DRAFT INITIAL ENVIRONMENTAL EXAMINATION REPORT

Rural Water Supply and Sanitation Project, Water Supply and Sanitation Sector Reform Programme Phase II, Nigeria.

SUSTAINABLE ENVIRONMENT DEVELOPMENT INITIATIVE

OCTOBER, 2013

CONTENTS

List of Acronymns

DRR	Disaster Risk Reduction
EA	Executing Agency
EDF	European Development Fund
EIA	Environmental Impact assessment
EMP	Environmental Management Plan
EO	Environment Officer
EU	European Union
FGN	Federal Government of Nigeria
IEE	Initial Environmental Examination
LGA	Local Government Area
M&E	Monitoring and Evaluation
NWRI	National Water Resource Institute
RUWASSA	Rural Water Supply and Sanitation Agency
RWSS	Rural Water Supply and Sanitation
UNICEF	United Nations Children's Fund
WASH	Water, Sanitation and Hygiene
WASHCOM	Water, Sanitation and hygiene Committee
WSS	Water and Sanitation Sector
WSSSRP	Water Supply and Sanitation Sector Reform Programme

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Executive Summary

The Rural Water Supply and Sanitation Project have been designed to contribute to the rural water supply and sanitation sector's reform under the Water Supply and Sanitation Sector Reform Programme, Phase II (WSSSRP II). The project will contribute to strengthening social bond and peace building among the beneficiaries in the project States through local capacity building and provision of access to improved sources of safe drinking water and basic sanitation in 12 self-selected Local Government Areas in the project States, namely: Anambra, Cross River, Osun, Jigawa, Kano and Yobe. The purpose of this Initial Environmental Examination (IEE) is to provide environmental threshold determinations for the proposed Rural Water Supply and Sanitation Project (RWSSP) in the selected communities of 12 self-selected Local Government Areas (LGAs) of five European Union (EU) WSSSRP II project States in Nigeria. The IEE covers all the activities that are proposed for the programme, so as to ensure environmentally sound project design implementation. Field visits were conducted by the IEE consultant in two focal communities in each State. The visits were to collect environmental information about the proposed project and its potential impact areas. The methodology adopted for impact identification and prediction were checklists and questionnaire methods. The impacts were classified in terms of level (low, moderate and significant). The likely impacts/issues of the proposed project construction as well as operation have been described covering both adverse and beneficial ones. In-depth interviews were conducted with traditional rulers and other key stakeholders (Youth and women leaders). In schools, interviews were conducted with head teachers. These served as key stakeholders where the project Water, Sanitation and Hygiene (WASH) facilities would be constructed. The data collected were analyzed to identify both the negative and positive impacts of the project on the environment. The project activity impacts on the environmental components indicate that the construction phase is relatively more severe than the operational phase impacts. During the construction phase, the worst affected environmental components are air, noise, soil and resource depletion. The operational phase is characterized by an overall positive impact on public health and safety due to augmentation in water supply, thus reducing the spread of disease vectors and unsafe water sources. An Environmental Management Plan (EMP) has been developed to address mitigation measures/actions to be taken during construction and operation phases of the project. The EMP proposes an institutional framework within the State RUWASSA's and the local government WASH units to carry out the environmental and social mitigation tasks and coordinate its implementation, monitoring and evaluation.

The IEE has assessed the environmental impacts of all infrastructure proposed by the project and has concluded that all negative impacts will be successfully mitigated and that the project is expected to deliver major benefits to the benefiting communities and schools.

Introduction

I. Project Description

The Water Supply and Sanitation Sector Reform Programme, Phase II (WSSSRP II) is a successor to the 9th EDF Water Supply and Sanitation Sector Reform Programme (WSSSRP). It aims at consolidating the achievements of the predecessor programme with a view to addressing most of the remaining fundamental issues of the Nigerian water and sanitation sector; including: lack of or inadequate legal and institutional framework at both the federal and state levels. It intends to sustain the improvements on water governance made by WSSSRP at the federal level and in the EU focal states[1] through the provision of technical assistance and capacity development to ministries and agencies responsible for water resources, water and sanitation services delivery at the federal level and in the focal states. The rural component of the programme will be implemented by UNICEF and this will cover support for capacity building of state and local governments' MDAs responsible for rural water supply and sanitation interventions.

The rural component will also support to strengthen sector coordination through building of synergy across all level, contribute to programme steering committees, participation in advocacy as well as programme reviews; promote synergy in programme implementation and effective coordination between the small town and urban component of the programme through joint planning, review and experience sharing at all levels. It will also support in the establishment and running of comprehensive and coherent planning, monitoring and evaluation system. This will ensure that programme plans are integrated into the overall State sector plans and budgets, while programme best practices are shared amongst the various players with a view to harmonized programme approaches. These will be implemented by UNICEF through a combination of partially decentralised management and joint management with the EU.

II. Purpose of Initial Environmental Examination (IEE) Study

In recent years, environmentally sustainable development has remained one of the major challenges facing development programming in most developing countries, including Nigeria. Accordingly, the Ministry of Environment has introduced a variety of instruments into the country's development planning. Initial Environmental Examination (IEE) is one of the tools used for environmentally sustainable development planning and intervention for small scale development projects.

Nigerian laws and regulations require that environmental impacts of development projects are identified and assessed as part of the planning and design process, and that action is taken to reduce those impacts to acceptable levels. This is done through the environmental assessment process, which has become an integral part of project development and implementation globally.

The purpose of the IEE study is to:

The purpose of this IEE is to provide environmental threshold determinations for the proposed Rural Water Supply and Sanitation Project (RWSSP) in the selected communities

[1] *The focal States are Anambra, Cross River, Jigawa, Kano, Osun and Yobe States.*

of 12 self-selected Local Government Areas (LGAs) of Six EU WSSSRP II project States (Anambra, Cross-River, Jigawa, Kano Osun and Yobe) in Nigeria. The IEE covers all the activities that are proposed for the program, so as to ensure environmentally sound project design implementation.
The norms for this study will be guided by the National Environmental Impact Assessment Guidelines. The general objectives of this IEE would be:

(I) Identify and analyze the potential environmental impacts (whether positive or adverse) on physical, biological, socio-economic & cultural resources, from the location, design & construction of project structures & associated facilities in the project areas.

(II) Propose the suitable mitigation measures for minimizing the potential negative environmental impacts and to augment the positive ones to improve overall performance of the project.

(III) Define and prepare appropriate environmental monitoring and management plan.

(IV) Determine the potentials for the improvements to natural resources and environmental management and socio-economic benefits to the communities in the project areas and its surroundings.

(V) Receive public feedback for safeguarding the natural environment with least negative impact on its natural settings and also to adequately assess & document community requirements relating socio-economic & cultural aspects in the project areas.

III. Nigerian National Laws on Environment

National Legislations

- Environmental Impact Assessment Act No. 86 of 10 December 1992
- Federal Environmental Protection Agency Act No 8 of 30 December 1988 : FEPA Act, cap 131 LFN, 1990
- National Environmental Protection (Pollution abatement in Industries and Facilities generating Waste) Regulations. 1991
- National Environmental Protection (Effluent Limitation) Regulations S.I.8 (FEPA, 1991).
- National Environmental Protection (Management of Solid and Hazardous Wastes) Regulation S.1. 15
- Federal Ministry of Environment Procedural Guidelines for EIA
- Harmful Waste Act No. 42 of 25 November 1988
- Federal National Parks Act August 1991
- Forestry Act. 1958
- Land Use Act 1978
- National Policy on the Environment
- Quarries Act 350 LFN of 1990
- Environmental Impact Assessment Sectoral Guideline for Infrastructure development projects (1995) of the Federal Ministry of Environment.

National Environmental Guidelines

The introduction of guidelines and standards was part of the implementation of the National Policy on Environment and the environmental pollution abatement strategy.
The guidelines and standards relate to six areas of environmental pollution control:

- Effluent limitations.
- Water quality for industrial water uses at point of intake.
- Industrial emission limitations.
- Management of solid and hazardous wastes.
- Pollution abatement in industries.

National Environmental Protection (Effluent Limitation) Regulation S.I.6 (1991)

This regulation was issued in 1991. It provides national Guidelines and Standards for industrial effluents, gaseous emissions, noise, air quality and hazardous wastes management.

National Environmental Protection S.1 .9 (Pollution and Abatement in industries in Facilities Producing Waste) Regulations, 1991

This provides general guidelines for the containment of pollution in industries that generate harmful-wastes.

National Environmental Protection (Management of Solid and Hazardous Wastes Regulation S.1. 15

This provides general guidelines for the management of solid and hazardous wastes in Nigeria and emphasizes the followings:

Waste Notification: Industries are obliged to notify the FMENV of all toxic hazardous and radioactive wastes which are stored on site or which are generated as part of operations (Regulations 1991, Article 2).
Waste Management: With regard to waste management, a legal basis exists in Nigeria for the establishment and implementation of a cradle-to-grave' tracking system. Specifically the Solid and Hazardous Wastes Management Regulations 1991 provide for the establishment of a documentation scheme to cover the generation, transport, treatment and disposal of hazardous-wastes.

Environmental Impact Assessment Act No. of 10 December 1992
This Act provides the guideline for activities or development projects for which EIA/EMP is mandatory in Nigeria. Such developments include oil and gas fields, conversion of mangrove swamps covering area of 50 hectares or more for industrial use, Land/coastal reclamation projects involving an area of 50 hectares or more. Pursuant to this, the EIA Act No 86 of 1992 sets out the procedure for prior consideration of environmental and social issues in certain categories of public and private development projects.

Federal Ministry of Environment Sectoral Guidelines for EMP
The FEPA Act cap 131. LFN, 1990 allocates powers of environment legislation making and enforcement to the Federal Environmental Protection Agency (FEPA), now Federal Ministry of Environment. (FMENV) In-line with its functions, FEPA has published the EIA/EMP Sectoral Guidelines (revised in September 1995). The guidelines cover major development projects and arc intended to inform and assist proponents in conducting EIA/EMP studies.

