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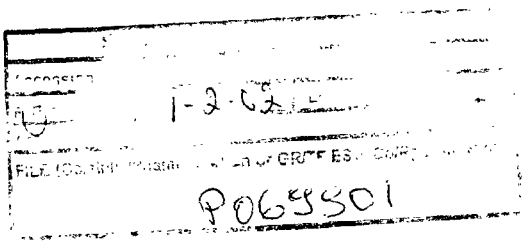

World Bank Community Based Urban Development Project

Environmental Impact Assessment Report

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Consultancy Service for Detailed Engineering Studies and Preparation of Bid Documents

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CONTENTS

ACCRONYMS/ABBREVIATIONS

ACO	=	Abattoir Construction and Operation
CBO	=	Community Based Organisation
CO	=	Carbon monoxide
CO_2	=	Carbon Dioxide
DB (A)	=	Decibel
EIA	=	Environmental Impact Assessment
EMP	=	Environmental management Plan
FCT	=	Federal Capital Territory
FMENV	=	Federal Ministry of Environment
H_2S	=	Hydrogen Sulphide
IDA	=	International Development Agency
Mg/m^3	=	Milligram per meter cube
NH_3	=	Ammonia
NOX	=	Nitrogen Oxides
OD	=	Operational Directive
PC	=	Public Conveniences
Pb	=	Lead
ROW	=	Right Of Way
RC	=	Road Construction
SPM	=	Suspended Particulate Matter
SI	=	Statutory Instrument
WDCO	=	Waste Dump Construction and Operation
WSP	=	Water Supply Project

EXECUTIVE SUMMARY

The Project:

The Federal Government of Nigeria through the Nasarawa State Government supported by the World Bank is undertaking a Community Based Urban Development Project in Karu and Mararaba Communities. The project will involve:

1. Rehabilitation of a total of (25) twenty-five kilometres of tertiary and secondary roads.
2. Construction of twelve (12) boreholes
3. Three (3) modern public toilets
4. One modern Abattoir
5. Constructions of twenty-three (23) refuse receptacles
6. Construction of a landfill site
7. Procurement of waste management equipment

The project is aimed at reducing poverty by providing basic services and infrastructure in Karu and Mararaba Communities, which are poor infrastructure deficient communities.

Institutional Settings and Regulatory Background:

The regulatory basis for this EIA are the;

- National EIA Decree No. 86 of 1992
- Procedural Guideline on infrastructure Development
- Sectoral Guideline on infrastructure Development
- National Policy on the Environment
- World Bank Guideline on Environmental Assessment
- Nasarawa State Environmental Edict No. 15 of 1997

Objectives of the Environmental Impact Assessment:

The objectives of the EIA are to:

- Provide necessary baseline data for purpose of the project
- Identify impacts of various components of the project to socio-economic setting and the environment
- Identify appropriate mitigation measures to ameliorate identified impacts.
- Incorporate relevant aspects of the EIA into the decision making process and provide basis for liaison and cooperation with all stakeholders.

Project Justification

Deplorable state of roads and acute shortage of drinking water and waste management facilities as well as poor drainage conditions in the area as high lighted earlier necessitated and justify the execution of the project.

Objective of the Project

The objectives of the project include:

- Making significant impact on the living conditions of the inhabitants of the area.
- Provide basic infrastructure and municipal services within a reasonable time period.
- Invest in infrastructure services to encourage future efforts by the communities to bring about physical and social improvements with their own resources and implement cost-efficient and affordable solution for infrastructure and services provision by adopting appropriate and affordable functional standards within pre-defined per-capital cost allocation amongst others.

Environment Description

The two communities are located to the north and south of the Abuja – Keffi highway. Karu and Mararaba townships are located on the eastern part of the FCT along Abuja – Keffi highway and has a combine population of about 450,000 people. Most of the inhabitants are peasant farmers but there is a significant presence of government workers, labourers, and petty traders. Karu is well

served by very good laterite roads while Mararaba is not planned and lacks good road network distribution. New residential developments are progressing fast within these communities due to its closeness to the Federal Capital.

Infrastructure

Mararaba and New Karu though both urban centres lack basic social amenities such as good drinking water, roads, housing and electricity supply.

Climatic Characteristics

The study area is influenced by two seasonal periods of dry and wet seasons. The dry season, which is, the dominant one lasts from November to April while the wet (raining) season lasts from May to October. Two air masses, the tropical maritime and the tropical continental air masses are responsible for the variations in the seasons.

Wildlife and Vegetation Characteristics

The study areas are very close to the Federal Capital City Abuja, which is well developed; therefore there are no wild animals. This is due largely to intense pressure put on land, which is increasing

by the day as a result of rush to the FCT from other parts of the country.

Vegetation of the area is also affected by these developments. The original thick vegetation cover is fast giving way to open area courtesy of rapid developments in housing infrastructure.

Potential Impact of Project

The projects potential impacts are as out lined below:

1. Construction of roads will lead to:

- Lowering of air quality
- Increase in background noise level resulting from equipment movement
- Soil erosion
- Damage to aesthetics
- Increase in accident risks
- Facilitation of easy movement
- Possible increase in population
- Possibility of employment opportunity

2. Boreholes construction and operation:

- Provision of clean water
- Influencing personal hygiene
- Stimulating local entrepreneurships
- Provision of employment opportunity

3. Construction and operation of public conveniences:

- Improving sanitary conditions of the communities
- Provision of cheap and hygienic toilets
- Possible contamination of underground water
- Possibility of employment opportunity

4. Construction and Operation of Abattoir:

- Possible increase in foul smell
- Provision of hygienically prepared beef
- Employment generation

5. Waste dump operation:

- Improving the aesthetic of the communities
- Employment generation
- Possible contamination of underground water

- Improving quality

Mitigation Measures

Chapter eight of this report gives details of measures to be adopted to reduce or eliminate impacts arising from the projects implementation activities or their operations. Generally, the projects are of positive side but could generate negative concerns, which need to be mitigated.

Environmental Management Plan

The consideration of environmental management which is an integral part of the detailed project design activities and operations should ensure protection of the environment and human health and should have as its objectives:

- Minimization of environmental risk
- Reduction/elimination of adverse impacts

Achieving the above objectives could be possible by adopting the following policies and principles, which are already elaborated in the main report.

