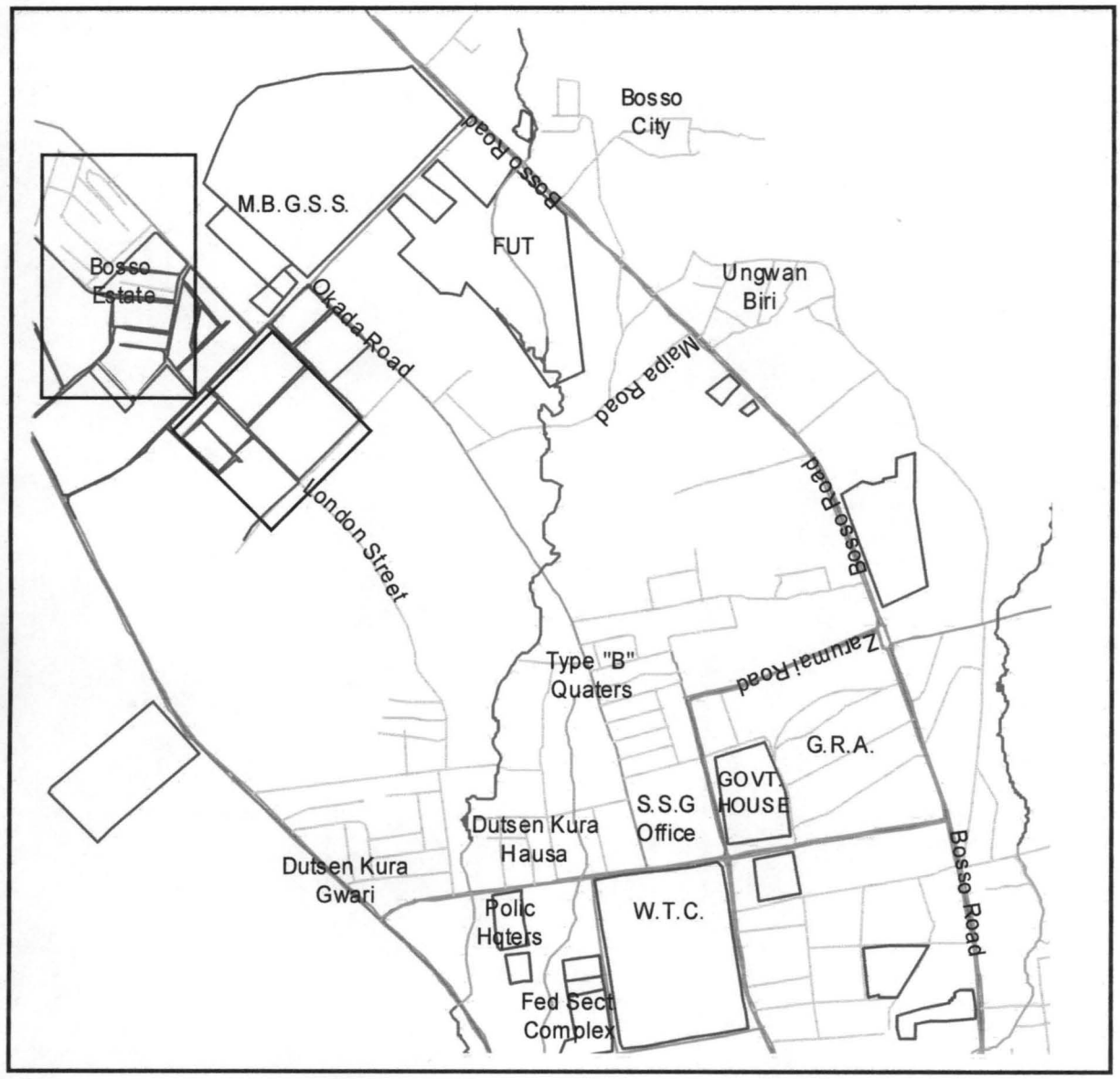
the reduction of Topographic Maps of Niger... Sheets 163, 164 and 1

ns are based on data provided by: WORKS DEPARTMENT, BOSSO LOC...

not serve the purpose of settlement of boundary disputes.



LAND MASS OF
4761.92 Hectares
OF LAND.



SCALE

0 m 250 m 750 m

LEGEND

Bosso estate MBGSS (Maryam Babaginda Girls' Secondary School)

Bosso Low-cost

Fig.1.5 Map of parts of Minna showing the location of the study area (Bosso estate and low-cost) digitized from quick bird satellite imageries

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Chapter Preview

The growth of construction activities, farming and animal herding initiated one of the most remarkable changes ever in the relationship between humans and the natural environment. These activities also brought in their wake contact among people and between people and their refuse and waste matter, both of which acted to increase the incidence and transmission of disease and environmental degradation.

However, in the later 20th century, people became more aware of how construction systems affect the environment. This awareness has brought about increased desire to see to the improvement of the environment bringing about series of conferences on sustaining our environment. Declaring that "together we have damaged the environment and together we can improve it", President Richard M. Nixon on May 29 1969 established the Environmental Quality Council, a cabinet-level advisory group, to propose improved methods of pollution control, to anticipate pollution problems, and to coordinate antipollution activities at all levels of government. The council parallels the National Security Council and the Urban Affairs Council in structure and scope. (1969: conservation and natural resources).

2.2 Man and his Environment

Environment is perceived as the general surroundings where a number of interrelated activities are taking place within the environmental system and between man and the environment too. From the perspective of physical and cultural landscapes, the physical or natural environment indicates that the environment is in its natural state. The features of the physical environment include land, rivers and water bodies, trees, hills/mountains, mineral resources such as iron-ore, gold, manganese, diamond, silver, columbite and petroleum among others. (Idowu, 2000)

The cultural landscape on the other hand denotes that an interaction has taken place between man and his environment. Such activities that are human based include agriculture, mining operations, sinking of bore holes, wells, tree felling, and constructions of bridges, houses, road networks and railways among others. Robinson,1976). Thus, every organism sees the environment as a resource store where he can conveniently fall back to, for all his needs (Faniran and Ojo, 1980).

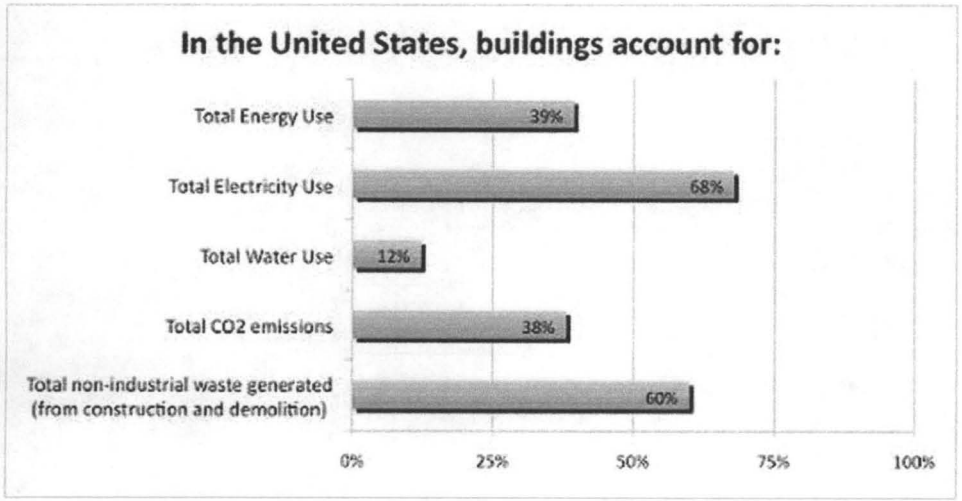
However man's relationship with its environment has always changed with time, depending on his understanding and knowledge of the physical environment. The natural environment is generally endowed with variable quantity and quality of

sources within the space (Simmons, 1981). Thus, man has come to regard his ıvironment as a depot housing his needs and therefore always devising ways of ɔstracting these resources within it. Efforts made by man to harness these ıvironmental-based resources have translated into a number of environmental ɔuses. These abuses arose out of man's ignorance in relating with the ıvironment and disregarding its welfare (Jimoh, 2000).

ılso, in the words of Holliday [1977], the feeling for environment is of great nportance to man while the need for orientation in society is equally important t only at individual levels but for corporate activity as well. It is this feeling that kes it imperative for change to take place where growth, economic activities and hnological innovation are occurring especially in environmental development. hese circumstances, he said the environment will succumb since people tend to ffer while such changes are carefully controlled. In view of the developmental ture of construction and its impact on both the society and man if not properly rnessed, it is necessary to study these effects, understand the nature of each of em, proffer solutions and recommend measures at tackling them.

In the United States of America buildings use resources such as energy, water and aw materials, generate waste (occupant, construction and demolition) and emit

potentially harmful atmospheric emissions [fig.2.1.]. Building owners, designers and builders face a unique challenge to meet demands for new and renovated facilities that are accessible, secure, healthy, and productive while minimizing their impact on the environment. This is sustainable design.



(Source: Environmental Protection Agency USA, 2004)

Fig. 2.1 Bar –chart illustrating percentage of energy, electricity and water used by buildings in the USA. The total CO_2 emission and non industrial waste (from construction and demolition) generated are presented in percentage.

The main objectives of sustainable design are to avoid resource depletion of energy, water, and raw materials; prevent environmental degradation caused by structures and infrastructure throughout their life cycle; and create built environments that are liveable, comfortable, safe, and productive. In recreating Bosso estate and the low cost there is need to introduce the objectives of

tainable design to achieve an holistic environment for the well being of the ident and the society at large.