Nigerian EMP Procedure
The FMENV developed a National EMP Procedure (FEPA 1985) in response to the promulgation of the EIA Act No. 86 of 1992. The procedure indicates the steps to be followed from project conception to commissioning in order to ensure that the project is implemented with maximum consideration for the environment.
The procedure for EMP involves the project proposal stage where the project proponent notifies FMENV of the proposed project in writing. The project proposal is expected to contain all relevant information on the project, including a land-use map.
This stage is followed by the screening phase, during which the Ministry will carry out, an Initial Environmental Examination (lEE) and assign the project into a category based on the following criteria: Magnitude; Extent or scope; Duration and frequency; Risks; Significance and Mitigation measures available for associated and potential environmental impacts. The location of the project in Environmentally Sensitive Areas (ESAs) is also an important criterion in project categorization. The areas categorized as Environmentally Sensitive Areas (ESAs) include coral reefs, mangrove swamps, Small islands, and tropical rainforests, areas with erosion-prone soils, natural conservation areas, etc.
There are three categories (I, II, III) In FMENV's EIA/EMP Procedural Guideline. Category I projects are subjected to full-scale EIA/EMP. It consists of, among others, construction of Roads and Infrastructure projects like, Railways, Ports and Harbours. Airports, Electrification Projects-etc.
Projects listed in 'Category' II may not require a full-scale EIA/EMP except when such a project is located in an Environmentally Sensitive Area (ESA) and in this case the project will be automatically assigned to Category I. The requirement for Category II projects is a

partial EIA/EMP. Also, mitigative measures or changes in project design (depending on the nature and magnitude of the environmental impacts) as well as further actions may be required from the proponent. Category II projects include reforestation) afforestration projects, land and soil management, small-scale irrigation and drainage, mini hydro-power development small-scale development of petroleum or related activities, etc.
Category III projects arc those expected to have essentially beneficial impacts on the environment. For projects in this category, the Ministry will issue an Environmental Impact Statement (EIS). Projects in this category include family planning programme institutional development, environmental awareness projects, etc.
Another stage of FMENV's EMP procedure, which comes up after the project proposal stage in the scoping stage, the main feature of which is that the proponent will be required to submit a Terms of Reference (TOR) for the proposed EMP study. In some cases, the Ministry may demand a Preliminary Assessment Report, and any additional information from the proponent to assist in vetting the scope and the TOR of the proposed EMP study. This stage is followed by actual implementation of the EMP study, preparation of Draft Final and Final EMP Reports, review process and approval/certification.

Other National Legislations
Apart from the FMENV guidelines highlighted above, there are other legislations that have been put in place to serve as a check on the operators of oil and gas industries. Some of these are summarized below:

Penal Code
The Nigerian Penal code makes it an offence punishable with up to 6 months imprisonment for Any person who: Violates the atmosphere in any place so as to make it noxious to the health of persons in general dwelling or carrying on business in the neighborhoods or passing along a public way or does any act which is and which he knows or has reason to believe to be, likely to spread the infection of any disease dangerous to life, whether human or animal".

The Explosives Act
This Act was promulgated in 1964 and empowers the Minister of Mines & Power (now Solid Minerals) to make regulations on the importation, manufacture, storage and use and the ownership and possession of explosives.

Endangered Species Act (1985)
The endangered species Act No. 11 of *1985* prohibits the hunting, capture and trade of endangered species.

Quarries Act Cap 385 Laws of Federation of Nigeria, 1990
The act provides for and regulates quarrying activities in Nigeria. It prohibits unauthorized quarrying activities for industrial use and diversion of water course or impounding of water for that purpose. The Act gives the Minister for Mines and Power the power to make regulations for prevention of pollution of natural water supply.

Land Use Act 1978
States that ... it is also in (he public interest that the rights of all Nigerians to use and enjoy land in Nigeria and the natural fruits thereof in sufficient quality to enable them to provide

for the sustenance of themselves and their families should be assured, protected and preserved".

National Inland Waterways Authority, Act (1997)
Act 13 of 1997 establishing the National Inland Waterways Authority (NIWA) repeals the Navigable Waterways (Declaration) Act of 1988. The NIWA is managed by a governing board, whose functions, among others, include the following:

- Serve as the body providing regulations for all inland navigation;
- Ensure the development of infrastructural facilities for national inland waterways network connecting the creeks and the rivers to meet the challenges of modern inland waterways transportation;
- It is charged with undertaking capital and maintenance dredging. and hydrological and hydrographic surveys;
- Design of ferry routes and operate ferry services within the inland waterways systems: and
- Involved in the survey, removal and receipt of derelicts, wrecks and other obstructions from inland waterways and undertake the installation and maintenance of lights, buoys. and all navigational aids along water channels

State Legislations
The Nigerian Constitution allows States to make legislations, laws and edicts on the Environment as environmental is listed under the concurrent schedule of (The 1999 Constitution.
The EIA Act No. 86 of 1992 also recommends the setting up of State Ministries of Environment (SMENV) and Environmental Protection Agencies (SEPA), to participate in regulating the consequences of project development on the environment in their area of jurisdiction. SMENVs thus have the responsibility for environmental protection at the state level within their states. The functions of the SM EN V/SEPAs include:

- Routine liaison and ensuring effective harmonization with the FMENV in order to achieve the objectives of the National Policy on the Environment;
- Co-operate with other relevant National Directorates/Agencies in the promotion of environmental education;
- Be responsible for monitoring compliance with waste management standards and;
- Monitor the implementation of the EMP and the Environmental Audit Report (EAR) guidelines and procedures on all developments policies and projects within the State.

Figure 1: The flow chart of the EMP process in Nigeria

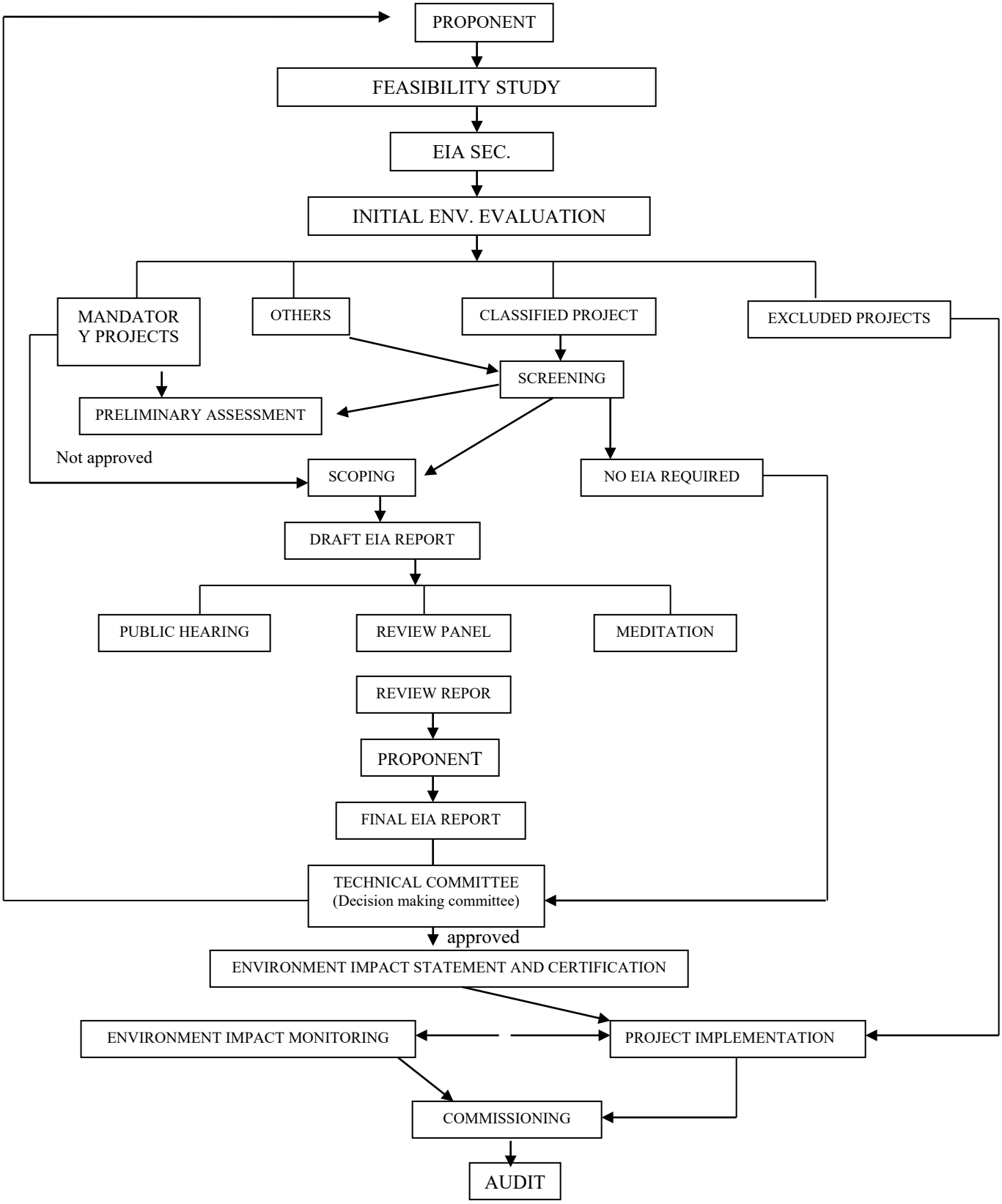
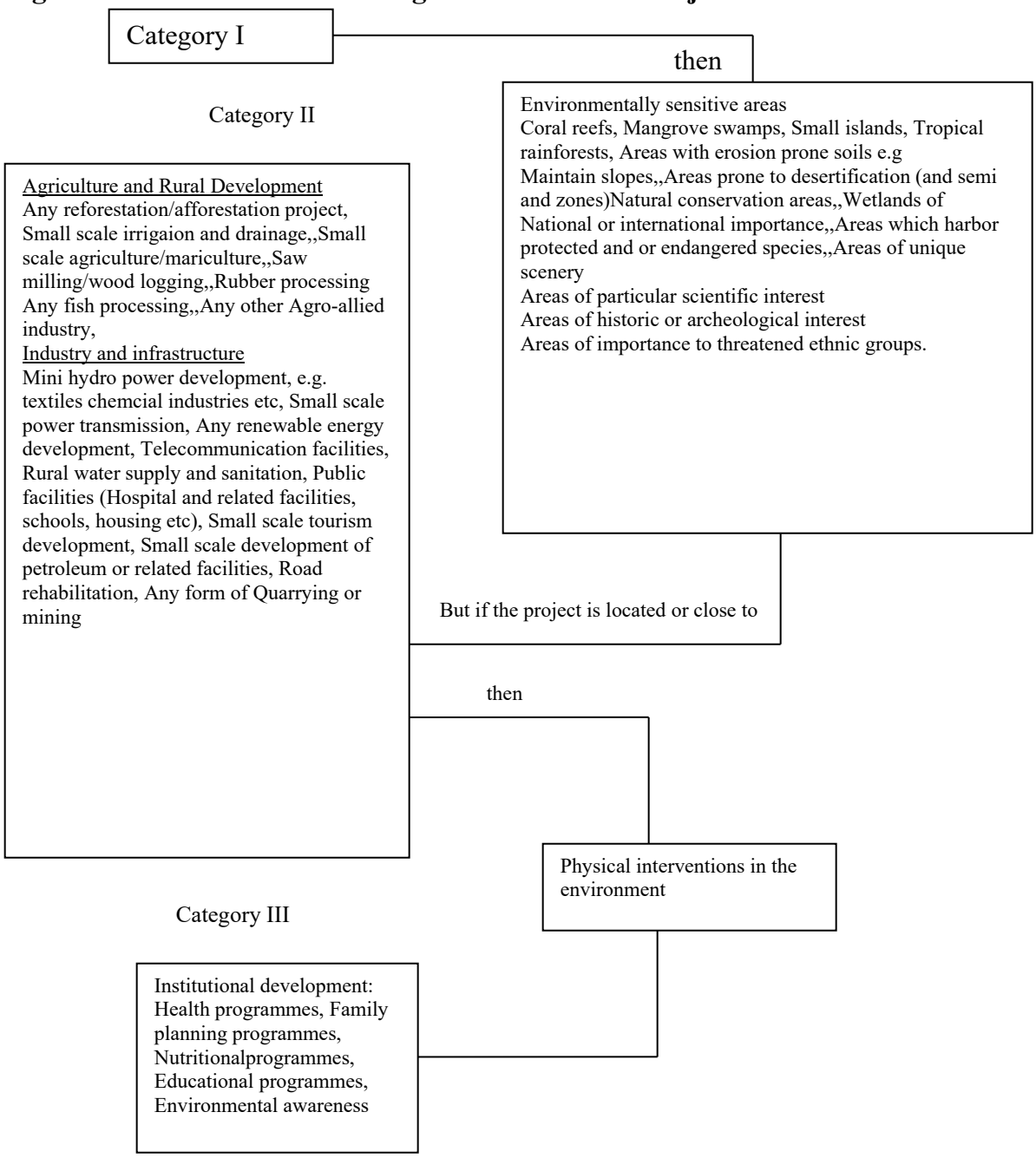