- Potential impacts identification

- Contingency planning
- Environmental monitory/inspection

Conclusion

This EIA has been carried out in accordance with National, International and State regulatory requirements on the environment and it is intended to provide environmental and social aspects of the planning and execution of the project.

Also, the potential environmental and social impacts of the project on the existing setting have been identified and evaluated and mitigations proffered where applicable. Furthermore, EMP has been developed and provided for the project and it is hoped that if executed in accordance with the EIA provisions and the EMP, it will cause no serious damage to both the environment and social setting of the areas involved.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Nasarawa State Government in conjunction with the World Bank proposes to upgrade and provide where not available, the facilities in the township areas of Mararaba and New Karu in Karu Local Government Area of the State. The project will involve construction activities ranging from roads and drainage, boreholes, public conveniences, solid waste management and an abattoir. The water supply scheme, waste dumpsite and public toilets are to be located on land whose ownership has been transferred to the community. Relevant documents are in the custody of the project implementation unit.

Sequel to the above, the Government and World Bank commissioned an Environmental Impact Assessment (EIA) of the proposed project in compliance with the regulatory requirements and their commitment to conducting the activities in an environmentally friendly manner.

1.2 Brief on the Project

The projects activities, which are to be carried out at Mararaba township area, near the south-eastern border of the Federal Capital Territory, Abuja and the Headquarters of Karu Local Government Area of Nasarawa State, was conceived to take care of the most pressing needs of the communities brought about by the most recent population explosion in these areas as a result of movement of the Federal Capital to Abuja.

The activities involved in the project are road rehabilitation following the existing right of way (Row) of cumulative length of about twenty-five (25) kilometres for both primary and secondary roads, construction of ten (15) number boreholes; five (5) at Karu and seven (7) at Mararaba, construction of three (3) modern public toilets and a modern abattoir to be located at the Northern section of Mararaba very close to the Market. Also to be involved in the project is the construction of a waste dumpsite and waste collection centres.

The activities involved in the construction of the various sub-projects that make up this project do not involved significant direct pollutant discharges that are large enough

to cause degradation of air, water or soil; large scale physical disturbances of the site. There is also no substantial disturbance of forest and other natural resources, measurable modification of hydrological cycle. The project does not involve involuntary displacement of people and other significant social disturbances.

1.3 Institutional Settings and Regulatory Background

Relevant guidelines and regulations applicable (directly and/or indirectly) to the execution of the proposed project are covered by the mandates of the Federal Ministry of Environment (FMENV), the World Bank regulations/guidelines for execution of projects and other national and international regulations.

1.3.1 Federal Ministry of Environment (FMENV)

The principal FMENV guidelines and regulation related to the execution of the project activities are specified in the:

- National Environmental Impact Assessment (EIA) Decree No. 86 of 1992.
- National EIA procedural guideline (1995)

- FMENV, Sectoral Guideline on Infrastructure Development (1995).
- FMENV, Sectoral Guideline on Waste Treatment and disposal (Draft; 1998).
- Statutory Instrument (S.I. 15) – National Environmental Protection (Management of Solid and Hazardous Wastes) regulations 1991. This instrument spells out the requirements for ground water protection, surface impoundment, land treatment, waste piles, landfills, incineration, etc.
- National Policy on the Environment (Revised – 1999) section 4.3.

1.3.2 The World Bank Guideline

- Environmental Assessment Source Book Vol. 1 (Policies, Procedures and Cross-Sectoral Issues).
- The World Bank: Sectoral Environmental Assessment – 1993.
- The World Bank: Environmental Assessment Source Book update; assessing the Environmental Impact of Urban Development.
- World Bank Operational Policy O.P. 4.0

Other guidelines and regulations relevant to the project are:

- United Nations' Environmental Impact Assessment: Basic procedures for developing countries.
- Nasarawa State Environmental Edict No. 15 of 1997.

1.4 Objectives of the EIA.

The main objectives of the EIA are:

- To provide necessary baseline data (ecological and socio-economic) for the purpose of the project.
- Identify the impacts of various components of the project to the socio-economic setting and the physical environment.
- Identify appropriate mitigations measures to reduce or eliminate the identified impacts.
- Recommend an appropriate and effective monitoring programme to measure possible changes to the environment.
- Incorporation of relevant aspects of the EIA into the decision making process and provide a basis for liaison and cooperation with all stakeholders.

1.5 Benefits of the EIA

The benefits of the EIA to the socio-economic and the ecological environmental setting include but not limited to:

- Identification at an early stage the project's inherent potential and associated negative impacts and their corresponding mitigation measures.
- Enhancing environmental quality through careful project implementation.
- Ensuring project sustainability by considering future possible socio-economic changes.

1.6 Assessment Methodology

For the purpose of the community based urban upgrading project, two (2) forms of investigations were involved; literature search into existing write ups about the ecology and socio-economics of the area and field data gathering involving reconnaissance/field work and laboratory analysis of the acquired samples. Such samples include, water samples, soil samples as well as informal interview of stakeholders.

CHAPTER TWO

2.0 PROJECT BACKGROUND

2.1 Declaration

The proponent of the project declared that all the components of the project i.e. road construction/drainage, construction of public conveniences and abattoir as well as drilling of boreholes will be carried out within the framework of the existing State, National and International legislations and Regulations governing environmental management.

2.2 Project Location

Mararaba and New Karu townships are the two areas where the urban upgrading project activities are proposed to be carried out. The two urban areas bordered each other at a distance of about 40 km along Abuja – Keffi Road at the southeastern border of the Federal Capital Territory (FCT) Appendix 1. is a map showing the proposed project location. Prior to the movement of the FCT to Abuja, these areas were basically rural to semi urban with very sparse

population and basic infrastructure typical of a rural township.

Presently, these areas have grown significantly both in size and population well above 400,000 people. This led to extensive pressure on the existing infrastructure and general services, waste management crises and other socio-economic problems like in adequate housing and security.