3 Nature and Essence of Environmental Problems due to Construction

lot of impacts are created on the environment during and after construction tivities. In construction, both the extraction and the utilization of materials are urces of environmental problems. However, it is not just embarking on any oject but we must ensure that it is what the people need that will satisfy the need ne moment and will not threaten the security of the community (environment) he nearest future. (The Nation: news as posted by Adeola Ogunlade on tember 13, 2009). This is buttressed by Dianna Biggs that throughout the last tury, many construction activities were carried out worldwide and only today the implications really being understood. The infrastructures and ecosystems of regions in which these constructions were cited were severely damaged stroyed, wreaking havoc on the people, animals, and vegetation who called ese places home.

3.1 The Construction of Dams,

The construction of large dams completely change the relationship of water and land, destroying the existing ecosystem balance which, in many cases, has taken thousands of years to create. These not only destroys the forest but often uproots tens of thousands of people, destroying both their land and their culture (Biggs, 2001). Dams can also wreak havoc on human populations. Reservoirs created by dams can inundate entire riverside communities that may be centuries old and filled with rich archaeological treasures. Community inhabitants are forced to seek out new places to live and work.

People who depend on rivers for their livelihood may need to change their way of life when dams destroy natural river flows. For example, the culture of the Nishram and Wasco peoples once centred on Celilo Falls on the Columbia River. Standing on wooden platforms, members of these tribes dipped long-handled nets into the falls to catch Chinook salmon en route to upstream spawning grounds. Celilo Falls represented a unique confluence of conditions that made it one of the most productive fishing spots in North America. The banks of the falls also served as a market place, where traders gathered to exchange goods. Construction of The Dalles Dam in 1957 completely submerged Celilo Falls, forever eliminating them and the culture built around them. (Jackson, 2008)

e rates of waterborne diseases increase rapidly. Downstream ecosystems are naged by dams which trap silt, holding back valuable nutrients. Reduced silt ds to coastal erosion. The sheer weight of water in dams has in Chile, nbabwe, and Greece led to earthquakes. The irrigation and industrial projects wered by dams lead to further environmental damage. Irrigation leads to ination of soils and industry leads to pollution. (World Rainforest Movement, 90)

urrently there are around 40,000 large dams which obstruct the world's rivers, mpleting changing their circulation systems: this is not going to occur without environmental impacts. Some of the impacts of dam in the environment ude:

Erosion: One of the first problems with dams is the erosion of land. Dams d back the sediment load normally found in a river flow, depriving the wnstream of this. In order to make up for the sediments, the downstream water odes its channels and banks. This lowering of the riverbed threatens vegetation d river wildlife. [A major example of soil erosion problems is the Aswan Dam in gypt.

ne of the reasons dams are built is to prevent flooding. However, most osystems which experience flooding are adapted to this and many animal species epend on the floods for various lifecycle stages, such as reproduction and atching. Annual floods also deposit nutrients and replenish wetlands.

pecies Extinction: As fisheries become an increasingly important source of food pply, more attention is being paid to the harmful effects of dams on many fish nd marine mammal populations. The vast majority of large dams do not include roper bypass systems for these animals, interfering with their lifecycles and ometimes even forcing species to extinction.

pread of Disease: Dam reservoirs in tropical areas, due to their slow-movement, e literally breeding grounds for mosquitoes, snails, and flies, the vectors that rry malaria, schistosomiasis, and river blindness.

hanges to Earth's Rotation: Nasa geophysicist Dr. Benjamin Fong Chao found vidence that large dams cause changes to the earth's rotation, because of the shift f water weight from oceans to reservoirs. Because of the number of dams which have been built, the Earth's daily rotation has apparently sped up by eight-millionths of a second since the 1950s. Chao said it is the first time human activity has been shown to have a measurable effect on the Earth's motion.

so, research has shown that the construction of dams in Kainji, Jebba and iroro have had negative effects on the environment and the people living around reservoirs. One of the most important changes brought about by dams in these as is large scale flooding. Of note, the reservoir behind Kainji dam has wiped much needed vegetation, woodlands and grazing lands (Jubril 2006).

.2 Housing Construction

ousing is a type of construction of permanent shelter for human habitation. cause shelter is necessary to everyone, the problem of providing adequate using has long been a concern, not only of individuals but of governments as l. Thus, the history of housing is inseparable from the social, economic, tical and environmental development of humankind. The types of human sing are as varied as human culture. (Listokin and Burchell, 2008)

housing estate is a group of buildings built together as a single development. e exact form may vary from country to country. Accordingly, a housing estate is ually built by a single contractor, with only a few styles of house or building sign, so they tend to be uniform in appearance. Generally housing estates are ono tenure. In Asian cities such as Singapore, Hong Kong and Seoul, an estate ay range from detached houses to high density tower blocks with or without

nmercial facilities; in Europe and America, these may take the form of town
using, or the older-style rows of terraced houses associated with the industrial
olution, detached or semi-detached houses with small plots of land around them
ming gardens, and are frequently without commercial facilities.

using estates are the usual form of residential design used in new towns, where
ates are designed as an autonomous suburb, centered around a small commercial
ntre. Such estates are usually designed to minimize through-traffic flows, and to
ovide recreational space in the form of parks and greens, (Chan and Karen, 1996;
ng and Chester, 2006).

the late 19th century the construction of houses had become a major
hitectural subject, studied by ranking architects. Books with drawings of both
ple and elaborate houses were perennially popular, and domestic architecture
s discussed in the new architectural journals as well. Houses became, for many,
mbols of status. Cottages and bungalows, small one-story dwellings each on its
nd, proliferated.(MacDonald, 2008)

.3.3 Public Constructions

These forms of construction works include institutional and industrial buildings. There are some significant structures in Bosso LGA such as petrol stations, chools, clinics and factories. As important as they are to the society, they could be ources of hazardous waste generation to the environment.

Paul Engelking , defined hazardous wastes as solid, liquid, or gas wastes that can cause death, illness, or injury to people or destruction of the environment if improperly treated, stored, transported, or discarded. Substances are considered hazardous wastes if they are *ignitable* (capable of burning or causing a fire), *corrosive* (able to corrode steel or harm organisms because of extreme acidic or basic properties), *reactive* (able to explode or produce toxic cyanide or sulfide gas), or *toxic* (containing substances that are poisonous). Mixtures, residues, or materials containing hazardous wastes are also considered hazardous wastes.

Hospitals are expected to use special care in disposing of wastes contaminated with blood and tissue, separating these hazardous wastes from ordinary waste. Hospitals and doctors' offices must be especially careful with needles, scalpels, and glassware, called "sharps." Pharmacies discard outdated and unused drugs; testing laboratories dispose of chemical wastes. Medicine also makes use of significant

nounts of radioactive isotopes for diagnosis and treatment, and these substances ust be tracked and disposed of carefully. This type of waste may pollute soil, air, rface water, or underground water. Pollution of soil may affect people who live it, plants that put roots into it, and animals that move over it.

.4 Deforestation

his affects the livelihoods of between 200 and 500 million people who depend on rests for their food, shelter, and fuel. Deforestation and degradation may ontribute to regional and global climate imbalances. Forests play a major role in arbon storage; with their removal, excessive carbon dioxide in the atmosphere ay lead to global warming, with many problematic side-effects. Deforestation, other words, is an expression of social injustice. (Colchester ,1993).

ccording to Professor Norman Myers, the annual destruction rate seems set to ccelerate yet further, and could well double in another decade" (Myers, 1992). As Myers points out, "we still have half of all tropical forests that ever existed". The truggle to save the world's rainforests continues, and there is a growing worldwide oncern about the issue. In order to save rainforests, we need to know why they are being destroyed.

Vhile deforestation is now viewed as a problem, historically it was considered to sist national development. Natural forest "capital" was liquidated and replaced y other forms of capital to produce food, raw materials, energy, or infrastructure. Bass, 2005)

he construction of roads and highways is a bit problem in wooded areas. In the mazon (Plate 2.1), a 960km highway called the BR-163 from Curiaba in the iddle of South America to Santarem in the top right corner of Brazil was roposed. The BR-163 will allow giant grain producers in the Matto Grosso region export their crops to Europe via Santarem far more quickly and cheaply. It is timated that 49000km2 of forest will be destroyed during construction awrence and Roger, 2001).

griculture in temperate regions has depended upon forest removal, capitalizing on forest soil fertility. Most of England's woodlands were deforested by 1350. In ntinental Europe and North America, deforestation accelerated in the 18th and 9th centuries to clear land to grow food for industrial cities, and to meet fuel and onstruction needs. (Bass, 2005)

Plate I Illustrates parts of Amazonian Rainforest that has been destroyed after the construction of BR-163 highway. (Source: Coleman, 2010).

Harrison Ngau, an indigenous tribesman from Sarawak, Malaysia and winner of the Goldman Environment Award in 1990, has this to say about why tropical forests are being destroyed:

> *The roots of the problem of deforestation and waste of resources are located in the industrialized countries, where most of our resources, such as tropical timber end up. The rich nations with one quarter of the world's population consume four fifth of the world's resources. It is the throw away culture of the industrialized countries, now advertised in and forced on to the Third World countries that is*

leading to the throwing away of the world. Such so-called progress leads to destruction and despair! [World Rainforest Movement.