Figure 2: Checklist for the Categorisation of EIA Projects



International Standards, Treaties and Conventions

Global and Regional Treaties and Conventions are, in principle, binding in first instance on National Governments that accede to them. They are obliged to implement such arrangements through national legislation. At the international level, Nigeria is party to a number of Conventions that are relevant to the proposed development project. The more relevant ones are reviewed briefly below:

Vienna Convention for the Protection of the Ozone Layer, including the Montreal Protocol and the London Amendment

The objectives of this Convention adopted in 1985 are to protect human health and the environment against adverse effects resulting or likely to result from human activities which modify or are likely to modify the Ozone Layer and to adopt agreed measures to control human activities found to have adverse effects on the Ozone Layer.

Convention of the Conservation of Migratory Species of Wild Animals or Bonn Convention

The Bonn Convention's adopted in 1979 aims at the conservation and management of migratory species (including waterfowl and other wetland species) and promotion of measures for their conservation, including habitat conservation.

Convention on Biological Diversity

The objectives of this Convention, which was opened for signature at the 1992 Rio Earth Summit and adopted in 1994, are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources by appropriate transfer of relevant technologies.

Convention concerning the Protection of the World Cultural and Natural Heritage or World Heritage Convention

This Convention adopted in 1972 defines cultural and natural heritage. The latter is defined as areas with outstanding universal value from the aesthetic and conservation points of view.

In addition, Nigeria is a signatory to the following relevant international conventions:

- The African Convention on the Conservation of Nature and Natural Resources, The African Convention, 1968;
- The Convention Concerning the Protection of the World Cultural and Natural Heritage, The World Heritage Convention, 1972;
- The Convention on International Trade in Endangered Species of Wild Fauna and Flora, CITES, 1973;
- Convention on Conservation of Migratory Species of World Animals, Bonn, 1979.
- The Basel Convention on the Control of Trans-boundary Movement of Hazardous Waste and Disposal, 1989;
- The Framework Convention on Climate Change, Kyoto Protocol, 1995;
- The Convention on Biological Diversity, 1992.

Further to the Federal Ministry of Environment EIA/EMP procedural guideline (Category II), rural water supply and sanitation projects do not require a formal EIA. Hence the national law on EIA is not applicable to the proposed project that this IEE addresses.

IV. Review of Environmental Impacts and Sustainability of Sanitation Installations

1. Role of Vegetation Surrounding Sanitation Installations

A good vegetative cover should be maintained over sanitation installations. It is important to protect the surface from any erosion. Herbaceous, shallow rooted plants, such as flowering perennials and annuals, turf grass and many ground covers are unlikely to damage the lines (where present). In addition the vegetation will help remove excess water (Santarla, 1984). Some techniques include:

(a) Rain Gardens - Bioretention Areas

Rain gardens are shallow surface depressions that are planted with native vegetation in other to capture and treat runoff from impervious surfaces such as rooftops, streets and parking lots. Rain gardens reduce the volume of storm water runoff, reduce peak rate runoff, increase groundwater recharge, provide pollutant removal and also have aesthetic and habitat benefits. Rain gardens also can provide potential air quality and climate benefits. As water ponds at the surface, pollutants settle out, and it is filtered through soils and vegetation. The volume of runoff is reduced through surface ponding, soil storage, evapotranspiration, and infiltration. There are some downsides to bioretention areas; they require regular maintenance until vegetation is well established and they always require periodic maintenance. Plants must be carefully selected and allowed enough time to establish, and they may be costly (Santarla, 1984).

The contributing drainage area to a rain garden would be eligible to receive Impervious Area Credit. The vegetation planted in rain gardens should be preferably native, and

tolerant of salt, wet conditions, and dry conditions. Rain gardens consist of inflow areas, shallow ponding areas over planting soil, a mulch layer, vegetation, and an overflow mechanism to take larger rainfall events system or other. Rain gardens can be constructed with subsurface sand or gravel bed if additional storage capacity is required (Gary, 1977). A rain garden can be sized and shaped to fit landscape constraints, and multiple bioretention areas can be placed throughout a site to capture runoff from various surfaces. Rain gardens provide a number of benefits. Runoff velocity is reduced as it enters a rain garden, and water quality is improved.
Recommended native plant species for rain gardens are many. Annual maintenance tasks for rain garden vegetation includes: clean up, regular weeding during the growing season, cutting back perennials and pruning woody plants, plant replacement as necessary, and watering during exceptionally dry times. In addition, litter pickup and clean out of any inlets and pipes is required to keep systems attractive and functioning (Pelczar and Rodger, 1972).

(b) Green Roofs
Green roofs are rooftops that include a thin covering of vegetation which allows the roof to function more like a vegetated surface than an impervious one. The thickness of the vegetation can range anywhere from 2-6 inches, and usually contains several layers of waterproof material, insulation, growth media, fabric and the actual vegetation on top of these layers. Vegetated roofs are a form of source management for reducing the rate and volume of runoff from a precipitation event (Ronayne et al., 1984).

(c) Grow Zones
Grow zones (vegetative buffers) provide many benefits such as improved water quality, reduced flow volume and pollutant removal. Grow zones have low long-term maintenance needs and costs are relatively low, and they can provide aesthetic and habitat benefits as well.

(d) Porous Pavement
Impervious surfaces such as roads, buildings, parking lots and sidewalks prevent rainfall from entering the ground. This significantly increases the amount of runoff into local water bodies. Porous pavement allows water to infiltrate, and percolate through the soil layers, recharging our aquifers. Conventional paving materials are less expensive than porous pavement materials, but in the long run porous systems can lower development costs by reducing the need for conveyance and detention of storm water (Gary, 1977).

(e) Tree Trenches
A tree trench is a linear water management feature consisting of trees planted in several feet of amended planting soils, and it is designed to capture runoff from adjacent impervious areas. Tree trenches are applicable in linear areas with limited space to manage water (Santarla, E. 1984).

2. Sanitation technologies include:

(i) Ventilated Improved Pit (VIP) toilet

Principles of operation	**Operational and institutional requirements**	**Costs**	**Sustainability/comment**
Waste drops into the pit where organic material decomposes and liquids percolate into the surrounding soil. Continuous airflow through the top-structure and above the vent pipe removes smells and vents gases to the atmosphere. A darkened interior is maintained causing insects entering the pit to be attracted towards the light at the top of the vent pipe and trapped by the fly screen. A separate hand washing facility is required.	Locate to prevent ingress of storm water to pit, as well as in consideration of local groundwater use and conditions. Does not accept domestic wastewater. Cannot be placed inside the house. Ensure access for mechanical pit-emptying and availability of sludge treatment and disposal where required. Ensure repair/replacement of damaged/worn materials	Capital: may range from ₦9528.96-₦47644.80, depending on householder input and choice of materials. Operating: ₦949 per year if emptied once in 5 years.	Widely used internationally and in rural and peri-urban areas. Most successful in water-scarce environments. Failures generally due to inadequate user education and/or poor design and construction. Costly adaptations can result where shallow rock or shallow water tables occur.