2.3 Project Justification

Karu and Mararaba Communities were chosen to benefit from this project due to the deplorable state of infrastructures and basic services within them. At both New Karu and Mararaba, potable drinking water and good roads are virtually not available. The roads inside the townships are all unsurfaced and generally not motorable especially at rainy season. Pools of water at the centre of the roads are a common feature resulting from lack of drainage and blockage of available ones. Water for drinking and other domestic purposes is being purchased daily from water vendors popularly called "Mai Ruwa" and is generally not safe for public consumption. This is made inevitable

due to complete absence of pipe borne water or public boreholes.

Sanitary conditions of the streets and houses in these areas are also a source of potential health hazards. This is in consideration that toilet facilities are grossly inadequate and unkempt where they exist and the streets are dotted with heaps of waste dumps. In a nutshell, developments in the area are carried out with no regard to future or anticipated expansion and modernization.

The realities of acute shortage of these basic infrastructure facilities and the continuous influx of people especially those of lower income class into the area necessitated the project. This (the project) will go along way in making the areas more habitable to people and stimulate small holder entrepreneurship thereby promote economic growth.

2.4 Objectives of the Project

The project will upgrade basic infrastructure and municipal services in the Mararaba and New Karu townships with the following as its objectives.

- Make significant impact on the living conditions of the communities including the environmental conditions in

the settlements and hence the health conditions of the people.

- Achieve such impacts by provision of basic infrastructure and municipal services within a reasonable time frame.
- Invest in infrastructure and services in the settlement to encourage future efforts by the communities to bring about physical and social improvements with their own resources.
- Implement cost-efficient and affordable solutions for infrastructure and services provision by adopting appropriate and affordable functional standards within pre-defined per-capita cost allocations.
- Make infrastructure improvements, planned and implemented in an integrated manner to help avoid disruption in the settlements in future because of piecemeal provision of the various services required.
- Establish adequate operation and maintenance arrangements through partnerships between local governments and beneficiary communities to better ensure overall sustainability of infrastructure.
- Demonstrate a replicable and sustainable approach to upgrading that can be scaled-up to citywide programmes.

CHAPTER THREE

3.0 PROPOSED ACTIVITIES

3.1 Water Supply

This component of the project involves the drilling of fifteen (10) number boreholes, comprising of seven (7) to be in Mararaba and five (5) at New Karu. Target land locations, which are expected to be made available by the communities, are; the markets areas, the corner shops and other populated areas and already, the geophysical investigations for the various proposed sites had been concluded. The results of this for the identified sites are included in the accompanying Engineering report.

The boreholes to be constructed are designed to have drilling casing and screening and equipped with overhead storage tanks, pumps, riser, rump house and a standby generator. Chain wire enclosure will be used round the generator and trained personnel will man the borehole. Also, considering the success of private entrepreneurs in operating boreholes in these communities, it is intended that these private initiatives will be used as a model for the operation and maintenance of the proposed boreholes. Further, the high operation and maintenance cost of the

boreholes resulting from purchase of spare parts and fuel for the generator made the consideration of collection of charges fee necessary. This is basically to ensure project sustainability.

The private operators are to operate and maintain the facility according to the maintenance schedule in the accompanying operation and maintenance manual.

3.1.1 Water supply Alternatives

Various options/alternatives for the provision of portable water to the communities were considered and they are:

i) Pipe-borne water supply to run along public access roads.

ii) Construction of boreholes as centralized water supply.

iii) No project option.

Options (i and iii) were rejected for the fact that option i, is capital intensive and not feasible with the available funds while option iii) was rejected considering the dire need for potable water for domestic and other uses.

Option ii, which is adopted as a viable option was chosen due to the fact that the available finances could comfortably cover its execution and hence provide the needed clean and reliable source of water for domestic and other uses.

Engineering design for the borehole and the auxiliary facilities has been done to specification and to fit with the socio-economics of the areas. Also environmental considerations were taken into account to ensure project sustainability. The design of the water supply facilities has been based on other recently constructed water supply facilities in the same area. These have been found to operate successfully. Twin boreholes are proposed thus enabling supply to continue even if the pump in one borehole is being serviced. Electric driven submersible pumps have been specified with a standby generator because the electricity supply in the area is unreliable. The pumps will deliver to a 50 cubic metre overhead tank. This tank gravitates through pipe-work to a minimum of five standpipes. The tank provides a buffer for peak periods when the demand at the standpipes exceeds the capacity of the borehole pumps.

3.2 Roads Rehabilitation

Rehabilitation of roads and drainage is a significant component of the project with a total of twenty-five (25) kilometres to be rehabilitated, surfaced and paved in the two (2) identified communities i.e. New Karu and Mararaba. This will involve site clearing, earthworks, construction of pavement and block work drains as well as surface dressing. To avoid tempering with the natural setting of the communities and for economic reasons, no demolishing of any structure will be done and that all roads will follow the existing Right Of Way (ROW) at both communities. Also, it is expected that the design will achieve a balanced cut and fill meaning that borrow pits will not be required. Drainage along side of the surfaced and unsurfaced roads will be ensured and the roads (surfaced ones) will be paved to avoid been eroded by rain and flowing waters. The construction activity will involve the use of equipments such as graders, rollers, plate compactors, trucks, etc. and an approximate volume of 76,000 m^3 of gravel are required. Sample drawings for the topographical survey of the road alignments and cross sections have been provided in the accompanying Engineering report.

Soil samples along the route alignments were collected and tested in the laboratory and the results provided in the accompanying Engineering report. This confirmed the visual examination results of the trial pits believed to be of high California bearing ratio i.e. good foundation material.

Gravel pits will be sited 25 km from the start of the duplication, which was as a result of difficulty faced in securing an alternative closer site. The consultant supervising the work for Abuja – Keffi highway that will pass through Mararaba and Karu, provided this information. The consultant also provided details for the proposed alignment for the duplication of the said highway. a typical road and drainage drawing for the proposed project is provided in the in the accompanying Engineering report.

3.2.1 Road Rehabilitation Alternatives

Alternatives considered for the road construction activities include the followings:

i) Following the existing (ROW) "Right Of Way".

ii) Straightening with grading or surfacing widening the roads. Where necessary by carrying out some forms of demolition.

iii) Do nothing.

In consideration of the above alternatives, alternatives ii) and iii) were rejected on the ground that alternative ii) is a very costly one and cannot be covered by with the available finances. Alternative iii) on the other hand, is not a good option going by the difficulty faced by the people of the communities in aspect of transportation infrastructure.