4.1. Consequences of Deforestation

he actual and potential consequences of forest destruction are numerous. Possibly e most important is loss of biodiversity—tropical forests contain at least 50 per ent, and possibly as much as 90 per cent, of the world's plant, as well as animal, pecies. Many of these are likely to be of use to human beings as sources of raw naterials, of medicines, and of food, either directly or by providing genetic esources to develop new food crops or improve existing ones. However, of the inority of plant species that have been identified, even fewer have been studied losely as yet (Lawrence et al, 2001).

he trees are large Carbon dioxide stores, and when the trees are burnt they release nis gas. This leads to an increase in the Carbon dioxide levels in the air. Carbon lioxide is the major contributor in the effect. Usually, nutrients held in the plant biomass flow to the soil in leaf litter, where decomposition produces humus, which improves soil texture and moisture retention. But without its tree cover, the soil is exposed to the full impact of the heavy rain. Without roots and humus there is nothing to bind the soil, and it is easily washed away. The remaining soil becomes

baked hard and weeds and grasses colonize. This soil may support ranching for a while but soon it becomes exhausted because the nutrient levels are lower than the original forest. Valuable nutrients are also exported from the ecosystem when the cattle are slaughtered. (Haines-Young and Hiscox, 2005).

Plate II Illustrates area that have experienced deforestation which led to the development of gully erosion. (Source: Cornelius, 2010).

In areas where deforestation occurs the community as a whole suffers. If there are no trees, the land becomes far more unstable than before. The roots from the trees no longer exist and therefore it leaves the forest floor open to erosion and

udslides etc (Plate 2.2). The land also becomes sandy and dry as the sun can now netrate deep into the forest, where before, the tree-cover blocked out the maging rays. When this occurs plants living near the cut down tree die and ther in the sun. It is believed that with every tree felled another forty are stroyed in the process.

he replacement of forest with grassland can also have a major effect on the way life of indigenous peoples. Without the forest wood, artefact, tools, and uildings that are an important part of their economy cannot be manufactured. imilarly, once the forest habitats are gone, they cannot continue their traditional source of fruit and nuts.

oil erosion can cause gullying of slopes and, without the stabilizing effect of the ees, landslides can occur. Soil loss leads to increasing sediment load in rivers, hich can damage their ecosystems, causing loss of species, particularly fish. Reduced channel capacity can lead to flooding in lowland areas, often far from the deforested site. This, in turn, disrupts surrounding ecosystems and can have severe impacts by flooding lowland valleys where extensive settlement has occurred due to the rising population. Those most at risk are usually poor peasant farmers. (Haines-Young and Hiscox, 2005)

n indigene of Bosso recounted the loss of wild animals brought about by velopment in the area. The local animals are affected just as much as the people. heir natural habitats are destroyed and species, possibly unknown to man become tinct, because they have nowhere to live. When the bull dozers knocked the trees wn, bucks, monkeys, antelopes and birds were all caught in the destruction. The imals either ended up in the cities or were killed, or they starved to death in their ew surroundings.

.5 Erosion

onstruction activities covers events such as houses, road networks, rail .lines, ridges, canals, aqueducts among others which are capable of completely enying surfaces of adequate plant covers. The effects of this type of scenario re many and hazardous. For example, Cooke and Doornkamp (1974), Oyegun 980, 1983), Jimoh, (1997, 1998) observed that land surfaces without protective overs (plants) are liable to the incidence of severe soil erosion problems. Thus, he constructional activities have not only created the problems of soil erosion but lso, it greatly disturbs the ecosystems.

Without human activities, losses of soil through erosion would in most areas probably be balanced by the formation of new soil. On new and undisturbed land, vegetation protects the soil, when rain falls on a surface of grass or on the leaves of

es; some of the moisture evaporates before it can reach the ground. It can erefore be said that trees and grasses serve as windbreaks, and a network of roots lp to hold the soil in place against the action of both rain and wind, but riculture and lumbering, as well as housing, industrial development, and ghway construction have partially or wholly destroyed the protective canopy of getation and greatly sped up erosion of certain kinds of soils.

ewman and James (2008) said that in reality, the nature and extent of soil erosion id deforestation varies greatly throughout Africa and much of it is unrelated to man activity. This variation is noticed in the different forms of erosion such as vind erosion and gully erosion.

ully formation is a severe form of soil erosion (plate2.3) which is a natural eologic process that can be greatly accelerated by human activities such as rbanization, deforestation, overgrazing of cattle, and poor agricultural

Erosion attacks the moisture-bearing ability of soils and adds deposits to waterways.

Plate III Gully formation due to deforestation. Source: (Atkinson, 2010).

These destructive processes continue at an increased rate on every continent, as overpopulation and industrialization tax the remaining soil. (Microsoft Encarta).

2.6 Pollution

Pollution is the contamination of the environment by man-made substances or energy that has adverse effects on living or non-living matter. This contamination of air, water, or soil materials interferes with human health, the quality of life, or the natural functioning of ecosystems.

In simple terms, pollution can be seen as the wrong substance in the wrong place in the wrong quantities at the wrong time. This implies that harm is caused to the

nvironment, and if the same substance is present at levels too low to cause harm, nen it can be considered as contamination. It was the industrial revolution that ave birth to environmental pollution as we know it today.

he provision of water and sanitation facilities are important measures in onstruction works and in the reduction of health disease burdens on the society. he provision of these facilities is also critical to socio-economic development. Lawrence et al, 2001)

According to the British Geological Survey, there are many sources of water supply, in our society, such as pipe borne water, spring, dug wells, stream, and bore holes. Of note to sanitary contamination are the dug wells and the bore holes which are constructed within the habitable premises of humans. These sources of water supply have the tendency of being contaminated with regards to the locations of sanitary provisions on site. Such sanitary provisions could be the septic tanks, the pit latrines, conventional sewerage, soak trenches and composting latrines.

Its natural state, ground water is usually of good quality and as a result the preferred source of drinking water because treatment is limited to disinfection (Lawrence et al., 2001). However, the construction of ground water supplies

pipes] may provide a direct route for contamination of the water and therefore eed to be properly designed and constructed.

Zimmerman (2009) said scientists are worried about groundwater contamination, which arises from leaking underground storage tanks, poorly designed industrial vaste ponds, and seepage from the deep-well injection of hazardous wastes into underground geologic formations. By some estimates, on average, 25 percent of usable groundwater is contaminated, and in some areas as much as 75 percent is contaminated.

2.6.1 Solid Waste Disposal

Solid waste can be described as rubbish or materials that are not needed and are economically unusable without further processing. It may be in liquid, gas, or solid form and originate from a wide range of human operations, such as industry, commerce, transport, agriculture, medicine, and domestic activities. Waste may be classified in many different ways, such as according to its origin (for example, domestic, industrial, and commercial, clinical, construction, nuclear, agricultural) or its properties (for example, inert, toxic, and inflammable). Without suitable treatment such waste becomes a source of contamination of the environment at

large, leading to air pollution (such as acid rain or traffic pollution), water pollution, and oil pollution.

2.6.2 Construction Wastes

Wastes associated with building/housing construction include unused and excess material generated during site excavation, site clearance, construction, and renovation activities.

Plate IV **Rubbles and Debris from Construction Site.**

(Source: docklandsrecycling.co.uk,2010)

se wastes may be rubble (concrete, bricks, and asphalt) (Plate 2.4), wood and
d products, plaster, metals, plastics, and insulation. These materials
nmonly referred to as C&D debris) comprise approximately 15 to 30 percent of
vaste disposed of in landfills. (Natural Building Technologies, 2007)

re is the potential to recycle many elements of construction waste. Often roll-
containers are used to transport the waste. Rubble can be crushed and reused in
struction projects. Waste wood can also be recovered and recycled.There are
easing regulations about waste disposal from construction and many products,
n common products like gypsum plasterboard and mineral wool insulation are
v labelled as hazardous and require special disposal. In addition there are many
ojects to find new uses for waste construction materials. However here, as with
ste disposal, the less processed a material is, and the less hazardous, the easier
use, recycling or healthy disposal (for example through composting) will be.

ıe emergence of great factories and consumption of immense quantities of coal
ıd other fossil fuels gave rise to unprecedented air pollution and the large volume
f industrial chemical discharges added to the growing load of untreated human
vaste. Usually pollution occurs in the processing of materials for construction,

ough not surprisingly; the construction industry has the biggest effect of all ctors because of the quantity of materials used in construction.

6.3 Effects of Pollution on Man and his Environment

dverse air quality can kill many organisms including humans. Ozone pollution n cause respiratory disease, cardiovascular disease, throat inflammation, chest ain, and congestion. Water pollution causes approximately 14,000 deaths per day, nostly due to contamination of drinking water by untreated sewage in developing ountries.

An estimated 700 million Indians have no access to a proper toilet, and 1,000 Indian children die of diarrhoea sickness every day. Nearly 500 million Chinese lack access to safe drinking water. 656,000 people die prematurely each year in China because of air pollution. In India, air pollution is believed to cause 527,700 fatalities a year. Studies have estimated that the number of people killed annually in the US could be over 50,000. Noise is among the most pervasive pollutants today. The problem with noise is not only that it is unwanted, but also that it negatively affects human health and well-being. Problems related to noise include hearing loss, stress, high blood pressure, sleep loss, distraction and lost productivity, and a general reduction in the quality of life.

ke containing carbon dioxide, carbon monoxide and polycyclic hydrocarbons sols are released from diesel power generating set. Diesel power generating are utilized to provide electricity in homes due to inability of the hydroelectric er plants with installed capacity of 6,000 mega watts to meet growing demand ch is expected to hit 10,000 mega watts in 2007 (NNPC/TOTAL, 2004).

bon monoxide occurs wherever there is incomplete combustion. Inhalation lts in a rapid rise in carbon monoxide concentration in the blood within the t hour and a much slower rise thereafter. The gas is more readily absorbed by blood's red cells to the exclusion of oxygen to vital organs, particularly the rt (Ridley and Channing, 1999). At low concentrations the gas irritates the eyes. igher concentrations irritate the lungs and it can cause pulmonary edema, adache, dizziness, convulsions and unconsciousness.

l spills can cause skin irritations and rashes. Noise pollution induces hearing ss, high blood pressure, stress, and sleep disturbance. Mercury has been linked to evelopmental deficits in children and neurologic symptoms. Older people are najorly exposed to diseases induced by air pollution. Those with heart or lung lisorders are under additional risk. Children and infants are also at serious risk. Lead and other heavy metals have been shown to cause neurological problems.