(ii) Composting/Urine diversion (UD) toilet

Principles of operation	Operational and institutional requirements	Costs	Sustainability/comment
Waste is deposited in the chamber and dry absorbent organic material, such as wood ash, straw or vegetable matter is added after each use to deodorise decomposing faeces and/or control moisture and facilitate biological breakdown (composting). Urine may be separated/diverted through use of specially adapted pedestals. This may be collected and used as a fertiliser. In desiccation systems, ventilation encourages the evaporation of moisture.	Does not accept domestic wastewater. Ensure ease of access by householder and promotion of manual 'turning' of compost and removal of composted/desiccated material. Suitable disposal site/area necessary.	Capital (variable depending on system and householder input): ₦47644.80 – ₦63526.40 for commercial systems. Operating: ₦560.35-₦8005.35 per annum, depending on local government involvement and householder willingness to handle waste, and disposal options.	Control of moisture content is vital for proper operation. Contents often become too wet, making the vault difficult and unhygienic to empty, as well as malodorous. User educational requirements and continuous input significant for proper operation in terms of the composting process.

(iii) Wet systems

(a) Pour-flush toilet

Principles of operation	**Operational and institutional requirements**	**Costs**	**Sustainability/comment**
After defecation, the pan requires flushing with a few litres of water. The water retained in the pan provides a seal against smell, flies and mosquitoes	Appropriate for small volumes of water and can accept domestic wastewater - generally carried by hand to the latrine. Ensure access for mechanical emptying of contained waste, and suitable subsoil drainage (high reliance on the soil environment in rendering the effluent harmless) and/or availability of sludge treatment and disposal.	Capital: ₦32021.39-₦56037.43 which can increase where soils are not well suited to drainage. Operating: ₦2401.60-₦4803.21 per annum where subsoil drainage is available.	International acceptance demonstrated where water is used for anal cleansing and users squat. Blockages occur through use of inappropriate anal cleansing material. Offset pour flush can allow location of toilet inside house, but generally larger flushing volumes are required.

(b) Aqua-privy and soak away

Principles of operation	Operational and institutional requirements	Costs	Sustainability/comment
After defecation, the pan requires flushing with a few litres of water. An aqua-privy requires the addition of water to keep the end of the chute submerged. Containment of the waste may vary from a sealed container to a solids collection system and effluent soakaway.	Appropriate for small volumes of water and can accept domestic wastewater – generally carried by hand to the latrine. Ensure access for mechanical emptying of contained waste, and suitable subsoil drainage (high reliance on the soil environment in rendering the effluent harmless) and/or availability of sludge treatment and disposal.	Capital: ₦32021.39-₦56037.43which can increase where soils not well suited to drainage. Operating: ₦2401.60-₦4803.21 per annum where subsoil drainage is available.	International acceptance demonstrated where water used for anal cleansing and users squat. Blockages occur through use of inappropriate anal cleansing material.

(c) Conservancy tank

Principles of operation	Operational and institutional requirements	Costs	Sustainability/comment
Waste is flushed into the tank where it is contained in isolation from the surrounding environment before removal by tanker for treatment.	Tank sizing dependent on flush volumes, domestic wastewater levels and frequency of emptying. Ensure access for mechanical emptying and availability of treatment and disposal facilities	Costs depend on size and emptying frequency. Cost: At ₦32021.39 – ₦80053.46 depending on top structure and tank volume. Operating: ₦8700.00 per household per annum (based on an estimated emptying cost of ₦2897.94 per tank) assuming the tank is emptied, on average, 3 times per year.	Widely used, particularly in more sensitive soil and geohydrological environments

(d) No Water Consumption System (NOWAC)

Principles of operation	Operational and institutional requirements	Costs	Sustainability/comment
Fill main chamber with water to activate the system. No additional water will be required in future. Waste drops into the water in the main chamber where the organic material decomposes. This process is natural and executed by organisms. The waste moves around in the main chamber for a period of approximately 100 days. The brown water moves into the second chamber. This chamber is fitted with an anaerobic filter and is situated in the main chamber. It destroys approximately 98% of all dangerous pathogens before it flows over into an anaerobic filter where the remains of the pathogens are destroyed by organisms and oxygen. The volume of the overflow equals the volume of the waste per person. This overflow of uncontaminated water flows into a soak away, which can be seen as an additional filter. (Kennedy, 1982)	Operates: • Without additional water • With only the seat as mechanical part • Without any chemicals No maintenance required for 15 – 20 years. After 15 – 20 years the sand layer at the bottom of main chamber is removed with a pump after which the system will work for another 15 – 20 years. Note: Only sand and not the water will be pumped out.	Capital: ₦80053.46 – ₦96064.16 per unit which includes: • The complete system • The concrete top structure • The transport • The installation • The training of each household Note: Installation costs can increase in rocky areas and against steep slopes. Operating: No costs up to 15 – 20 years.	Similar systems are accepted internationally in echo sensitive areas and where water is scarce.

(e) Full bore waterborne sewerage

Principles of operation	**Operational and institutional requirements**	**Costs**	**Sustainability/comment**
Waste from the toilet, and possibly domestic wastewater, is flushed using significant volumes of water into the sewer system for removal to a treatment facility. There are several types of such facilities and these treat effluent to high standards prior to discharge into the aquatic environment	Requires a reliable and uninterrupted household water connection and spatially regular permanent settlements. Specific design criteria must be applied throughout the sewerage network. Skilled, organised and effective operation and maintenance capability is required for sewers and the full functioning of wastewater treatment facilities.	Capital: ₦96064.16 - ₦112074.85 taking bulk and sewerage costs into account. Operating: ₦6404.28 - ₦12808.55 per annum.	Unaffordable to many, particularly in terms of access to sufficient volumes of household water. Appropriate anal cleansing material is required. The health consequences of failure are devastating in comparison to onsite, dry sanitation.

(f) Septic tank and soakaway or Small bore solid-free sewer

Principles of operation	Operational and institutional requirements	Costs	Sustainability/comment
Waste from the toilet, and generally domestic wastewater, is flushed into the settling chamber where it is retained for at least 24hrs to allow settlement and biological digestion. Partially treated liquids then pass out of the tank and into the subsoil drainage/soakaway system. Digested sludge gradually builds up in the tank and requires eventual removal by tanker.	Requires a reliable household water connection. Specific design criteria must be applied to the settlement tank and soakaway system. This option is applicable only in areas of low settlement density and where soils have a high ability to drain effluent away. Ensure access for emptying of tanks by vacuum tanker, as well as availability of sludge treatment and disposal.	Capital: ₦112074.85-₦136090.89 Operating: ₦3202.14-₦7204.81 per emptying, depending on emptying frequency.	Widely used by formal rural households and farming areas, where reliable water supply is available. Provides a high level of service and user convenience. Failures due to poor design and construction, and use of inappropriate anal cleansing material. Soakaway system is particularly prone to failure in the long-term if detailed soil testing is not carried out.

(g) Shallow sewerage

Principles of operation	Operational and institutional requirements	Costs	Sustainability/comment
Waste from the toilet and possibly domestic wastewater, but at much lower volumes than for conventional sewerage, is flushed into the on-site sewerage system and progressively washed down to either a dedicated treatment facility or into street sewers and then on to a major treatment works. (Guy and Ian, 1999).	Requires reliable household availability of water and high levels of connection into the sewerage system are necessary. Can, however, be laid out in less formal and spatially irregular settlements. Less stringent design criteria - but organised and effective operation and maintenance capability is required. This can be delegated to residents for on-site sewers. Significant user education and acceptance of shared management of the system is critical.	Capital: ₦ 40026.73 to ₦ 48032.08 - savings of up to 50% over conventional sewerage capital costs. Operational: ₦4803.21 – ₦7204.81 assuming that all maintenance is provided by the service provider. Drops to ₦4995.34 where residents are responsible for operation and maintenance of block (not bulk) sewers	Used, with reported success, under a wide range of conditions in a number of South American countries, Ghana, Pakistan and Greece.

3. Alternative final disposal methods include:

(a) Dosing Systems

Dosing systems store pretreated effluent in a dosing tank and periodically apply large doses to the soil absorption field by pump, siphon, or gravity. Each dose is distributed over a large portion of the absorption field. The system is then allowed to drain, which allows the soil surface to return to an unsaturated condition. The frequency of dosing is determined by soil type and ranges from one to four doses per day (Otis, 1984).

Evaluation: The precise causes of soil clogging are not well understood, and some

question still exists whether dosing is effective. It is suggested that clogging will occur with dosing systems as well as standard systems. Further research and careful tracking of installed systems is necessary. The cost of the additional dosing chamber and pump adds approximately ₦130,000 to ₦160,000 to the price of a standard system.

(b) Pressure Distribution Systems

Pressure distribution systems, like dosing systems, store pretreated effluent for periodic distribution to the soil absorption field. Effluent is pumped throughout the entire absorption field through small diameter pipes. This method provides the most uniform distribution, thus avoiding localized overloading problems. The benefits of dosing are also achieved with this system.

Evaluation: Pressure systems are recommended for permeable and coarse-textured soils as they maximize the potential for treatment (by distributing the effluent evenly over the entire absorption field) and minimize the potential for direct bypass of effluent to the groundwater (Ronayne et al., 1984). Because of the extra tank, pump, control devices, and power usage, they are more expensive to install, operate, and maintain than a gravity system. The cost of the additional dosing chamber and pump adds approximately ₦129239.33 to ₦161549.16 to the price of a standard system. The price of the absorption field is similar to the standard field. It is likely that these systems afford the most effective treatment in coarse textured soils, but it is not clear whether or not the life of the absorption field in fine soils is prolonged.