To better the lots of the people, alternative i) was adopted which will involve surfacing of major access roads and grading the minor ones to facilitate easy movement.

3.3 Public Toilets

Another significant component of the project is the construction of modern public toilets in three (3) strategic locations (mostly in high public concentration areas). . A cleaner and a watchman will be employed

for each of the fourteen boreholes to maintain cleanliness and ensure security of the facilities.

The facilities are proposed to be operated by a community-based organization because of the direct interest the community has on the maintenance of the facilities. This organization is expected to conduct publicity campaigns to encourage the use of the public conveniences and educate the users on the proper use of the facilities. This is expected to influence acceptability of the project and hence sanitary condition of the communities. It is further expected that as time goes on, private enterprise will take over the operation of the facility through collection of fees.

3.3.1 Public Toilets Alternatives

Alternatives to design and location of this facility were given due considerations and were identified as:

i) Construction of pit toilets.

ii) Construction of well built squat slab toilet and showers with male/female areas.

iii) Construction of stand alone toilets.

iv) Do nothing with the present situation.

The alternatives above were carefully considered and evaluated, but all were rejected except ii) on the ground that;

- it offers the most cost effective and integrated option
- it is the environmentally best option of all.

Other alternatives were rejected on the premise that;

Option (i) is not environmentally friendly as it could allow contact of the human excreta with the under ground water which is the main source of domestic and drinking water thereby polluting it. Hence, exposing the communities to the dangers of contacting water borne diseases. It could also result to emission of contaminated air and could thus lead to spread of air borne diseases.

Option (iii) was rejected not because it is not environmentally friendly but just as it could not provide the needed total public convenience i.e. giving both females and males access to use at the same time and as well provide a bathing place. On the other hand, the last option (option iv) was rejected in consideration of the dear need of these

facilities in view of the terrible sanitary conditions of the communities. Also, the opportunity the State Government has at her disposal is a rare one and carrying out the project will encourage more people to settle in these areas to engage in small-scale business (ventures) and thus boost the internally generated revenue profile of the Government through taxation. Detailed engineering design of the proposed facility is in the accompanying Engineering report.

3.4 Solid Waste Management/Disposal

To further emphasize the Government's desire to ensure improved sanitary condition of the communities all forms of wastes and especially solid wastes are to be collected and disposed off in a safe and environmentally friendly manner. A site has already been chosen for this purpose and will be operated as a waste dump. Twenty-three (23) refuse receptacles will be constructed to gather the waste from nearest households for onward delivery to the dumpsite (see layout on page in the accompanying Engineering report.).

3.5 Construction of Abattoir

The existence of a market place at Mararaba and by extension the presence of butchers slaughtering and marketing beef necessitated the need for having a centralized butchery/slaughter house. This prompted the idea of inclusion in the upgrade project a modern abattoir to be located along Keffi – Abuja road east of Mararaba town to cater for the need of the butchers while ensuring that a clean and safe beef is sold to the populace.

The proposed abattoir is designed to consist of a modern building with a properly designed disposal system for liquid waste (see layout in the accompanying Engineering report.). It is expected that most of the solid waste will be recycled and hence no special disposal facility is required in that regard. Slaughter activity being a job dealing with a lot of blood and other waste matter, large volume of water is required and with that in mind, a borehole is proposed

to cater for the water needs of the operators of the facility.

The most suitable of the following modes of operation of the facility will be adopted when finally comes on stream:

i) The facility to be operated and maintained by the butchers association since they have direct interest in operating and maintaining it.

ii) The facility be operated and maintained by a private enterprise that will then charge the butchers for each animal slaughtered.

In either of the aforementioned situations, proper house keeping must be ensured considering the direct health implications the operation of the facility has to its products consumers. The abattoir will be operated and maintain by private operator according to the maintenance schedule specified in the accompanying operation and maintenance manual.

3.5.1 Potential Accidental Events

As stated earlier, the abattoir is proposed or designed as a modern facility and hence its operation is expected to be mostly mechanical.

For this reason therefore, the operators must be well trained to avoid incidence.

The main potential accident in the facility is the floor i.e. concrete or tiles and the animals to be slaughtered. To avoid or minimize incidences in these areas, slaughtering must be done with utmost care while at the same time the animals should be handle with great care so as not to frighten them.

CHAPTER FOUR

4.0 CONSULTATION

4.1 Identification of Stakeholders

Development activities have the potential to impact the economic, social and cultural aspects or categories of a community or communities, where such activities are taking place. Therefore, there is the need to take into consideration public concern during project development, especially at the initial stages of the process of environmental Assessment. A consultation programme could facilitate this. For the purpose of this project, the stakeholders identified are;

- The host communities of New Karu and Mararaba
- Nasarawa State Government
- Nasarawa State Government
- Butchers Association of Karu and Mararaba
- Community Technical Committees
- Greater Karu Urban Development Authority

4.2 Consultation with Stakeholders

The above mentioned stakeholders were severally consulted and informed about the proposed project, its

positive and negative consequences were discussed and deliberated upon and acceptable implementation procedure was unanimously accepted.

The Local Council, the State Government and the were the first to be consulted being the bodies responsible for the project funding. While the inhabitants of the New Karu and Mararaba were consulted using an informal structured interviews administered strategically.

4.2.1 Objectives of Consultation Programme

The main objectives of consultation programme are:

i) Provision of information to satisfy public concern, particularly to the principal stakeholders (and obtain input in respect of their concerns)

ii) To avoid conflict by addressing issues promptly.

iii) Identify social conditions of the host communities and;

iv) To identify best ways of implementing project.

4.2.2 Organisation

New Karu and Mararaba townships are located in Karu Local Government Area of Nasarawa State of Nigeria as earlier mentioned in this report.

They are two independent communities traditionally each with its traditional ruler.

The two communities are rapidly expanding due to their proximity to the Federal Capital, Abuja making it increasingly difficult to identify their individual boundaries and that of the FCT. The settlements are basically modal, taking advantage of the major transportation route to the North Eastern States and the South and most importantly, the influx of people into the FCT where there is acute accommodation problem. Presently however, these two towns are highly nucleated with several roads (thought unplanned and sometimes unmotorable) traversing their various sections.