Chemical and radioactive substances can cause cancer and as well as birth defects (McNeill, 2009).

.6.4 Regulation and Monitoring

To protect the environment from the adverse effects of pollution, many nations worldwide have enacted legislation to regulate various types of pollution as well as to mitigate the adverse effects of pollution.

Pollution control is a term used in environmental management. It means the control of emissions and effluents into air, water or soil. Without pollution control, the waste products from consumption, heating, agriculture, mining, manufacturing, transportation and other human activities, whether they accumulate or disperse, will degrade the environment. In the hierarchy of controls, pollution prevention and waste minimization are more desirable than pollution control.

2.6.5 Asbestos.

In July, 1989 the Environmental Protection Agency (EPA) in America ordered a ban, to take effect over seven years beginning in 1990, on nearly all remaining uses of asbestos. The ban will affect a wide variety of products, ranging from car brake linings to roofing shingles. When released into the air, the tiny fibres of the cancer-

sing substance, once widely used for insulation around pipes, can enter the gs, and they have been found to cause lung cancer and asbestosis, a chronic piratory condition that makes breathing difficult. The only exceptions to the A ban are products for which no substitutes are available or there is little lihood asbestos fibers will reach the lungs. The new EPA rule does not affect estos materials already in place in buildings — in some cases removing the estos may pose a greater risk than leaving it alone. By October, the EPA ught lawsuits against contractors who had removed asbestos from over 100 w York City schools without properly notifying the agency, so that requisite pections could not be made on those buildings.

.7 Habitat Destruction

abitat destruction is the process in which natural habitat is rendered functionally nable to support the species present. In this process, the organisms which eviously used the site are displaced or destroyed, reducing biodiversity. Habitat estruction which occurs by human activity is mainly for the purpose of harvesting atural resources for industry production and urbanization. Clearing habitats for griculture is the principal cause of habitat destruction. Other important causes of nabitat destruction include mining, logging, trawling and urban sprawl. Habitat destruction is currently ranked as the most important cause of species extinction

worldwide. It is a process of environmental change important in evolution and conservation biology.

Extinction is not exclusively a natural phenomenon. For thousands of years, as the human species has grown in number and technological sophistication, we have demonstrated our power to cause extinction and to upset the world's ecological balance. In North America alone, for example, about 40 species of birds and more than 35 species of mammals have become extinct in the last few hundred years—mostly as a result of human activity (King, Scott and Eugenie, 2009).

It is hard to keep track of the number of species made extinct every year, and of the further erosion of biodiversity and rare habitats. However the fact that the construction industry is such a huge consumer of materials, particularly of imported chemicals, minerals, metals and organic materials such as timber inevitably means it has a huge impact and obviously has the greatest impact of any sector in the nation and on habitat erosion and destruction globally. (Barbault and Sastrapradja. 1995.)

Many essential materials are now in short supply. These include materials such as copper, which is largely mined in South America where whole mountains have

been taken down and landscapes altered in the search for ever more rare resources. They include materials like Titanium Ore which is used for the production of Titanium Dioxide, which is one of the main ingredients of paint among other things. This is often mined in rare habitats such as Madagascar with consequential and inevitable dangers to the ecology. (Natural Building Technologies, 2007)

Of course it is possible to mine and extract materials from habitats without destroying them. However there will always be consequences to this benign form of extraction in terms of cost, speed and quantity. It is therefore imperative that we radically reduce our demand on such materials in order to allow this process to happen benignly. At present the whole world is heading in the opposite direction, and we will lose huge areas of unique habitat forever in the coming years unless we change the way we consume such materials. This is particularly as regards how we build. It means using less of these materials by building more simply, with more local and plentiful (i.e. sustainable and renewable) materials and with less waste.

In the simplest terms, when a habitat is destroyed, the plants, animals, and other organisms that occupied the habitat have a reduced carrying capacity so that populations decline and extinction becomes more likely. The perhaps greatest

threat to organisms and biodiversity is the process of habitat loss. Temple (1986) found that 82% of endangered bird species were significantly threatened by habitat loss.

2.7.1 Impacts of Habitat Destruction on Man and the Environment

Habitat destruction vastly increases an area's vulnerability to natural disasters like flood and drought, crop failure, spread of disease, and water contamination. On the other hand, a healthy ecosystem with good management practices will reduce the chance of these events happening, or will at least mitigate adverse impacts.

2.8 Social and Economic Impacts of Construction

In the process of construction, the issues confronting today are achieving desired development for economic or social reasons on one hand and safe guarding the environment and maintaining good quality conditions of living on the other. Striking a balance therefore between the socio economic development of a society and environmental sustenance is a demand that must be met.

The high level of activity in construction caused a feeling of confidence in the national economy. Despite the loss of agricultural lands to the natives which has brought a continued decline to agriculture, economic activities in the area received

a boost with nonfarm sectors such as manufacturing , civil service, goods and services bringing more employment opportunities to the residents. According to the 1963 Economic Review in construction activities in America, the number of non- farm workers rose by over a million; farm employment continued its long-term decline, falling by about 300,000.

In manufacturing, jobholders increased by several hundred thousand, reflecting to a large extent expansion of output in the durable goods sector, especially metals, machinery, and automobiles. A small advance of employment in soft-goods manufacturing resulted mainly from activity in the apparel industry. Wholesale and retail trade, transportation and public utilities, and services contributed substantially to the rise in employment. Government employment rose by about 200,000, all of the increase occurring at the state and local levels.

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Materials: Procedure of Data Collection

The various data required to achieve the objectives of these studies will be discussed in this chapter. The data collection procedure, sample design and the techniques that will be applied for the analysis of data will be discussed as well.

Two major data types were used; the primary and secondary data.

3.1.1 The Primary Data

These include the materials for collecting information such as the structured questionnaire, the personal interviews and other important data gathered from field work carried out on the study area.

3.1.2 Secondary Data

The sources for these data include published and unpublished documents such as text books, journals and maps. Substantial information on the study was obtained from past researches. Other literatures were sourced from the internet.

Most of the secondary data were used for the literature review in the previous chapter while the primary data were used mainly for the analysis.

3.2 Method of Data Collection.

Data was collected through the following methods:

3.2.1 Reconnaissance Survey

A reconnaissance survey of the study area was conducted to obtain relevant information on the environmental conditions of the study area. Global Positioning System (GPS) was utilised to obtain the geographic coordinates and elevation of selected houses surveyed and sites of interest.

3.2.2 Questionnaire

The questionnaire was structured to get relevant information for the necessary analysis. The information sought was to enable the researcher categorize the variables and their relationship with the environment. Questionnaire was designed as a face to face structured interview to maximize the accuracy and wholeness of the data being collected. This was done to provide clearly recorded data and to document any irregularities that might have occurred during the data collection.

3.3 Sampling Method

Stratified random sampling method was used to give each house in the study area an equal chance of being surveyed.

3.3.1 Sample Frame

A multi-stage sample design was used in which the entire study area was mapped out into sections. These sections were first randomly sampled within which individual housing units were sampled. It was from these housing units that individuals were sampled out for data sourcing.

3.3.2 Sample Size and Procedure

The sample size, n was determined with the confidence level of 95%, confidence interval of 11.71 and a population estimate of 147,361.the sample size was estimated to be 69 which were rounded up to 70 for easy calculations. Two undergraduates and two graduates awaiting service year were used to distribute the questionnaires and interview the respondents.

3.4 Deforestation Analysis Using Quickbird Satellite Imagery

Quickbird satellite imagery that covered Bosso estate and low cost with their surrounding areas was utilized to assess the extent of deforestation with the use of

global mapper GIS (Geographic Information System) and image processing software. The imagery was acquired in 2006 and was obtained from National Population Commission of Nigeria. Quickbird satellite imagery has spatial resolution of about 0.60 metre, that is, it can sense and detect object of up to 0.60 metre or more in size.

Radiometric and geometric corrections have been undertaken by the organization that acquired the imagery. When the quick bird imagery was imported into the global mapper software, it automatically filters the imagery. The geographic coordinates obtained from GPS was used to geo-reference the imagery and areas of interest identified, configured and labelled. The software was utilised to calculate the area affected by deforestation.

3.5 Method of Data Analysis and Presentation

The statistical method was the use of tables, charts and graphs as mode of presentation. This was to find the relationship between each variable and construction.

CHAPTER FOUR

4.0 RESULTS

4.1 The Socio Economic Status of the Respondents

This section shows the information on the socio economic status and demographic characteristics of the respondents.

Table 4.1.1 Sex of the Respondents

Sex	No	%
Male	49	70
Female	21	30
Total	70	100

Source: *Field Survey, 2010*

Table 4.1.1 summarises the gender of the respondents, 70% of which were male while 30% female.