(c) Alternating Distribution Systems

Alternating distribution systems do not store effluent, rather, the disposal of pretreated effluent is alternated between two separate absorption fields constructed in close proximity. The fields are usually alternated annually. This allows the unused field to drain and aerobic decomposition of the clogging mat to take place. Residential systems are usually constructed with two equal fields, each containing 75 percent to 100 percent of the required surface area (Otis, 1984).

Evaluation:

The soil must also meet standards for a conventional system. Installation, therefore, is costly, and the primary benefit received is an increased lifetime for each absorption field.

(d) Mound or Fill Systems

Mound or fill systems are a pressure distribution system installed in a mound constructed on top of the natural soil. These systems are used when the groundwater level is too close to the surface or when the soil is either too permeable or not permeable enough. The mound is constructed of a course-grained material (usually sand) through which the pretreated effluent travels before it reaches the original soil surface. The mound is covered with topsoil and planted with vegetative cover (Adapted from Otis, 1984).

A standard soil absorption field is constructed below the topsoil. A mound system is constructed on top of the topsoil layer and thus gains the additional benefit of this soil layer for treatment. Treated effluent can spread laterally through the topsoil until it is absorbed into the subsoil.

Evaluation: Mound systems have emerged after much development as an effective alternative for sites with unsuitable soils. However, construction of a mound requires large quantities of new soil brought to the site, and the mound must be carefully designed and constructed to function properly. A mound system can cost between ₦646,196.66 and ₦1,292,393.31 to design and install, and is therefore usually the choice of last resort.

(e) Evapotranspiration Beds
Evapotranspiration beds discharge to the air instead of the soil. Use is restricted to areas where annual evaporation exceeds annual precipitation. Beds are lined with a watertight liner such as plastic, filled with crushed rock and sand, and covered with top soil. Pretreated effluent is distributed to the beds with perforated pipelines in the same manner as conventional absorption systems.

Evaluation: Testing of 17 systems in eastern Oregon revealed poor performance. All but one of the systems developed holes in the liner, which allowed untreated effluent to enter the ground water. One system, constructed with a special heavy liner, and three times larger than the other systems studied (7500 sq.ft.), appeared to function satisfactorily (Ronayne et al., 1984).

Available alternative disposal methods include the use of:

(i) Aerobic Tanks
An aerobic tank is a watertight container in which a mechanism has been installed to bring the wastewater into contact with air. In the presence of air, the waste products then decompose. Solids and greases are separated and liquid effluent is discharged to a disposal system. Solids must be pumped from the final chamber regularly.
Aerobic tanks can reduce BOD (biological oxygen demand—a measure of the amount of oxygen used to decompose organic material in water) by 85 percent to 98 percent under ideal conditions and SS (suspended solids) by 40 to 80 percent. A septic tank reduces BOD by 25 percent to 65 percent and suspended solids by 40 to 80 percent (Buchholz, 1980).

Evaluation: Aerobic devices are sensitive to changes in quantity or characteristics of the wastewater they are treating. In field conditions, effluent has not been shown to be of a higher quality than septic tank effluent, and the quality of the effluent varies widely over time. These are mechanical devices which require knowledgeable operation and maintenance. Because of the need for regular inspection and maintenance, aerobic tanks are best suited for conditions where they are under the management of a wastewater management utility.
.
(ii) Anaerobic Filters
Anaerobic filters are designed to provide further treatment to septic tank effluent before discharge to a soil absorption system. The filter is a watertight container filled with crushed rock or other solid medium which will support microbial growth. Effluent is treated as it comes in contact with anaerobic organisms on the surfaces of the filter material. Flow is generally from the bottom upwards (ensuring that the filter material is always saturated) to maintain anaerobic conditions in the filter (Kennedy, 1982; Viraraghavan and Kent, 1986).

Evaluation: Development is still experimental for small residential systems. It is reported than anaerobic filters can reduce the Biological Oxygen Demand (BOD) of septic tank effluent by an additional 30 percent to 80 percent and can further reduce fecal coliform by 43 percent to 95 percent (Viraraghavan and Kent, 1986). These units require no extra energy and maintenance is similar to that for a septic tank. No cost estimates are available. More research and field testing are needed.

Sand Filters

Many sand filter designs have been installed on an experimental basis for residential onsite use (Ronayne et al., 1984). In general, sand filters operate by directing pretreated effluent into or onto a layer of sand, allowing it to drain through the sand (where aerobic decomposition of waste products takes place) and collecting the filtrate in a perforated pipe at the bottom of the filter. Filters can be constructed above or below the ground. Systems constructed below the ground can be contained in a watertight vault or uncontained in direct contact with the surrounding soil. Some designs recirculate part of the filtrate back through the filter for further treatment. The liquid filtrate is ultimately disposed of in a soil absorption field. Sand filters can produce effluent of very high quality with reported BOD and suspended solids (SS) reductions of 99 percent and 97 percent, respectively (Ronayne et al., 1984).

Evaluation: The Oregon Department of Environmental Quality has conducted extensive research into the use of sand filters for residential onsite use (Ronayne et al., 1984). Their research has shown good success at improving the ability of soils to accept and treat effluent on sites with soils which are not acceptable for conventional systems. In some cases, with very poor soil conditions, a sand filter is installed to treat septic tank effluent before disposal in a mound system. However, a system of this type would cost in the neighborhood of N160,000.

Analysis of alternative final disposal and treatment methods of excreta

The solids and scum from a septic tank are to be pumped from the tank approximately every three years. Failure to pump a septic tank regularly results in rapid soil clogging and system failure. Treatment and Disposal Systems suggests that there are three distinct phases in the life of onsite systems that require control;

1. Installation
2. Operation
3. Maintenance

An onsite system must be operated and maintained carefully to function properly. For example, the use of garbage grinders or excessive water volumes can have a detrimental effect on the operation of an onsite system. A critical maintenance function for most systems is pumping the septic tank; failure to do so can cause a rapid failure of the soil treatment and disposal system (Viraraghaven, 1986)

Regular inspection and documentation of maintenance

Onsite wastewater systems require regular maintenance to adequately protect public health and the environment. Inspections are conducted by health officials or licensed individuals, such as plumbers or septic tank pumpers, trained and certified to carry out inspections.

Environmental Impacts on Water Supply Sustainability

1. Potential Environmental Impact on water source Sustainability

Flush toilets and septic tanks	This comprises flush to pipe sewer system, pour to flush system, septic tanks or flush to pit latrine. The treated effluent of a septic tank usually seeps to the ground through a leaching pit.
Improved latrines	This which comprises of the VIP latrine, pit latrine with slab and a composting toilet. The pit latrine is risen above the groundwater level so as to prevent corruption. Also, the composting toilet is a dry one in which carbon rich materials are added to the excreta and the appropriate conditions are controlled to attain composting.
Traditional latrines	Pit latrines without slabs, bucket and hanging latrines make up this category. The pit is as before dug higher than the underground water thereby reducing water corruption. The hanging latrine particularly is a toilet built directly over the sea, a river or other bodies of water where excreta drops directly into. This has one of the worst environmental impact on water.
Open Defecation	Human faeces are disposed of in fields, forest, bushes, open bodies of water, beaches or other open spaces. They contribute also a high corruption rate to water.

2. Suitability of Siting Proposed Deep and Shallow Wells to Ensure Minimum Environmental Damage

In most cases the deep wells are usually less susceptible and responsible to surface environmental damage as compared to the shallow wells. The depth of the well however is often determined by the groundwater aquifers which are layers of porous substrate that contain and transmit groundwater.

(i) Shallow Wells

These are often accompanied by unconfined aquifers. They are often more likely to cause surface environmental damage. As water moves through the landscape it collects soluble salts, mainly sodium chloride. Where such water enters the atmosphere through evapotranspiration, these salts are left behind. In irrigation districts, poor drainage of soils and surface aquifers can result in water tables coming to the surface in low-lying areas.

Major land degradation problems of soil salinity and waterlogging result, combined with increasing levels of salt in surface waters. As a consequence, major damage has occurred to local economies and environments. (Richard, 2005).

Four important effects are worthy of brief mention. First, flood mitigation schemes, intended to protect infrastructure built on floodplains, have had the unintended consequence of reducing aquifer recharge associated with natural flooding. Second, prolonged depletion of groundwater in extensive aquifers can result in land subsidence, with associated infrastructure damage – as well as (thirdly) saline intrusion. Fourth, draining acid sulphate soils, often found in low-lying coastal plains, can result in acidification and pollution of formerly freshwater and estuarine streams. Another cause for concern is that groundwater drawdown from over-allocated aquifers has the potential to cause severe damage to both terrestrial and aquatic ecosystems.

(ii) Deep Wells

Groundwater is a highly useful and often abundant resource. However, over-use, or overdraft, can cause major problems to human users and to the environment. The most evident problem (as far as human groundwater use is concerned) is a lowering of the water table beyond the reach of existing wells. Wells must consequently be deepened to reach the groundwater; in some places the water table has dropped hundreds of feet because of extensive well pumping and the rate of depletion is accelerating. A lowered water table may, in turn, cause other problems such as groundwater-related subsidence and saltwater intrusion.

Aquifer drawdown or over drafting and the pumping of fossil water increases the total amount of water within the hydrosphere subject to transpiration and evaporation processes, thereby causing accretion in water vapour and cloud cover, the primary absorbers of infrared radiation in the Earth's atmosphere. Adding water to the system has a forcing effect on the whole Earth system, an accurate estimate of which hydrogeological fact is yet to be quantified. Some probable problems associated with these well include:

(a) Subsidence

Subsidence occurs when too much water is pumped out from underground, deflating the space below the above-surface, and thus causing the ground to actually collapse. The result can look like craters on plots of land. This occurs because in its natural equilibrium state, the hydraulic pressure of groundwater in the pore spaces of the aquifer and the aquitard supports some of the weight of the overlying sediments. When groundwater is removed from aquifers by excessive pumping, pore pressures in the aquifer drop and compression of the aquifer may occur. This compression may be partially recoverable if pressures rebound, but much of it is not. When the aquifer gets compressed it may cause land subsidence, a drop in the ground surface (Sophocleous, 2002).