4.2.3 Demography

The present populations of New Karu and Mararaba has been estimated to be 450,000 inhabitants.

4.2.4 Education

Education wise also, despite the population of Mararaba, there is single public primary or

secondary school. All the schools including Mararaba Primary and Secondary school, Abuja International Primary and Secondary school, Ademola Adeoye Nursery and Primary school etc. are privately owned.

4.2.5 Social Amenities

Also amenities such as telephone are completely non-existent while those that exist e.g. electricity are highly epileptic. Social amenities e.g. Cinema halls, parks and other recreational centres are non-existent.

4.2.6 Infrastructure

There is an obvious lack of good and motorable roads after leaving the major highway. The streets are very narrow criss-crossed by open gutters in some places with clear lack of drainage facility. Water supply is equally a serious problem in these areas/communities as virtually every household depends on water vendors for its domestic water needs.

Housing condition at these communities are below any urban standard, at best could be considered

as potential disasters except in few cases where concrete houses are build. In addition, the available houses are being over stretched of their carrying capacity with an average of four (4) to six (6) people occupying a room.

4.2.7 Health Conditions

Health services at both communities are mainly provided by privately own clinics such as Adonai, Island and Savannah clinics amongst others. There is clear absence of public or Government owned health centres in Mararaba except the one at Karu.

Also, the sanitary condition for the two (2) communities – Mararaba and New Karu appear quite unsatisfactory or unsafe to be considered a healthy environment. Wastes of all kind are dumped uncontrollably in these communities. Sewage disposal is not quite different from that of solid waste except in some cases where in-built toilet facilities are provided in flush system and pit type.

The informal interview revealed that the prevalent causes of morbidity in the population were as a result of communicable diseases those related to environmental cleanliness and these include: Cholera, Malaria, Diarrhoea, Cough, etc.

Major health hazards encountered in the study area were invariably those from the unsanitary nature of the neighbourhoods, streets and residential and commercial premises. Another source of potential available drinking water from water vendors whose priority is to make good sales and money with no regards to the quality of the water they sell.

4.2.8 The Economy

The inhabitants of the communities under review obtained their lively hood from largely from provision of services and exchange of goods. As explained earlier in this Chapter, most of the inhabitants are either government workers, those working with construction firms and specialized services providers or traders. Most of these people shuttle daily to and from the city centre

where their offices are located with few others running their businesses in the locality.

4.2.9 Cultural Heritage and Quality of Life

The astronomic growth in population within a short time span resulting from influx of people into the FCT greatly affected the old setting of these communities. Prior to the movement of seat of Government to Abuja in 1992, the communities were basically agrarian with life centred on neighbourhood and family ties and the economy simply rural. The way of life was as typical and as simple as found in any Nigerian rural settlement with celebration of naming and wedding ceremonies and the yearly Sallah and Christmas celebrations.

However, since the 1990s when Federal Government establishments moved from Lagos to Abuja, the situation changed drastically. The once simple rural life changed to a typical Nigeria city life especially with the quality of the population coming in on daily basis. Also demand for essential basic services increased especially on aspect of housing, roads and drinking water. The

major ethnic groups found in the two communities presently are Gbaggi, Koro, Gwandara, Yeskwa, Gade, Mada, Eggon, Igbo, Hausa, Yoruba and a host of others.

The condition of decay and insufficiency of available infrastructure including good roads, housing, sanitation and health facilities no doubt give clear picture of poor quality of life. Although there exist a number of private clinics and hospital, access to good medical care to most of the inhabitants remained a mirage considering the high cost of securing or payment of the available services. Acute shortage of potable water and terrible sanitation problems re-enforced the obvious fact of low quality of life in the communities.

CHAPTER FIVE

5.0 ENVIRONMENTAL STATUS

5.1 Environmental Data Acquisition

The Chapter presents environmental data characteristics of the proposed projects area, which will be used as a benchmark for future changes that may arise due to the project implementation. A multidisciplinary approach was adopted for the collection of the environmental data and the process include:

- Field data collection/survey/ground truthing.
- Desk top/Literature search.

The data obtained (physical, chemical and socio-economic) through the above-identified methods were integrated and incorporated in the report. The activity was carried out in May 2001, which followed the initial field reconnaissance through the two communities and their environs.

5.2 Climatic Characteristics

The study area is influenced by two seasonal periods, the dry and wet seasons. The dry season is the dominant season and lasts from November to April. The period is

characterized by hot and dry Northeast trade winds. Heavy down pour and thunderstorms characterizes the rainy season, which begins in May and last through October, especially at the beginning of the season. The season is influenced by the southwesterly, which is a moisture-laden air mass. On the other hand, the temperature regime in the area also follow the pattern explained above i.e. higher temperatures are experienced during the dry season especially at the tail-end of it while lower temperatures are experienced at the middle of the wet season to the beginning of dry season.

5.3 Wildlife and vegetation characteristics

The study areas fall within the larger vegetation zone of Northern Guinea Savannah characterized by tall woody trees and grasses. However, due to its proximity to the well-developed FCT and the continuous pressure/demand of land for building purposes, the vegetation has been seriously or massively depleted. Presently, large expanse of land could be seen in the area with bare surface almost devoid of vegetation.

Consequently, it could be deduced that the area is sparsely vegetated and as such vegetation resources are of less significance.

Wildlife distribution in the study area followed the same pattern with vegetation. Prior to movement of FCT to Abuja, wildlife was a common scene in the area. However, as their habitats got threatened, a lot of them migrated further into the bush while many others were hunted down. At the moment and especially during the field study no single wildlife was observed most probably due to the fact that their habitats have been over taken by human developments.

5.4 Hydrology

Locating a stream or river in an around Mararaba or New Karu proved a Herculean task during the field visit. However, a dry valley was observed which probably comes alive during the rainy season. Thus, the area could be said to be devoid of rivers and streams.

CHAPTER SIX

6.0 PONTENTIAL AND ASSOCIATED IMPACTS ASSESSMENT

6.1 General

All physical development activities that border on the environment no matter their usefulness to the people have some kind of negative impacts that come with them. In this light, the proposed activities i.e. road construction, boreholes drilling, construction of public conveniences and the abattoir could be said to have potential impacts to both the environment and the communities. Thus, this Chapter will dwell mainly on the impacts associated with the implementation and operation of the projects.