Table 4.1.2 Age Range of Respondents

Age range	No	Percentage
20-30	14	20.00
31-40	24	34.29
41-50	17	24.29
51-60	7	10.00
Above 60	8	11.43
Total	70	100.00

Source: *Field Survey, 2010*

The age range of the respondent is contained in table 4.1.2. this was graded for easy collation.20% of the respondents were between ages 20 and 30,while the greater number of respondents fall within the 31-40 years age bracket with the lowest 10% between the 51-60 years .

Table 4.1.3 Marital Status of Respondents

Status	No	%
Married	53	76
Single	14	20
Divorced	3	4
Widowed	0	0
Total	70	100

***Source**: Field Survey, 2010*

Table 4.1.3 shows that majority of the respondents were married (70%) while 20% were single and 4% divorced.

Table 4.1.4 Occupation of Respondents

	No	%
Farming	6	8.57
Trading	9	12.86
Civil servant	40	57.14
Others	15	21.42
Total	70	100.00

Source: *Field Survey, 2010*

The data representing the occupation of the respondents is in table 4.1.4 thus:57.14% are civil servants,12.86% are traders with 21.42% in other fields such as artisans and 8.57% are farmers.

Table 4.1.5 Years of Respondents' Residency in the Area

	No	%
Above 20 years	28	40
Below 20 years	42	60
Total	70	100

Source: *Field Survey, 2010*

The number of years of residency in the study areas was used ton determine the level of understanding of the respondents of the study ares.40% have lived in the areas for more than 20 years while 60% have been resident there below 20 years.

4.2 Physical Effect of Construction

This section seeks to determine the physical effect of construction on the environment from the respondents' opinions.

Table 4.2.1 Respondents' Opinion on Impact of Construction on the Environment

	No	%
Yes	62	88
No	8	12
Total	70	100

Source: *Field Survey, 2010*

88% of the respondents feel strongly that construction activities have affected the environment from table 4.2.1, while 12% feel otherwise.

Table 4.2.2 Respondents' Opinion on Areas of Impact of Construction on the Environment

Positive	No.	%
Negative	7	10
Positive	21	30
Both	42	60
Total	70	100

***Source**: Field Survey, 2010*

Table 4.2.2 shows the divergent views of the respondents on the impact of construction with 60% of the opinion that the environment is impacted both positively and negatively while 10% feel more inclined to the negatively impact with 30% seeing it on the positively side.

Table 4.2.3 Respondent Opinion on the Visibility of Impact on the Environment

Impact↓	**Degree of Impact ↓**			
	Mild	%	Serious	%
Environment	32	46.00	38	54
Health	52	74.00	18	26

Source: *Field Survey, 2010*

The impact of construction on the environment can be viewed largely either mildly or seriously depending on its effects both on the environment and on human beings. In table 4.2.3 46% and 52% feel it is mild on the environment and on man respectively while 54% and 26% say it is serious on the environment and on man respectively.

4.3 Pollution

This section is to determine the various forms of pollution which can be directly or indirectly related to construction activities on the environment: on water, land and man.

Table 4.3.1 Availability of Septic Tanks

Septic tank	No	%
Yes	63	90
No	7	10
Total	70	100

Source: *Field Survey, 2010*

The availability of septic tanks in residences was a major concern with the knowledge that the location of such facilities in relation to water supply can be dangerous. It was gathered as shown in table 4.3.1 that 90% of the respondents have septic tank. Also with on- site investigation it was noticed that some of these are closer to the water source than what is actually recommended by authorities.

Table 4.3.2 Respondents' Source of Water Supply

Source	No	%
Wells/borehole	30	42.86
Tap water	22	31.42
Water vendor	10	14.29
Others	08	11.43
Total	70	100.00

Source: *Field Survey, 2010*

The source of water will determine the impact of the septic tank or any other form of contaminant. It was realized that approximately 43% of the respondents use hand dug wells and or boreholes while 31% use tap water, 14% patronize water vendors with 14% using other source of water supply such as streams.

Table 4.3.3 Respondents' Opinion on Groundwater Contamination

Contamination	No	%
No	28	40
Yes	42	60
Total	70	100

Source: *Field Survey, 2010*

Table 4.3.3 shows that 60% of the respondents have at one time or the other suffered water contamination while 40% have not experienced water contamination of any sort.

Table 4.3.4 Nature of Contamination

Nature	No	%
Odour	15	21
Colour	26	37
Taste	29	42

Source: *Field Survey, 2010*

Table 4.3.4 highlights the various nature of water contamination: odour, colour and taste. 42% have experienced water taste contamination, 37% have had their water changed colour and 21% have had water contamination in the form of odour.

Table 4.3.5 Cause of Contamination

Cause	No	%
Spillage	07	10
Seepage	28	40
Natural	20	28.6
Fake pipe	15	21.4
Total	70	100.0

Source: *Field Survey, 2010*

This shows the different possible cause of water contamination such as spillage (10%) either through oil or other contaminants, underground seepage (40%) either from septic tank or any other source, natural (28.6%) and fake pipes or faulty pipes (21.4%).

Table 4.3.6 Handling of Construction Waste after Completion

Action	No	%
Re-used	13	32.86
Left on site	40	57.14
Taken away	07	10.00

Source: *Field Survey, 2010*

Table 4.3.6 sought to determine what construction waste is put into. It could be re-used (32.86%), left on site (57.14%) or carted away (10%). Waste left on site is a source of pollution, and according to majority of respondents construction waste is usually left on site.

4.4 Deforestation/ Erosion

Table 4.4.1 Site before Construction

Site	No	%
Thick forest	15	21.43
Marshy area	22	31.43
Rocky area	08	11.42
Plain	25	35.72
Total	70	100.00

Source: *Field Survey, 2010*

Knowing that the vegetation on the virgin land is a reflection of the original state of the area, Deforestation was assessed on the respondents view of how the areas were before and the used of a quickbird imagery.21.43% said the area was a thick forest,31.43% feel it was marshy,11.42% say it was rocky and 35.72% said it was plain.

Table 4.4.2 Areas Impact is Mostly Notable

Area	Highly	%	Slightly	%.
Aesthetics	32	45.71	21	30.00
Developmental	24	34.28	32	45.71
Pollution	24	34.28	12	17.14
Deforestation	55	78.57	15	21.43
Erosion	40	57.14	15	21.43

Source: Field Survey, 2010

In table 4.2.2 60% of the respondents opined that construction impacts the environment both positively and negatively. Here in table 4.4.2 the study sought to determine the particular impacts under positive and negative indices. Construction has massively brought about deforestation (78.57%) and though developmental((45.71) and aesthetical(30%).

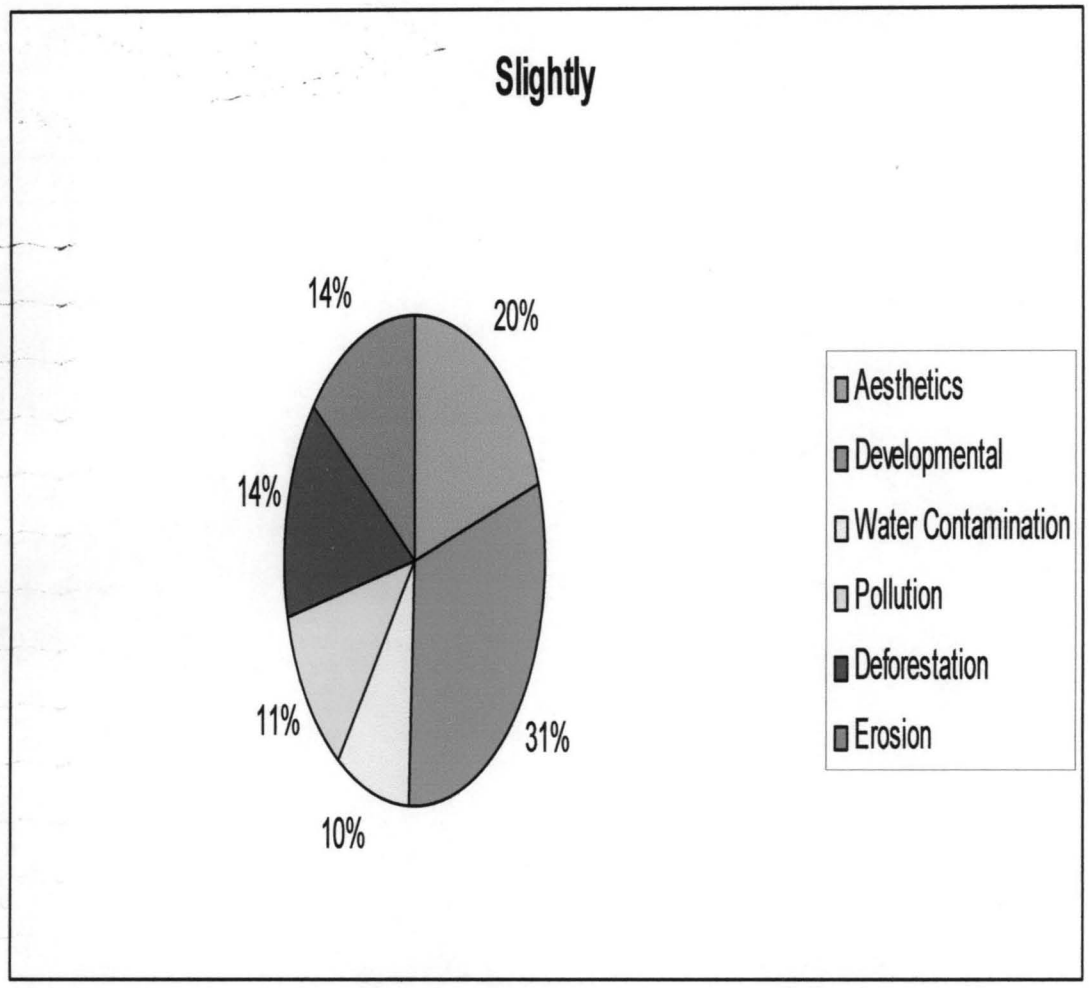


Fig.4.1 Pie - chart illustrating the areas impact is slightly noticeable in the study area.