(b) Sea Water Intrusion

Generally, in very humid or undeveloped regions, the shape of the water table mimics the slope of the surface. The recharge zone of an aquifer near the seacoast is likely to be inland, often at considerable distance. In these coastal areas, a lowered water table may induce sea water to reverse the flow toward the land. . Sea water moving inland is called a saltwater

intrusion. Alternatively, salt from mineral beds may leach into the groundwater of its own accord.

3. Potential Impact of Selected Deep Wells on Aquifer Stability

An aquifer is a groundwater reservoir composed of geological units that are saturated with water and sufficiently permeable to yield water in a usable quantity to wells and springs. Sand and gravel deposits, sandstone, limestone and fractured crystalline rocks are example of geological units that make form aquifers. Aquifers however are of two types: the confined and unconfined. The confined are synonymous to Deep wells.
Confined aquifers also known as artesian or pressure aquifers occur where groundwater is confined under pressure greater than atmospheric. i.e in relatively deep wells. A region supplying water to a confined area is known as a recharge area. Water may also enter by leakage through a confined bed. Rises and falls of water in wells penetrating confined aquifers result primarily from changes in pressure rather than changes in storage volumes. Hence confined aquifers display only small changes in storage and serve primarily as conduits for conveying water from recharge areas to locations of natural or artificial recharge (Sakthivadivel, 2007). Deep wells as a result allow for aquifer stability and hydrological balance over a long term as opposed to shallow wells.

V. Approach and Methodology

1. Desk review

This involved collection and review of secondary sources of information from various sources; Initial interaction and consultation with the local communities and LGA/State level stakeholders; and Delineation of geographical boundary of the influence area.

Project specific checklists

Environmental checklist and questionnaires were utilized. Community environmental checklist is presented in appendix II. Community and Schools WASH assessments are presented in appendix III and IV respectively.

2. Field survey

The field visits was conducted by the IEE consultant during June and July 2013, in 2 focal communities in each State. The visits were to collect environmental information about the proposed project and its potential impact areas.
The criterion for community selection was underserved communities in each self selected local government area, as determined by the LGA WASH unit coordinator. For the collection of environmental features related to biophysical environment, maximum 100 meter distance observable from the structures was taken as an influence area. The impacts were classified in terms of level (low, moderate and significant). The methodology adopted for impact identification and prediction was checklists and questionnaire method. The likely impacts/issues of the proposed project construction as well as operation are described

in the following sections. The likely impacts/issues have been assessed covering both adverse and beneficial ones.
In-depth interviews were conducted with traditional rulers and other key stakeholders (Youth and women leaders). It was used to collect biological, socio-economic and cultural environment related information using a checklist. Community and Schools WASH assessments questionnaires were used to assess current situation and expected environmental impacts of construction, operation and maintenance on community and school environment. In schools, interviews were conducted with head teachers. These served as key stakeholders where the project WASH facilities would be constructed. Photographs were taken to show different environmental features.
The community and school locations were located within geographical coordinates in each State by the use of Geographical Positioning System (GPS) equipment. For each community and school, the latitude and longitude were recorded.

3. Data Analysis

The data collected was analyzed to identify both the negative and positive impacts of the project on the environment.

4. Public consultation

In order to ensure the public involvement, the following procedures were followed during IEE report preparation:
Interactions with local communities and related stakeholders were conducted to collect public concerns and suggestions. Discussions were conducted to solicit information regarding the bio-physical and socio-economic and cultural aspects of the proposed project, and also to collect their suggestions and acceptance of the project. The discussions were held at the different selected communities and a record of public consultations prepared.
The draft IEE report will be reviewed incorporating the suggestions from the concerned stakeholders. The final IEE report will be sent to State RUWASSA for approval. The approved IEE report will be accessible to interested parties and general public through the concerned RUWASSA.

5. Mitigation Measures and Monitoring Plan

Based on the identified impacts; their nature, extent and magnitude, the mitigation and monitoring prescriptions has been developed. A realistic approach has been used for the application of the mitigation measures in the local context. Environmental Monitoring Plan (EMP) has been developed to assess the effectiveness of the mitigation measures and implementation status.
Assessment of institutional capacity of implementing agencies in the implementation of the proposed Environmental Management Plan (EMP) and a training proposal to enable the agencies to implement the EMP and monitoring plan have been developed.

6. Information Disclosure

Information about the proposed project and IEE study has been disseminated through person to person contacts and interviews and group discussions during field study of IEE.

Available institutions at the local level have been informed through notice distribution or posting at concerned LGAs. The approved IEE report will be accessible to interested parties and general public through following agencies:

- LGA WASH Department/Units
- RUWASSAs
- State Ministries of Water Resources and Equivalent

B. Description of Environment

I. Physical resources

Topography of Jigawa Kano and Yobe states

Jigawa State has a total land area of approximately 28,410 square kilometres. Its topography is characterized by undulating land, with sand dunes of various sizes spanning several kilometres in parts of the State. The main rivers are Hadejia, Kafin Hausa and Iggi Rivers with a number of tributaries feeding extensive marshlands in north-eastern part of the State. Hadejia - Kafin Hausa River traverses the State from west to east through the Hadejia – Nguru wetlands and empties into the Lake Chad Basin.
Relatively, Kano State has a total land area of approximately 20,131 square kilometres. Its topography is generally undulating, but rock outcrops are common in areas of Basement complex rocks. In the southern part of the state, the relief is about 500-600 metres above sea level. Kano and Challawa rivers flowing from the southwest converge to form the Hadejia River, which eventually flows into Lake Chad to the east.
With an estimated land area of 47,153 Square Kilometres, the topography of Yobe State is generally flat, except for the southern parts of Gujba and Fika Local Government Areas where the land is generally rocky. The Northern parts of the State are generally flat with undulating sand dunes. The River Yobe, from which the State derived its name, is one of the most important geographical features of the State.

Geology and soils of Jigawa, Kano, and Yobe state

The major parts of Jigawa and Yobe states are underlain by granites, schist's and gneisses of the basement complex. The ancient Precambrian rocks of the basement complex are separated from the younger sediment of the Chad Formation by a hydrological divide, which runs through Kiyawa, Dutse and Yankwashi. The Chad formation occupies the north-eastern parts of the state. However, the basement complex rocks have undergone weathering to give rise to fairly deep soils which are often covered by a sheet of laterite which has been exposed by denudation in some places. The Chad sediments are concealed by sand dunes with no surface outcrops. The sandy beds formed over the impervious clays of the Chad Formation form the main source of water supply in the dry season. The soils are generally sandy at the top and compact at depth with often hard pans. Aeolian deposits from the Sahara Desert form substantial part of soils in the state especially towards the northern parts. The mixing of the subsoil in these deposits has given rise to clayey subsoil, which dominates the northern parts of the state.

In Kano state more than four-fifth is underlain by quartzite, undifferentiated metasediments and basement complex rocks of the Precambrian upper cambrian origin. Prolonged weathering of the rocks produced deep clayrichregoliths, which have been subjected to laterization. The lateritic outcrops dot the interfluve areas of the upland plain serving as caps for regolith hills e.g. Gwauron Dutse and Dala hills. Well jointed younger granites of Jurassic origin occur in ring complexes in the extreme south. A narrow strip of the Chad Formation occurs to the east. In height, the relief ranges from lower plains (500 m) to highlands of more than 1,000m above sea level. The landforms include: the Rishi hills: plains with grouped hills: sandy plains; and alluvial channel complexes.
In their natural state, the soils divide into four main groups. The ferruginous tropical soils formed on crystalline acid rocks occupy about two-fifth of the State to the south, southwest and southeast; the brown and reddish brown soils and latosols occur in the northern half; the brown and reddish soils are in the north-eastern corner; and the juvenile and hydromorphic soils occur along the alluvial channel complexes.
The soils largely reflect the influence of parent materials. Intensive use of the soils and addition of manure and chemical fertilisers have altered their character, profile, texture, structure and chemical characteristics.

Climate of Jigawa, Kano, and Yobe States

The climate of Jigawa and Yobe states are similar, semi arid in features, characterized by a long dry season and a short wet season. The climatic variables vary considerably over the year and are erratic. The temperature regime is warm to hot. The mean annual temperature is about 25°C but the mean monthly values its range between 21°C in the coolest month and 31°C in the hottest month. However, the mean daily temperature could be as low as 20°C during the months of December and January when the cold dry harmattan wind blows from the Sahara Desert. Evapotranspiration is very high and relative humidity is highest in August (up to 80 per cent) and low in January through March (23 to 30 per cent) when it is moderated by the harmattan. The year is characterised by well marked dry and wet of seasons.
The wet season is roughly four months (June to September) and dry season is seven to eight months (October to May). The rainy season may of start in May but early rains in April are not unusual. The bulk of the rainfall comes in June through September. Violent dust storms followed by tornado and lightening, usually herald the onset of the rains in May/June and retreat in September or early October.
The total annual rainfall ranges from 600mm in the north to 1000mm in the southern parts of the state. Great variations occur in the annual total rainfall and may result in severe and prolonged droughts, which cause crop failures, death of livestock and overall human sorrow.
In Kano State however, there are four seasons: a dry and cool season, *Kaka* (mid November to February), marked by cool and dry weather plus occasional dusty haze, night time temperatures are cool with average low temperatures ranging from 11° to 14°C; the dry and hot season, *Bazara* (March to mid-May) when temperatures climb up to 40°C and which is a transition period between the harmattan and the wet season; the wet and warm season, *Damina* (mid-May to September), is the proper wet season when the lowest diumal temperature is recorded; and a dry warm season, *Rani* (October to mid-November) marked by high humidity and high temperature next to*Bazara* in hotness.