6.2 Identification and classification of potential impacts.

The key environmental and socio-economic components used as indicators of potential changes in the communities are as shown in the table below.

Environment/socio-economic components and potential impact indicators

Environmental/Socio-economic component	Potential Impact Indicators
Socio-economics	Population, Health and safety,

	Infrastructure change and Aesthetics.
Water Quality	Physic-chemical Characteristics (Improved drainage)
Air Quality and noise level	H_2S, NH_3, NOX, SPM and Noise level

The potential impacts of the proposed project are variegated and were identified through the interfacing of the project activities and the social and environmental components. Based on this, the following types of potential impacts were identified.

- Direct Impact – Impact resulting from the consequences of the activities of the activities.
- Indirect Impact – an impact that is at least one step away from the project activities.
- Localized Impact – an impact that is felt within the immediate vicinity of the projects.
- Short term Impact – an impact causing temporary effect and lasting for the period of the activities.
- Long term Impact – an impact lasting beyond the project activities.
- Positive Impact – Beneficial and positively affecting the communities and the environment.

- Negative Impact – adverse and negatively affecting the people and the environment.

The table below is the checklist for potential impacts of the project activities.

Activity	Potential Impact	Adverse	Beneficial	Direct	Indirect	Localized
Construction of roads	Lowing of air and other particular matter (smoke)	✔	-	✔	-	✔
	Increase in background noise level resulting from equipment movement	✔	-	✔	-	✔
	Soil erosion resulting from constitution in the rainy season or improper method thereby exposing the soil	✔	-	✔	-	✔

	Damage to aesthetic through deep and cuts, major fills and spoil deposit	✔	-	-	✔	✔
	Facilitating easy movement on completion of the road.	-	✔	✔	-	✔
	Possible influence to influx of people into the area thereby stimulating other economic ventures.	-	✔	-	✔	✔
	Possibility of employment opportunity.	-	✔	✔	-	✔

	Increase in accident risks resulting from increased road traffic.	✔	-	-	✔	✔
Boreholes construction and operation.	Provision of clean water on completion of work.	-	✔	✔	-	✔
	Influencing personal hygiene of the inhabitants of the communities due to increased water quality availability.	-	✔	-	✔	✔
	Stimulating local entrepreneurships bordering on water supply /availability.	-	✔	-	✔	✔

	Provision of employment opportunity during operation	-	✔	✔	-	✔
Construction and operation of public conveniences	Improvement of sanitary conditions of the area through centralized sewage collection.	-	✔	✔	-	✔
	Provision of cheap and hygienic toilets and bashes for the communities.	-	✔	✔	-	✔
	Possible contamination of under ground water through see-page of soakaways.	✔	-	-	✔	✔

	Possibility of employment opportunity for operation and maintenance.	-	✔	✔	-	✔
Construction and operation of abattoir.	Possible increase in foul smell if waste from animal parts are not properly collected and disposed.	✔	-	-	✔	✔
	Provision of hygienically prepared beef for the consumption of the people.	-	✔	-	✔	-
	Generation of employment opportunity for the operation of the facility.	-	✔	✔	-	✔
Waste Dump	Improving the aesthetic of the communities.	-	✔	✔	-	✔

	Provision of employment opportunities during the construction and operation periods.	-	✔	✔	-	✔
	Possible contamination of underground through sea page of leachete.	✔	-	-	✔	✔
	Improving air quality by removing rotten materials from the streets and hence improve health condition of the people.	-	✔	-	✔	✔

IMPACT PREDICTION AND SIGNIFICANCE

A method (Rau and Wooten, 1990) incorporating a list of project activities/actions with a checklist of environmental indicators (that may be affected) in a matrix format, was adopted for the prediction of impact levels. This follows the identification of cause-effect relationships between specific project activities/actions and potential environmental impacts. The entries in a cell of the matrix represent effect relationship.

The measures of impact level, in each case, was based on:

- Likely extent of impact
- Probable severity
- Sensitivity rating of the environment
- Nature and quality of activity impacting
- Legislative requirements

In addition, a scale of A to C was used in ranking the potential impacts thus:

- A = Low impact
- B = moderate impact
- C = Significant impact

Also, positive (+) and negative (-) signs were used to denote potential beneficial and adverse impacts respectively.

PROJECT ACTIVITY IMPACT MATRIX

Environmental Components	Project Activities				
	RC	WSP	PC	ACO	WDCO
Hydrology/Ground water quality.			B^-		C^-
Surface water quality.	A^-		C^+	A^-	B^+
Air Quality	C^-		B^+	B^+	C^+
Aesthetics	B^+	B^+	C^+	B^+	C^+
Noise level (on site)	B^-	A^-			
Socio economics					
Health Hazards	A^-				B^-
Visual Intrusion	B^-				
Employment/Income generation.	B^+	A^+	A^+	A^+	A^+

Key:

Project Activities:

RC = Road Construction

WSP = Water Supply Project

PC = Public Conveniences

ACO = Abattoir Construction and Operation

WDCO = Waste Dump Construction and Operation

Matrix Cell Entries

A = Low impact

B = Moderate impact

C = Significant impact

(+) = Beneficial

(-) = Adverse

POTENTIAL IMPACT INDICATORS FOR PROJECT ACTIVITIES

Different components of the project i.e. road construction, boreholes construction, public convenience, abattoir and the waste dump have different potential negative consequences to environment and social setting of the area. These potential impacts could be seen to start manifesting before they eventually dominate or show conspicuously. The table below shows a matrix of potential impact indicators to the various forms of project activities. It is worth nothing that due to the positive impacts the project activities have on the communities, executing of any of its component could lead to increased number of people been attracted to the communities.

Potential Impact Indicators Matrix

S/No.	Activity	Potential Impact Indicators
1.	Road construction	Percentage particulates matter increase in the atmosphere.
		Hearing impairment to increase noise level resulting from equipment movements.
		Population increase in the two communities.