The figure shows the different forms of impact relative to construction activities and how visibly it can be noticed in the study areas.

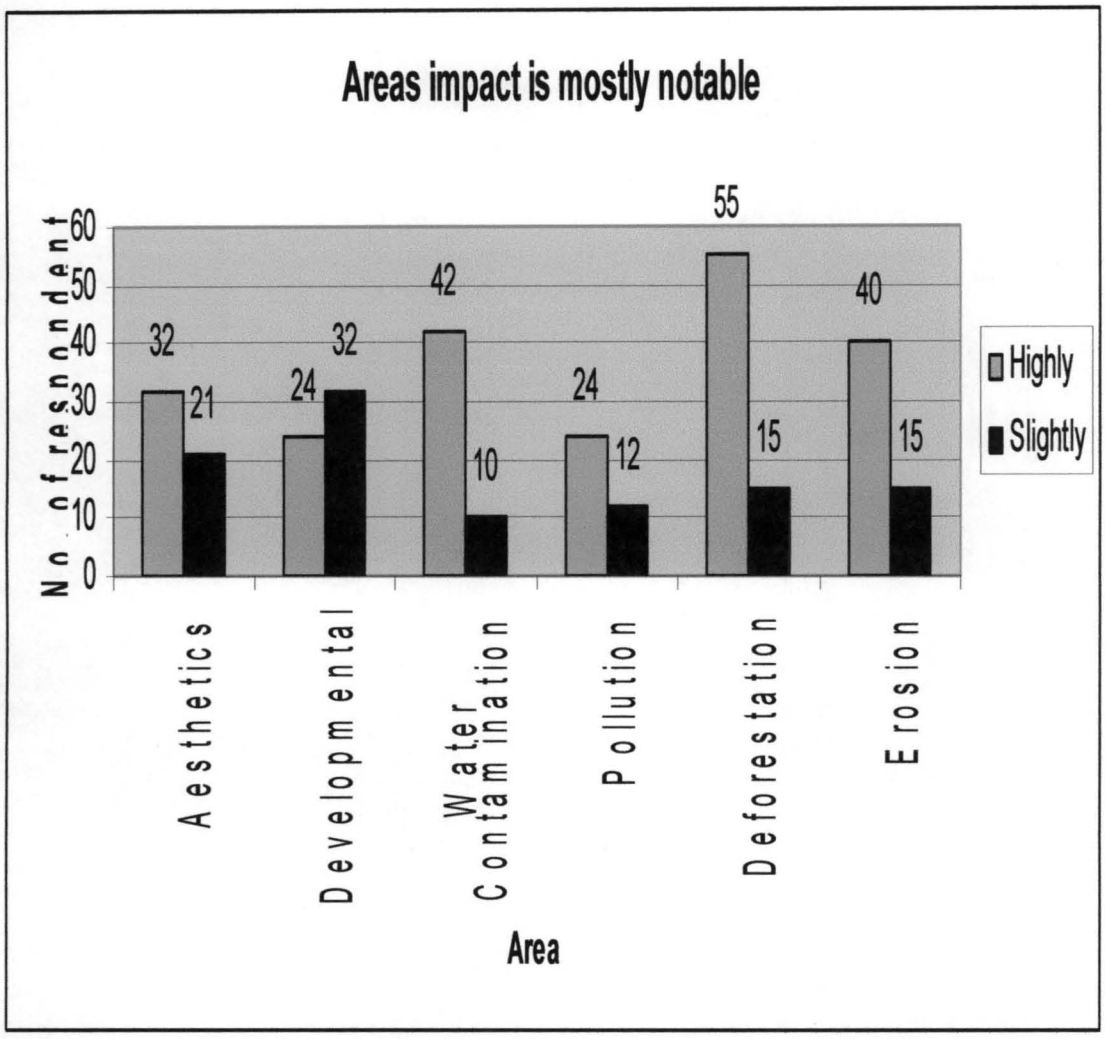


Fig 4.2 A bar chart illustrating areas impact is mostly noticeable in Study area,

Figure 4.2 is illustrative of the combination of the effects of construction on the environment in the study areas on both highly and slightly view of the respondents.

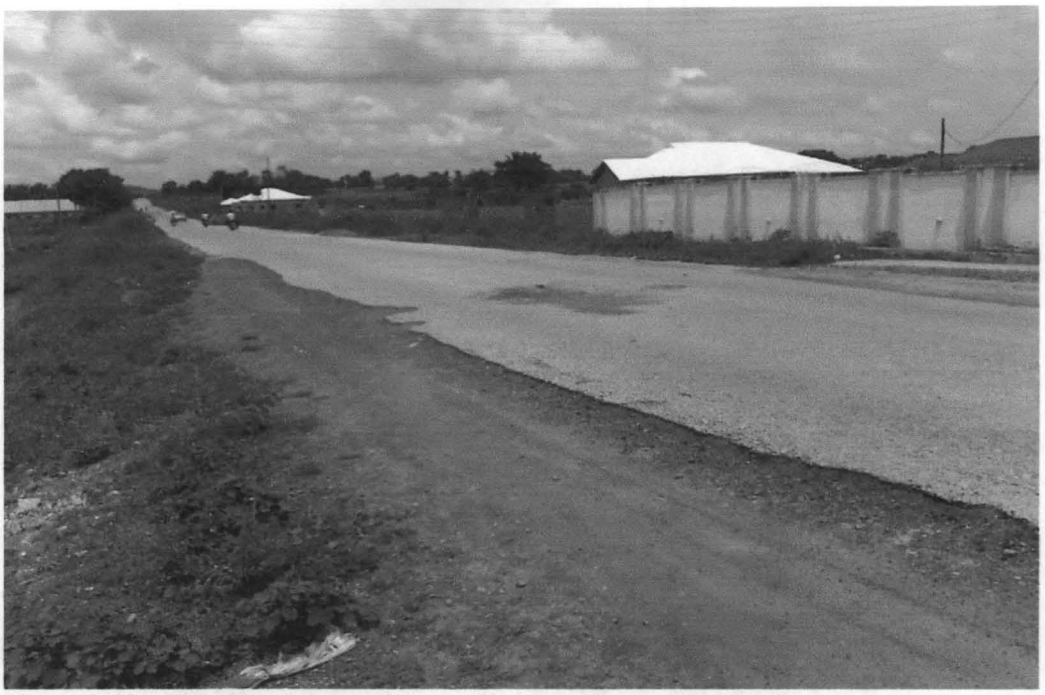


Plate V The Washing away of Road Surface due to Erosion

Plate VI Picture illustrates Natural Vegetation comprising of Trees and Shrubs at the Background.

Plate VII Hand Dug Well used as a Groundwater Source.

Plate VIII Indiscriminate Dumping of Refuse a Source of Pollution, Low-Cost

Plate IX An Estate Road Washed away by Erosion ,Bosso Estate .

Plate X. Erosion Caused by the Removal of Natural Vegetation, Bosso Estate.

Plate XI An Undeveloped Plot of Land in the Estate.

Plate XII Illustrates the Washing away of the Road through Erosion

Plate XIII Onset of Gully Erosion due to the Removal of Natural Vegetation

Plate XIV. Natural Vegetation in Undeveloped Part of Bosso Estate

Plate XV A Cashew Plantation at the Risk of Removal for Construction Work

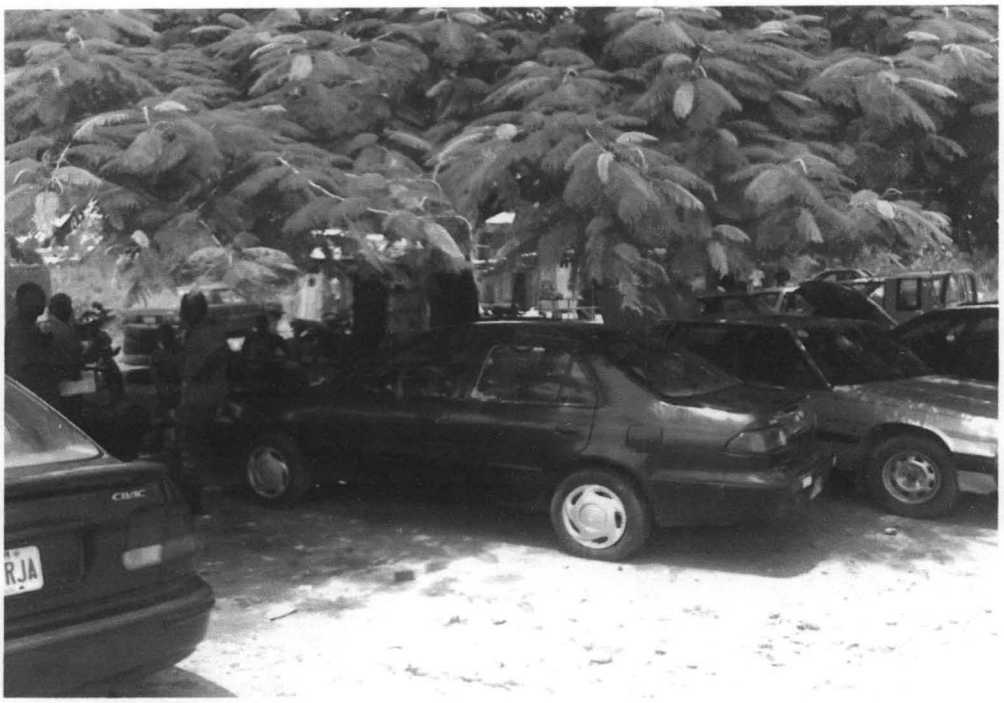


Plate XVI Illustrates a Mechanical Workshop as a Source of Pollution at the Estate

Plate XVII. Generating Set: Potential Source of Air Pollution

Plate XVIII Marshy Land Used for Rice Farming

Plate XIX Natural Vegetation Partly used for Rice Farming

Plate XX. Quickbird satellite image of Bosso Estate and surrounding environment. (Source: National Population Commission of Nigeria, 2006).