Mean annual rainfall ranges from over 1,000mm in the extreme south to a little less than 800mm in the extreme north. The rains last for three to five months. Mean temperature ranges from 26°C to 33°C.

Surface and groundwater of Jigawa, Kano and Yobe states

The provision of adequate water supply and sanitation to the rapidly growing urban populations is increasingly becoming a problem for governments throughout the world. The continuing expansion of the numbers of people in cities who need water and sanitation services form a continuous pressure to either invest in additional production capacity or to stretch the available supplies to serve more people. This has toll impact on both surface and ground water resources management.

In Jigawa state for instance, is drained by many rivers of which River Hadejia is the major one. The river conveys the major releases from Tiga and Challawa Gorge dams bisecting the state and eventually draining into Lake Chad. It bifurcates at Agufa through Miga to form the Kafin Hausa River which also drains into the Lake Chad. Other River systems include Gari-Marke, Tomas, Jekarade, Bunga and Chaichai. The state has six reservoirs, namely: Muhammad Ayuba, Dambo, Warwde, KafinGana, Birnin Kudu and Auyo Barrage. The river systems provide an estimated water volume of 667.8 million cubic meters annually. In addition to this, the annual average rainfall of 600mm of the State facilitates an annual recharge of underground water to the tune of 2,018 mm cubic meters per annum. The contribution of the river system to the aquifer recharge is to the tune of 1,658 million cubic meters annually.

In a related development, due to rapid increase in population growth in the Yobe State north of Nigeria, there is a shortage in the water supply to Damaturu city the capital of the state and surrounding villages. At the present the total water supply is about 10,000 m^2/day-abstracted form the shallow alluvial groundwater aquifer using 29 production wells. Due to the expected increase in water demand and the limited potentiality of shallow aquifer system, other deep aquifers were explored and investigated to evaluate their potentiality for future water demand

Two hydrological areas have been identified in Kano as the upland area and the Gari area. The upland area comprises of Rivers Kano, Challawa, Iggi and Gaya. While the Gari area comprises of Rivers Gari, Thomas, and Jakara. The upland area receives higher annual rainfall (Over 800mm) than the Gari area (less than 800mm). Runoff is higher in the upland than in Gari. Peak discharge is also higher in upland because of the higher rainfall and larger catchments.

In the Chad sedimentary area, which is of limited extent, there is virtually no surface drainage because of the high transmission losses. This means there is no reasonable surface water potential here. Infiltration rates are high while runoff low.

Aquifers of the Basement Complex area of Kano State are the weathered and fractured rocks in which groundwater exist under water table condition. Water table lies at a depth generally less than 20 m, and the maximum depth of boreholes rarely exceeds 60 m. The mean depth to water table was put at 8.4 m while the maximum depth is 18.5m.

Flora and Fauna of Jigawa, Kano and Yobe states

Natural vegetation covers less than 5% of the land area and even then it is largely degraded except for the Falgore reserve in Kano which also suffers from encroachment. The over-

riding human influence means that most tree species are common to both northern Guinea and the Sudan Savannah. Such common species include Adansoniadigitata (*Kuka in Hausa*) and Vitexdomiana (*Dinya*) which provide edible fruits and leaves. Diospyrosmespiliformis (*Kanya*) and Tamarindusindica (*Tsamiya*) provide edible fruits while Moringaoleifera (*Zogale*) provides edible leaves.
Other species found in the two areas but more common in the Guinea Savannah zone include Parkiaclappertoniana (*Dorawa*) which has declined in the Sudan Savannah following the three dry decades, Anogeissusleiocarpus (*Marke*) and Khayasegalensis (*Madaci*) are popular fuelwood species whose population has been decimated particularly in the Sudan Savannah. Khayasenegalesis is good timber, fuel wood, medicinal and provides fodder in the dry season but it has virtually disappeared. Species which are more common in the Sudan Savannah include ZiziphusSpina-Chrisli (*Kurna*), Hyphaene the baica (*Goriba*), Borrasusaethiopum (*Giginya*) and Balanitesaegyptiaca (*Aduwa*) which provide eadible fruits. Others are the leguminous Acacia species which supply livestock folder and fuelwood such as Acacia Senegal (*Dakwara*), Acacia Nilotica (*Bagaruwa*), Acacia Seyal (*Dushe*), and Acacia Albida (*Gawo*). Actively regenerating species on fallow land are Guierasenegalensis (*Sabara*), Hyphaene the baica (*Kaba*) and Piliostigmathonningii (*Kalgo*).

Hadejia-Nguru Wetlands

Site Description

The Hadejia-NguruWetlands (HNW) lies on the southern edge of the Sahel savannah in north-eastern Nigeria. The area is a flood-plain complex, comprised of a mixture of seasonally flooded lands and dry uplands. Prior to the droughts of the 1970s, the wetlands covered an area of about 4,125km^2, but are now reduced to 3,500km^2. The wetland is supplied by the Hadejia and Jama're rivers. The Jama'are rises in the Jos Plateau, the Hadejia in the hills around Kano; they join within the HNW to form the Yobe River, which discharges into Lake Chad. River flow is highly seasonal and varies considerably depending upon rainfall and run-off. Peak flow occurs in August and September when banks overflow and the area is inundated. Three broad vegetation-types are identifiable. One of these is scrub savannah, which includes the upland farmland areas andAcaciawoodlands. The second grows on the 'tudu' lands, sandy ridges which, with the exception of scattered, ephemeral ponds are never inundated. Characteristic tree species here include Acecia spp. (especially *A. albida*), *Ziziphus spp., BalanitesaegyptiacaTamarindusindica and Adansoniadigitata*, while common grasses are *Cenchrusbiflorus, Andropogon spp*. And *Vetiverianigritana*. There are also pockets of riparian forests, known as 'Kurmi'. Common trees of the kurmi forests, at about the northern limit of their distributions, are *Khayasenegalensis, Mitragynainermis and Diospyrosmespiliformis*. In some parts, kurmi has been replaced with orchards of mango *Mangiferaindica* and guava *Psidiumguajava*. The third main vegetation-type includes the seasonally flooded marshes and 'fadama', in which the tree Acacia nilotica is common while Dum palms *Hyphaenethebaica* grow on small raised islands. Aquatic grasses such as *Echinochloa and Oryza spp*. Are common in the marshes, while in drier parts *Dactylocteniumaegyptium, Setaria spp*. And *Cyperus* spp. Occur. There are also extensive beds of *Typha, autralis* while *Mimosapigra* thickets are common on edges of the lakes. Large parts of the fadama are under rise cultivation during the rainy season and, during the

dry season, are usually utilized for growing other crops as water-levels drop. Uncultivated areas are grazed by livestock. Annual rainfall ranges between 200-600mm, confined to the period late May-September.

Birds

A total of 377 bird species have been recorded. A few individuals of two species of global conservation concern, *Circus macrourus* and *Galinago media*, winter occasionally. Numbers of overwintering *Aythyanyroca* have declined considerably in recent years. The wetlands are extremely important for waterbirds, both for breeding species and for wintering and passage Palearctic waterbirds, while the surrounding areas hold significant numbers of species of the Sahel biome and Sudan-Guinea Savannah biome. Total numbers of water birds recorded during the January African Waterbird Census count were 259,767 in 1995, 201, 133 in 1996 and 324,510 in 1997.

Other threatened/endemic wildlife

The mammal *Gazellarufifrons* (VU) occurs, but is scarce. At least 39 species of freshwater fish are reported to occur.

Topography of Anambra, Cross River and Osun States

Anambra is located between latitude 5o 45N to 6o 45N; and longitude 7o 15E to 7o 45E and covers an estimated surface area of 7200km2. The area is underlain by Cretaceous to Recent sedimentary formations of the Anambra Basin that are of varying aquifer potentials. The state lies in the Anambra basin, the first region where intensive oil exploration was carried out in Nigeria. Anambra basin has about 6,000 m of sedimentary rocks.

Cross River State on the other hand lies roughly between Latitudes 5^0 32' and 4^0 27 N and Longitudes 7^0 50' and 9^0 28' E of the Equator. It has a landmass of about 23.074km^2 and is covered by a body of water from the tributaries of the Cross River and the Atlantic ocean. This renders a bulk of the land very fertile and swampy, providing for abundant aquatic, forestry and mineral resources for exploitation (crossrivergovernment.org). There are over 250 languages in Cross River State with the Efik, Bekwara and Ejagham dominantly spoken across the state and the people are mainly into farming and Fishing.

Osun state lies in the southwestern geo-political zone of Nigeria and bounded by Oyo state to the west, Kwara state to the north, Ekiti and Ondo states to the east, and Ogun state to the south. The state has a total land area of about 9,250.92 square kilometers (3,571.8 square miles).

Geology and soil of Anambra, Cross River and Osun States

In Anambra state, the sedimentary rocks comprise ancient Cretaceous deltas, somewhat similar to the Niger Delta, with the Nkporo Shale, the Mamu formation, the Ajali sandstone and the Nsukka formation as the main deposits. On the surface the dominant sedimentary rocks are the Imo Shale a sequence of grey shales, occasional clay iron stones and Sandstone beds. The Imo Shale underlies the eastern part of the state, particularly in Ayamelum, Awka North, and Oruma North LGAs. Next in the geological sequence, is the Ameke Formation, which includes Nanka Sands, laid down in the Eocene. Its rock types are sandstone, calcareous shale, and shelly limestone in thin bands. Outcrops of the sandstone occur at various places on the higher cuesta, such as at Abagana and Nsugbe,

where they are quarried for construction purposes. Nanka sands out crop mainly at Nanka and Oko in Orumba North LGA.