		Increase in vehicular movements on the roads that could lead to possibility of more accidents.
2.	Boreholes construction	Accumulation of water in a localize ponds leading to creation of breading grounds for mosquitoes and other insect vectors – i.e. increased mosquito population.
		Population increase in the communities.
3.	Public Conveniences	Reduction in level of excreta smell and sighting in the area.
		Change of drinking water taste from boreholes around toilets areas.
		Change in population (increase) of the two communities.
4.	Abattoir construction and operation.	Elimination of foul smell around the area.
		Improved quality of meat products obtained in the area.
5.	Waste Dump construction and operation.	Improvement in aesthetics of the streets in the area.
		Foul smell reduction on the streets of the communities

		Change in chemical constituents of underground water around the waste dump site.
		Change in water taste from borehole around the dump site.

CHAPTER SEVEN

7.0 MITIGATION MEASURES

The timing of the implementation of the mitigation measures will be mainly the construction phase. However, for waste management aspect and the abattoir operation, mitigation measures will be implemented throughout the project life span.

The implementing institutions for these identified mitigation measures are the host communities who will look after the abattoir and the water supply system and the Nasarawa State Government through other agencies such as the State Environmental Protection Agency, the Greater Karu Urban Development Authority and other relevant agencies will take care of the waste management and road maintenance aspects. These institutions (the communities and the State Government Agencies) will monitor and maintain the operation of these facilities as well as the implementation of the mitigation measures.

Also, for the training of personnel to handle the implementation of the mitigation measures, the Nasarawa State Government has a training programme in place through the human resources development department that will

identify the timing and kind of training to be given to the implementing officers. The Government will also be responsible for the cost of the training of these officers. However, for the purpose of these projects, training and waste management and community health education are of paramount importance which should be given priority attention.

The impact prediction exercise indicates that the project activities despite having more positive impacts have some negative impacts associated with its execution and operation. In the light of this, the potential negative impacts and their mitigation measures are described in the following sub sections.

7.1 Dust Generation and soil erosion during road construction

Potential impacts

The existing air quality appears to be of impurities such as suspended particulate matter (SPM) for the two communities except for gaseous/vehicular emission resulting from high traffic along Abuja – Keffi highway. The potential hazard involve in road construction include generation of dust and carbon monoxide. The dust is of particular interest because of its potential to severely impair air quality with second-order effect of adverse

impact on human health especially to the people living down wind. Also, the activity could lead to soil erosion and degradation as well as severe damage to the ecosystem.

Mitigation measures

The mitigation measure for dust and other gaseous emission during project execution shall include the following:-

- Use of efficient filters in the equipments to be used for the construction work as well as regular checks and maintenance.
- To ensure that dust generation is reduced to the barest minimum, water will be sprinkled on the surface just before embarking on any earthwork.
- The use of fillers by the workers is to be made compulsory to reduce the inhalation of dust, which could cause trachea infection.
- Adequate drainage will be provided to protect land and prevent erosion.

7.2 Creation of Artificial Lagoon around boreholes resulting from spilled water.

Potential impact

Water will be sold to individuals and water vendors, which will be collected directly from, tap heads connected from the overhead tanks. This will lead to spillage, and so also when any of the taps is bad and not repaired or blocked immediately thereby creating a lagoon of stagnant water. An environment is thus created for mosquitoes breeding (and other disease vectors) which will consequently transmit diseases to the people.

Mitigation measures

Mitigation measures for artificial lagoon created through spilled water have been conceived to include the following:

- Adequate drainage facility shall be created around the borehole to ensure that any water spilled is drained as quickly as possible to avoid stagnation and subsequent mosquitoes breeding.
- An attendant (operator) shall be employed to operate and monitor the facility. This will assist in observing and reporting any faulty tap for prompt repair. Also, to avoid constant break down (spoilage) of the tap, the operator shall be the only person to service customers.

7.3 Contact of sewage at the public conveniences with under ground water

Potential impacts

Since the public conveniences facilities are going to be located very close to the boreholes for reasons of availability of water, it is not impossible as the sewage from the soak away could find its way into the ground through see-page and get into contact with the ground water thereby polluting it. This will have negative consequences on human health through contacting diseases such as cholera and other diseases.

In addition to the above, the soak away if not properly covered or constructed, could be releasing to the surrounding environment contaminated air, which could also have detrimental effect on human health.

Mitigation measures

To ensure that above potential impacts are mitigated, the following measures were conceived and shall be adopted right at the commencement.

- The floors and sides of the septic tank will be concretised to ensure that no sewage got leaked into the surrounding so as not get in contact with under ground water. It should also be noted that the toilets

and the septic tanks shall be located against the direction of underground water and away from the borehole. Also living of the well will be ensured extending the casing above ground level and capping it properly.

- The cover slab will be made of reinforced concrete and venting will be high up to the level of roof top to avoid release of contaminated gases to the surrounding and ensuring high up dispersion.
- Water quality will be continuously monitored to ensure that it is both safe and desirable for the community for its various uses.

7.4 Littering of abattoir surroundings with animal wastes and unwanted parts.

Potential impact

Animal parts and their associated wastes are organic in nature and on decay they release some forms of gases and have foul smell. This makes both passers-by and those living around the area very uncomfortable. In other words, fresh and clean air needed for normal metabolic process will not be available to the affected person as such their health will be affected. Problem of dermatitis caused by skin infections in animals as well as the nature of the floor

(slippery) and cuts and abrasions from machinery are also potential impacts of the project.

Mitigation measures

Measures to mitigate the above impact have been identified and include;

- All animal parts (unwanted) shall be collected daily and taken to the primary waste collection centre (the nearest to the abattoir) for onward delivery to the waste dumpsite.
- Good house keeping and enforcement of health and safety standards shall be ensured.
- The inside of the facility shall be thoroughly washed daily and regular disinfect ion shall as well be carried out to ensure that all wastes are removed and that disease vectors are eliminated.

7.5 Leachete contact with under ground water at the Waste Dump site

Potential impact

Continuous dumping of wastes especially those of organic origin in the dumpsite have the potential of increasing bottom or floor level temperature. This situation coupled with lack of air circulation facilitates the process of decay and decomposition of materials, which in the process

release their inherent water content. This then got mixed with other harmful or toxic materials around forming aqueous solution and filter into the soil thereby contaminating and subsequently underground water. Also, spread of diseases and chemical contaminants by animals feeding on the dump is another potential impact of the project which when the affected ones are consumed could negatively impact on human health.