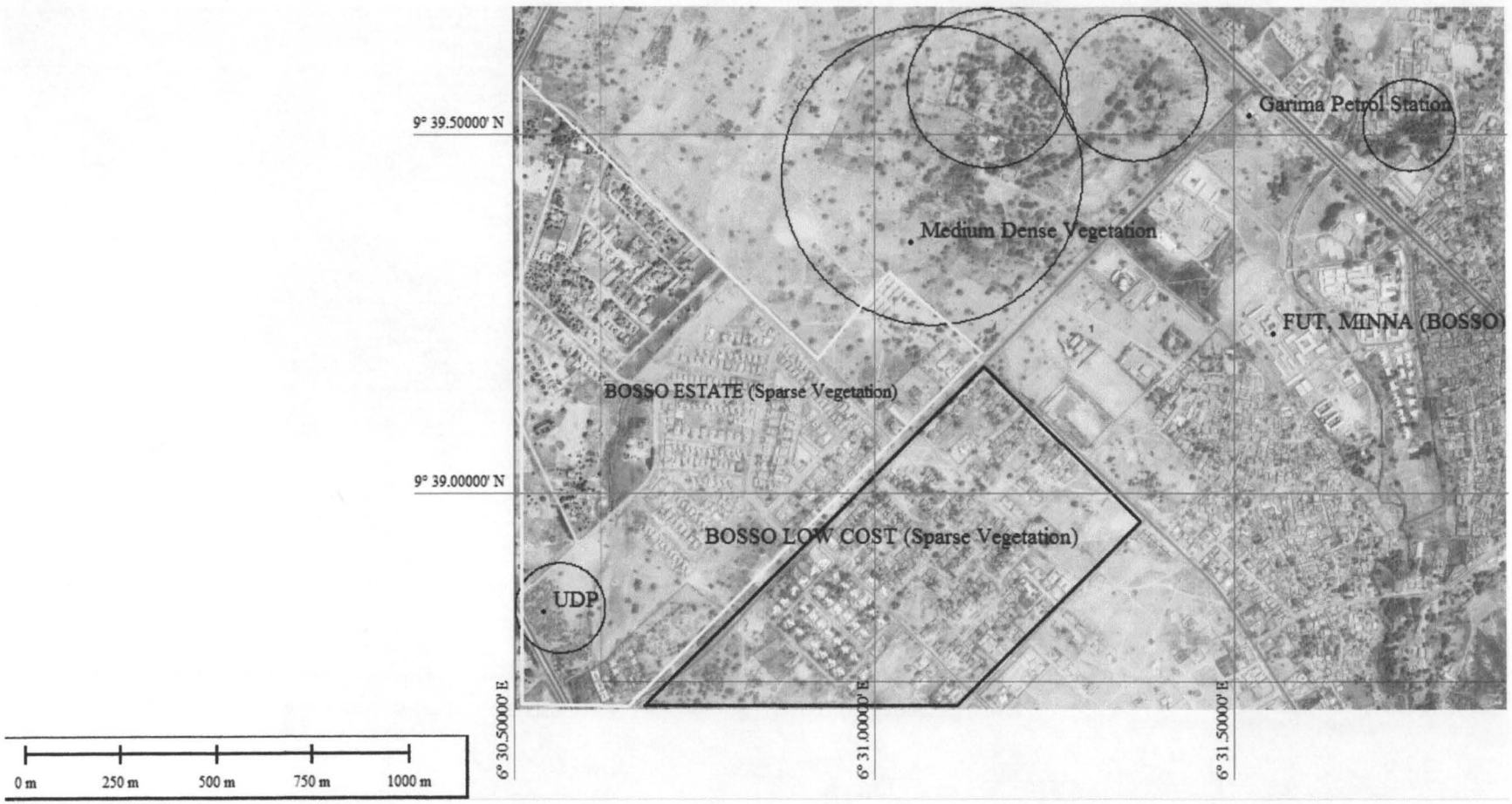


Plate XXI. Quickbird satellite image of Bosso Estate and surrounding environment indicating extent of deforestation. (Source: National Population Commission of Nigeria, 2006). UDP = Undeveloped plots showing medium dense vegetation. Green features are vegetation (trees and shrubs).

CHAPTER FIVE

5.0 DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion

This research on the effect of construction on the environment in the Bosso area of Minna, Niger state has made it possible to understand the yearning of the people concerning their environment. It has further enhanced the fact that indeed there are impacts of construction known to some people but never really taken thought of to improve on their environment, while there are still some who seems oblivious of any impacts associated with the environment; these are people whose major concern seems to be what is derivable from the environment.

5.1.1 Socio- Economic Status of Respondents

The findings of the research works are as follows:

In section 4.1, the socio economic data of each respondent shows a clear distinction of each person and personalities. The questionnaires were predominantly responded to by male respondents (70%) as opposed to the female gender, 30% (Table 4.1.1).

Table 4.1.2 shows the age range of the respondents' falls mostly within the bracket '31-40' and 41-50'with 34% and 24% respectively while 11.43% of the respondents were above 60 years of age.

The marital status in table 4.1.3 shows that 76% of the respondents were married with 20% single, 4% divorced and no widow(er).

From Table 4.1.4, it can be seen that 57.14% of the respondents were civil servants. Farming to most residents has become a secondary occupation. This buttresses the cultural mix noticed as a result of construction. The original inhabitants of the area used to be farmers, in fact the site of Bosso estate and the low cost used to be cashew plantation which has largely been lost to construction (plates XV).The area being marshy (Fadama) was also known for rice farming (Plate XIX), though this could still be seen at the far end of the estate; the construction nonetheless have greatly impacted on the socio economic lifestyle of the residents. The data therefore showed that farmers were 8.57%, traders 12.86 while others who could be students, unemployed or artisans were 21.42%.The other major factors of the respondents data was the years of residency in the area, it was gathered that 40% of the respondents have lived above 20 years in the area .

5.1.2 Physical Effect of Construction

Assessing the physical effect of construction on the environment eighty eight percent (88%) of the respondents indicated that construction had impacted on the environment (Table 4.2.1). Furthermore, Sixty percent (60%) of the respondents specified that construction had impacted both positively and negatively on the environment (Table 4.2.2). Some 30% admitted that there are indeed positive effects of construction such as development and aesthetics while 10% still see it on the negative impacts like deforestation, pollution, erosion, but overwhelmingly 60%, agreed that both positively and negatively construction activities have greatly impacted on the environment.

How visible then are these impacts? Could they be said to be mild or serious either on the environment or on man? In table 4.2.3, 54% mentioned that it is more serious on the environment while 74% feel the impact is milder on man. However it must be seen that the effect of construction on man has a rebounding effect on man both physically and socio economically.

Major causes of pollution in the environment was the course of study in section 4.3. First, the research sought to find out how many buildings provided septic tanks

for waste water storage, 90% of the respondent said there was the provision in their buildings (Table 4.3.1).

The source of water supply also revealed that majority of the residents use underground sources such as wells (plate VII) and boreholes 42.86%, while 31.42% use tap water, 14.29% patronize water vendors and 11.43% use other sources (table 4.3.2). However, 60% are said to have experienced water contamination at one time or the other (table 4.3.3), contamination which vary from colour to odour to taste (table 4.3.5).Though the cause of contamination was majorly attributed to seepage (40%), 28.6% think it is natural while 21.4% say it could have been from pipe and 10% admits spillage.

On the personal survey of the study area it was observed in some quarters that the distance of water source and the septic tank was close enough to cause underground seepage that could contaminate nearby water. The other sources of pollution mentioned were the indiscriminate dumping of waste (plate VIII) in the open which according to 75% of the respondents is discomforting especially the odour that exudes from such sites during the raining seasons; noise pollution as a result of generating set use (plate XVII), the smoke, fumes (carbon monoxide) and

noise as a result of transportation and workshops especially mechanical centres (plate XVI) in the study area.

Section 4.4 sought to find out how deforestation and erosion have been noticed in the study area, its effect on the residents and what other resultant effects have been noticed by the people in general. In table 4.4.1 it was realized that the study area could be said to be primarily plain (35.72%) and marshy (31.43%) which facilitated the planting of rice (plate 4.16) with trees interspaced. Though not a thick forest according to 21.43% of the respondents in the sense of it, the trees on the natural site was enough to provide ground cover. The removal of the top soil has therefore brought about the eroding of the area (plates V, IX, X). Table 4.4.2 showed that 78.57% of the respondent thinks deforestation has highly affected the environment and many complained of heated sun burn as a result of deforestation.

5.1.3 Deforestation Assessment Using Quickbird Imagery

The study area lies within the guinea savannah vegetation belt (Ezenwa et al 2007). Virgin land where buildings have not been constructed is occupied with grasses of about 80cm tall, shrubs and deciduous trees. (Yunusa, 2009).The vegetation on the virgin land is a reflection of the original state of the area. Deforestation was

assessed on the basis of reduction in vegetation intensity and total area now occupied by buildings and road which hitherto was occupied with vegetation.

The satellite imagery indicates that areas where construction activities have taken place in Bosso estate and the low-cost have experienced intense deforestation. The vegetation is currently sparse and this comprises of isolated trees either left un-destroyed during construction or planted after construction (plate XX). Considerable amount of trees and shrubs also exist in undeveloped plots (Plate XXI).

The area extent of Bosso estate that has experienced deforestation is approximately 0.956 km^2 while that of Bosso low cost is approximately 0.531 km^2.
The northern part of the study area yet to be developed in circle (plates 4.19) revealed medium dense vegetation which is likely to be close to the original state of vegetation in the entire Bosso area and surrounding environment.

The last section in the questionnaire was to find out the impact of the construction works on their socio economic lifestyle. About eighty-five percent (85%) of the respondents answered that the construction works has positively impacted on them. This shows that despite the many negative impacts of construction works e.g. deforestation, erosion, pollution; it has a way of positively affecting the people.

The accessibility to daily necessities was also inquired about to which majority confirmed that it's been easy accessing their daily needs. However, the poor condition of the roads was another major concern to most respondents for easy access to the market. Overall, for the residents of the estate, their socio economic lifestyle is not as much the question as the general impact of construction on the environment and the general well being of the people.

5.2 Summary

The aim of this study is to assess both the physical and the socio economic impact of construction activities on the environment; after careful steps at following the objectives to achieving the aim it was found that indeed there are many and varied impacts associated with construction which has met with a major failing in environmental control.

In the research it was gathered that the topsoil of the area has been removed through deforestation which has led to the erosion of the area. Most of the access roads constructed for easy transportation are eroded away. There are gullies formed or at the onset of formation due to the excavation of the topsoil for construction purposes. There are many sources of pollution in the area, many of

which are as a result of the social habits of the residents such as the indiscriminate dumping of wastes, citing of mechanical workshops in residential areas, the use of generating sets as a result of incessant power failures and much more. There has been a massive loss of habitat in the past and even now which calls for urgent effort at stopping the destruction of our habitat and ecosystem through man's own activities.

It must therefore be noted that the creativity of man in environment especially in our society is not yet fully standard, and, in the process of learning and selection there will be many ways and divers' outcomes and shortcoming. This calls for more effort to achieve a better result not only from the government and the professionals both from all and sundry.

5.3 Conclusion

The impact of construction on the environment concluding from this study cannot be overlooked ranging from its physical effects to the socio economic impacts knowing that our environment is a store house capable of meeting all our needs, BUT to reduce environmental degradation and for man to save his habitat, societies must recognize that the environment is finite.

IN an effort to exploit these environmental resources to advantage, a number of abuses have occurred. The consequences of these have been seen to be several and hazardous on both the environment and man. Thus, managing these abuses becomes inevitable since this will easily result in the restoration of the environmental quality and the sustenance of the future of the present and the yet unborn generation in Nigeria.

5.4 Recommendations

This study has tried to evaluate the post construction effect of construction on the environment. From the study, it has therefore become clear that indeed there are impacts of construction on the environment and the general well being of people to which these recommendations have been given.

1. Public education and awareness to the impacts of uncontrolled construction or failure to adhere to regulations and policies guiding construction will turn around public attitude positively. Therefore it is recommended that education to alter public attitudes should be undertaken. However, a number of environmental problems ensue due to the abuses meted to the environment in the course of interactions which is usually as a result of lack of sufficient education on how to relate with the environment. Therefore, the need to introduce

environmental education in our school's curriculum is strongly advocated as a check to solving environmental degradation. Also the environmental quality that gave birth to Federal Environmental Protection Agency in Nigeria (Decree 58. 1988) can be made more popular and thus gaining public sympathy through public enlightenment campaigns, lectures, distribution of relevant pamphlets, posters, seminars, workshops and media houses.

2. On-site preservation of tree canopy and natural buffer areas, in combination with existing vegetative features in the surrounding landscape, may serve to provide cover against erosion.
3. There is the need to improve on infrastructural amenities especially electricity supply to curb both the noise and air pollution as a result of generating sets.
4. Mechanic workshops in residential areas should be discouraged by setting up workshops/ centres in the outskirts as a measure to reducing air pollution.
5. Drainages around the estate roads should be constructed with the reconstruction of the roads.Properly constructed drainage systems can prevent erosion and gullying of land on slopes by catching the surface water before it reaches the slope. Also to prevent an excessive

accumulation in the soil of soluble salts that might be detrimental to plant growth.

6. Adequate distance should be enforced between the septic tanks and the water supply source (at least 30m) to avoid the continued contamination of water which seems to be a common occurrence in the estate.
7. Most of the waste materials generated as a result of building/housing construction can be reused, refurbished, or recycled into usable products. The benefit of these practices is that materials that would otherwise be disposed of from the waste stream are diverted for productive uses for pollution prevention and helping reduce the amount of waste generated by a building/housing construction project. In addition, the purchasing of recycled-content material will help to support markets for materials and small scale entrepreneurship.

   Soil excavated from the construction site should be reused. Topsoil can be re-spread in areas to be landscaped to enhance plant health; also to avoid heap of unused soil left on site.

Along with these recommendations it will be important to note that the strict use of Environmental Impact Assessment (EIA) which is a process for anticipating the effects on the environment caused by a development or construction is necessary.

There is no doubt that certain construction/development projects will always have significant environmental effects therefore EIA should be mandatory for all projects. As part of the EIA process details of the existing environment will need to be provided, positive and negative potential significant impacts assessed and mitigation measures proposed to reduce avoid or remedy any potential negative impacts identified.

Finally, this research work is limited in scope and coverage, it is therefore hoped that further works and analysis can be carried out on this massive problem of environmental degradation due to construction works with the hope of finding solution to this menace.

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APPENDIX 1

QUESTIONNAIRE SURVEY ON THE EFFECT OF CONSTRUCTION ON THE ENVIRONMENT IN BOSSO AREA OF MINNA, NIGER STATE.

Department of Geography
FUT, Minna,
Niger state.
September, 2010.

Dear Sir/Ma,

I am a post graduate student undergoing a program in environmental development and planning in the Geography Department of Federal University of Technology, Minna.

I will like to solicit your cooperation in answering this questionnaire by giving your objective opinions and answers to the following questions.

Thank you for your anticipated co-operation.

OYEKALE, MATILDA

M.TECH/SSCE/2007/1627

SECTION A: SOCIO-ECONOMIC STATUS OF RESPONDENT

1. Sex: male [ ] female [ ]
2. age: 20-30 [ ], 31-40 [ ], 41- 50 [ ], 51-60 [ ], above 60
3. Marital status: single [ ] married [ ] divorced [ ] widowed [ ]
4. Household occupation: farming [ ] trading [ ] civil servant [ ] others [ ]
5. How many people are in this household ----------
6. How long have you lived in this vicinity: above 20 yrs [ ] below 20 yrs [ ]

SECTION B: PHYSICAL EFFECT OF CONSTRUCTION.

7. In your own view, do you think construction have Impacted on the environment?

   Yes [ ] No [ ]

8. If yes in what ways do they impact.

   Positively [ ] negatively [ ] both [ ]

9. How visible are these impacts on

   - the environment mild [ ] serious [ ]
   - the health and general well being of the people
     mild [ ] serious [ ]

Pollution

10. Do you have a septic town [soak away] yes [ ] no [ ]

    b. How close is it to your water source? ----------

11. What is the major source of your water supply?
    a. wells/bore hole
    b. tap water
    c. water vendors
    d. others
12. Have you ever noticed any ground water contamination? ----------
    ---
    ---

13. What nature of contamination was noticed?
    a. odour
    b. color
    c. taste
14. What could be the actual cause of the contamination?
    a. spillage
    b. underground seepage from septic tank
    c. natural
    d, fake pipe usage.
15. How was the contamination tackled ----------

    ---

16 What are the potential dangers of open waste dump in the environment?----------
    ---

17 How has this menace affected the environmental conditions of the area?----------
    ---
    ---

18 The waste produced in the course of construction, how is it usually handled?
    a Re- used

b. Left on site

c Taken away

19 In the event of a new construction works around, how do they affect the neighborhood?----------

---

---

20 Are there certain noise pollution sources identified in the estate //low cost?---------- ----------

---

21.what is the effect of citing mechanical workshops in the neighborhood?---------- ----------

---

Deforestation/Erosion

22. How was this site before the construction activities began?

a. thick forest

b. marshy area

c. rocky area

d. plain

23. In what ways do you think deforestation has affected this environment.----------

---

---

24 When the topsoil or vegetation was removed how has it impacted on the environment?

---

25. In which of these areas are the impacts most notable?

	Highly	slightly
Aesthetics	--------	---------
Developmental	---------	----------
Pollution	----------	----------
Deforestation	----------	----------
Erosion	----------	----------

26. Highlight some of the other impacts you notice especially in Bosso estate and its environs ----------
---

---

27. What solutions do you suggest to mitigate these impacts?

- by the industry stakeholders----------

- by the government ----------

- by the people ----------

SECTION C: THE SOCIO-ECONOMIC IMPACTS OF CONSTRUCTION ON THE ENVIRONMENT

28. How has the estate affected your business /socio-economic life?
Positively [ ] negatively [ ]

29. How accessible are materials needed for daily living? ----------
---

---

30. What are the visible impacts of your economic lifestyle on the environment ----------
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