Mitigation measures

Although the waste dumpsite is proposed to be far away from the communities, the impacts it will have were not overlooked. In this regard, the following were considered:

- Wastes taken to the dump site shall immediately be burnt to avoid piling of wastes and subsequent decomposition of materials.
- Concrete flooring shall be considered before putting into operation to ensure that leachete are channelled to avoid sea page into the ground.
- Potential Hazardous wastes shall not be disposed off in the dump site.

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COST ESTIMATE FOR MITIGATION MEASURES

Project Component	Mitigation Measures	Quantity	Unite Rate	Amount	Responsible Authority
1. Water supply	-Adequate drainage of borehole sites		Part of construction cost		Host Community
	- Flushing & clearing of screens annually.	Lump sum	150,000.00	697,500.00	
	- Daily supervision	Lump sum	547,500.00		
2. Construction of Abattoir	- Daily collection & disposal of primary wastes by labourers (Monthly)	12 Months	40,000.00	480,000.00	Local Enterprises
	- Dislodging Monthly	"	20,000.00	240,000.00	
3. Roads & Drainages	Use of filters and water against dust during construction		Part of construction costs		Contractor
4. Public Toilets & Baths	Prevention of leakages in making adequate provision of preventive measures at construction stage		Part of construction costs		Client
	- Monthly cleaning	Monthly	20,000.00	240,000.00	Local Enterprises
	- Monthly dislodgement	"	15,000.00	180,000.00	"
5. Solid Waste management	- Concrete flooring		Part of construction costs		Client
	- Refuse collection, plants & equipment	6 units	-	₦110,775,000.00	

CHAPTER EIGHT

8.0 ENVIRONMENTAL MANAGEMENT

Environmental management as an instrument of control and quality improvement is aimed at all probable or potential impacts of a proposed project with the goal of avoiding or minimizing such impacts. This instrument helps an organisation to set environmental policy and objectives, to establish and assess the effectiveness of procedure and regulatory requirements.

This EIA report is intended to provide the environmental aspects of the planning and execution of the project, which is in compliance with regulatory requirements.

8.1 Environmental Management Plan (EMP)

The considerations for environmental management are an integral part of the detailed project activities, designs and operations. The EMP should ensure protection of the environment and human health from project activities and its objectives are:

- Minimization of environmental risk
- Reduction /elimination of adverse impacts

The achievement of EMP objectives shall be facilitated by setting out programme (consisting of the policy and principles) to which the projects shall conform and defining the means by which this programme shall be implemented. These policy and principles shall form the key reference document for ensuring that environmental issues are addressed throughout the projects' life cycle and shall include the major aspects described below;

8.1.1 Potential Projects Impacts Identification

The potential environmental Impacts of the proposed projects have been identified and possible mitigation measures proffered (Chapters 6 and 7 respectively).

8.2 Contingency plan for the proposed activities

Road Construction

Despite all the mitigation measures to reduce or eliminate dust during this activity, it is not unlikely that highly sensitive asthmatic workers could not get an attack with slight rise in dust level. For this reason, First Aid and other related drugs will be made available on site to handle emergencies. The essence of providing overhead storage tanks attached to the borehole is not only to store water while the pumping machine is working but also to ensure that water is made available even when repairs are been

carried out. Thus, the tank is serving as a contingency and ensures continuous supply of water.

Also the overhead storage tanks proposed to be attached to the boreholes will act as a contingency measure/plan in event of system failure. Thus the stored water will be used to bridge the gap of shortage supply from the borehole for the period it will be under repairs. In other words, consumers may not notice that the borehole was faulty as supply will be maintained.

8.3 Environmental Monitoring/Inspection

Environmental monitoring/inspection is an aspect of the Environmental Management Plant (EMP) and its objects include:

- To assess the effectiveness of the mitigation measures
- To verify the operational performance and impact of the project components and
- To determine whether observable environmental and social changes are the results of the project activities or natural variation.

The below table provides a comprehensive monitoring plan for the project.

Environmental Components	Parameter to be monitored	Monitoring Frequency	Regulatory Limit (FMENV)	Activity Phase
Ambient Noise Level	Noise Level	Daily	90 dB(A) for 8-hr. working period	Construction Phase
Gaseous Emission	Suspended Particulate Matter (SPM)	Bi-weekly	250mg/m^3	
	Carbon dioxides (CO_2)	Bi-weekly	10% by volume	
	Carbon monoxide (CO)	Bi-weekly	11.4mg/m^3 (Daily average of hourly Ambient Air).	
	Nitrogen oxides (NO_2)	Bi-weekly	350-1,000 mg/m^3	
Ground Water Quality	Arsenic	Quarterly at waste dump site	0.05mg/m^3	

	Lead (Pb)	"	0.05mg/m^3	Operational Phase
	Other Heavy Metals (Total)	Quarterly	10mg/m^3	
	PH	"	6 - 9	
Gaseous Emission	Same as those during construction.	"	As indicated in the construction phase	
Physical Environmental Improvement	Aesthetics	"	-	
Socio economic	Population and attitudinal changes	"	-	

It could be observed from the table above that frequency of monitoring of parameters is more during construction phase than the operation phase. This is for the fact that most of the projects' activities will take/require short time duration to be executed and to really capture their impacts, regular monitoring shall be employed. The operational phase on the other hand, is a long term phase and that the quarterly measurement of the parameters is expected to give unbiased result.

Further, it is expected that strict adherence to the implementation of the EMP will ensure:

- Early detection of subtle alternatives in environmental quality.
- Compliance to all regulatory limits and standards.
- Detection of inadequacies of mitigation measures recommended.

CHAPTER NINE

9.0 CONCLUSION

The Environmental Impact Assessment has been carried out in accordance with the National, International and State Regulatory Requirements on the environment. It is intended to provide the Environmental and Social aspects of the planning and execution of the proposed projects.

The potential environmental and social impacts of the proposed project on the existing settings of the project areas have been identified and evaluated. Also, mitigation measures have been proffered for the potential impacts. Furthermore, an Environmental Management Plan has been developed and provided for the projects. It can therefore be concluded that the projects will cause no serious damage to both the environment and social settings of the areas if executed in accordance with the EIA provisions, including the EMP.