The characteristic rock type in most part of Cross River state is predominantly sedimentary with some igneous intrusions. The dominant rock type here is the Amaseri Sandstone which is calcareous, fine to medium grained, fairly sorted with relict bedding. The soil type is predominantly hydromophile, mineral soil underlie impervious shale. Intense moisture, temperature and uniform day length of equatorial latitude profoundly affect the soil, thus exposing it to tropical conditions. Though dominantly sedimentary, some communities such as Idomi, Mkpani and Agoi in the north East of Yakurr are occupied by a part of the Basement Complex rock intrusions derived from the Oban Massifs. The rocks (granodiorites) are rich in quartzite, feldspar, baryte, mica, Uranium, high quality clay and laterite, as well as limestone.
The soils are also largely loamy sands rich in minerals derived from denudation phenomena from the northern igneous intrusions of Ikom, Boki and Obudu areas.
Osun state is underlain by metamorphic rocks of the basement complex, which outcrop over many parts. Although they are largely undifferentiated, two specific rock groups can still be identified, namely the migmatite complex (including banded magmatic and auguen gneisses and pegmatites); and meta-sediments (schiestsandquartzites, calsilicates, meta-conglomerates, amphibiolites and metamorphic iron beds). The soils are of two types; deep clayey soils and the sandy hill wash soils, associated with basement complex rocks.

Climate of Anambra, Cross River and Osun states.

Anambra State boasts of undulating landscape with tall trees and rich vegetation that is green all year round. Although annual rainfall is high in Anambra State, ranging from 1,400mm in the north to 2,500mm in the south, it is concentrated in one season, with about four months of dryness, November to February. Consequently, the natural vegetation in the greater part of Anambra State is tropical dry or deciduous forest, which, in its original form, comprises of tall trees with thick under growth and numerous climbers.
The climate of Cross River State region conversely is Tropical and is controlled by two dominant seasons-Wet and Dry Seasons. Considerable influence on the climate result from the apparent movement of the sun across the tropics, the relative stability of the inter-tropical Convergent Zone, the prevailing winds and its nearness to the Atlantic coast.
The wet season lasts from March to November while the dry season last from December to March with spurious rains even within the dry periods. The dominant winds are the South Westerlies, Easterlies and Westerlies during the wet season with intervening few months of Northerlies, North Easterlies and North Westerlies during the dry season. By and large, there appears to be no clear cut demarcation between rainy and dry seasons in Cross River State as there are occasional rains even during the dry season. The extent of the rains is determined by major elements of temperature, humidity, wind, cloud cover and sunshine.
Like Cross River regions, the climate of the state of Osun state is humid tropical, characterized by high temperatures and humidity with marked wet and dry seasons, though there are variations between the Southern and Northern parts. The state is drained principally by river Osun. The rainfall pattern is associated with torrential downpour from around April and spans towards September.

Surface and groundwater of Anambra, Cross River and Osun States

The extent and distribution of groundwater resources in parts of Anambra State, Nigeria is directly underlain by four different geological formations including, Alluvial Plain Sands, Ogwashi-Asaba Formation, Ameki/Nanka Sands and Imo Shale, with varying water storage and yielding capacities. Borehole depths within the Alluvial Plain Sands are shallow (5-30m) yet the sands are excellent aquifers with high yields (3-5 litres/sec) especially along the Anambra West – Onitsha - Ogbaru L.G.A. axis. Elsewhere the yield is low (about 0.5litres/sec) and may dry up at peak dry season periods.

Owing to the gentle and near flat topography and the Sedimentary geology of most parts of Cross River state, the speed of running waters on the surface is quite low when it rains. This gives room for gradual infiltration and storage within the sandy aquifers. Thus, streams flow for a relatively longer period into the year. For this same reason, Ground water potential is quite high, especially within the sandy aquifers at shallow depths ranging from 15-80m. Aquifers therefore occur at various shallow depths and artesian systems abound. These can be exploited for domestic water supply and irrigation.

Flora and Fauna of Anambra, Cross River and Osun states

Anambra state rich flora and fauna, large tracts of arable as well as bodies of water, is an array of agricultural investments. Species like Rice, Cassava, Yams, Cocoyams, Bananas & Plantains, Vegetables, Fruits form major part of the Forestry resources. Cattle, Sheep, Goats, Rabbits, Snails, Poultry, Bees and exotic animals (popularly known as Bush Meat) are also found in the state.
Apart from fishes found the largely riverine LGAs of Boki, animals in the areas include gorillas, chimpanzees, monkeys antelopes and reptiles such as crocodiles snakes etc.Most of the Cross Rivers waters are covered by phyto-planktonic organisms which make the waters apparently green in appearance and smelly at the peak of dry season when the flow regime is low.
The Osogbo Grove of Osun state is now seen as a symbol of identity for all Yoruba people, including those of the African diaspora, many of whom make pilgrimages to the annual festival. The grove has a mature, reasonably undisturbed, forest canopy, which supports a rich and diverse flora and fauna – including the endangered white-throated monkey. Some parts were cleared in the colonial period, and teak plantations and agriculture introduced, but these are now being re-established.

Protected Areas

A protected area in Jigawa State is the Hadejia – Nguru Wetlands in which some parts lie in the north-eastern part of the state.

A protected area in Kano State is the Falgore Game Reserve in southern part of the state.

A protected area in Yobe state is the Nguru wetlands of Nguru Lake.
The Afi River Forest Reserve is in Cross River State, Nigeria, and covers 312 square kilometres (120 sq mi). It is one of the largest forest blocks remaining in the state other than the Cross River National Park. The reserve lies between the Afi Mountain Wildlife

Sanctuary and Mbe Mountains Community Forest, both of which are home to Cross River Gorillas, and forms a corridor between the two.
Afi River Forest Reserve is a large forest in the south-east of the country situated immediately west of the Cross River National Park Okwangwo division (NGO10). The terrain is mountainous and much dissected by rivers and streams; the scenery is spectacular. The highest point is Afi Mountain, in the Centre-north of the reserve. The vegetation is Guinea-Congo lowland rainforest and characteristic tree species include *Berliniaconfusa, coulaedulis, HannoaKlaineana, Klainedoxagabonensis, Khayaivorensis* and Lophiraalata. The reserve is important for production forestry, tourism development and wildlife conservation. There is also cultivation in parts of the reserve, including bananas cocoa, kola and coco-yam (the main staple of the area). Cassava and yam are also grown but, because of low fertility, after about three years the land is abandoned to fallow for up to 15 years. Average annual rainfall varies between 2,000-2,500 mm, with the dry season lasting from November to February.

Birds
The avifauna of the reserve is poorly known. However, significant populations of *Picathartesoreas* and probably breed in the reserve, while a number of nationally uncommon species are known to occur, including *Tigriornisleucolophus, Urotriochismacrourus, Spizaetusafricanus, Himantornishaematopus, Columba iriditorques, Bubo poensis, Indicator maculatus*, Baeopogonclarnans, *Necossyphusfraseri* and *Apalisnigriceps*. In addition*, Telacanthuramelanopygia*, hitherto considered merely a rare vagrant to the country, has been recorded.

Other threatened/endemic wildlife
Among mammals, the primates *Mandrillusleueophaeus* (EN), *Cercopithcuserythotis*(VU) and *Gorilla gorilla*(EN) all occur, the latter in the hills in the north of the reserve, and signs of*Loxodonta* Africana *cyclotis* (EN) have been seen in the south.

Oba Hills Forest Reserve is a reserve in Osun State, Nigeria that covers about 52 km2 of hilly terrain with deep gorges. A 2003 report by the UICN said about 12% of the reserve had been planted with teak. Some chimpanzee sightings had been reported, and in 1999 a dead chimp was offered for sale in a local market. A 2009 report said that almost all of the reserve had been converted to plantations and farms, with only two gullies remaining forest-covered. Chimpanzees are now thought to be almost extinct in the reserve.

Cross River National Park

Site Description
Cross River National Park (CRNP) is a large area of lowland and submontane rainforest situated in south-east Nigeria along the border with Cameroon. The park is divided into two sections. The smaller area to the north-east, Okwangwo Division (NG010), is separated by about 50km of disturbed forest from the larger Oban Division. Oban Division is contiguous with Korup National Park in Cameroon (C019). The Cross River and its tributaries drain northern parts of Oban Division, while southern parts are drained by the calabar, Kwa and KorupRivers. The terrain is rough and elevation rises from the river valleys to over 1,000m in mountainous areas. Soils are ferralitic and sandy, and steadily become shallower with increasing elevation. Leaching and erosion are intense in exposed site s. the vegetation is

lowland rainforest and characteristic tree species include *Berlinia confuse*, *Coulaedulis, HannoaKlaineana, Klainedoxagabonensis, khayaivorensis and Lophiraalata.* In the less accessible areas the forest has had little interference, but elsewhere the vegetation has been much influenced by human activity. Exploitation has resulted in secondary regrowth and the establishment of plantations of oil-palm and rubber. The area has a rainy season of at least nine months (March-November) and receives over 3,500mm annually.

Birds
This is one of the most ornithologically diverse sites in Nigeria. Over 350 bird species have been recorded in this still vastly underexplored park. It is one of only two Nigerian localities for Phyllastrephus*xavieri*. Other nationally uncommon species include *Macheiramphusalcinus, Spizaetusafricanus, Gutterapucherani, Canirallusoculeus, Cercococcyxolivinus, Apalodermaaequatoriale, Melichneutesrobustus, Crinigerchloronotus, Myioparusgriseigularis and Malimbusracheliae.*

Other threatened/endemic wildlife
Floral diversity in Oban Division is extremely rich. A total of 1,303 flowering plants, 141 lichens and 56 moss species have so far been collected, some of which have restricted distributions, e.g. *Biophytum*zenkeri. Oban Division also has a rich mammalian fauna, including *Loxodontaafricanacyclotis* (EN), *procolobuspreussi (EN), Mandrillusleucophaeus* (EN) and *Cercopithecussclateri* (EN), a Nigerian endemic.

Okwangwo Division

Site Description
The Okwangwo Division is the northern part of the Cross River National Park (CRNP), separated by about 50km of disturbed rainforest from the southern Oban Division. It is located south-west of the Obudu Plateau in south-eastern Nigeria and lies immediately east of Afi River Forest Reserve. It is bordered to the east by Takamanda Forest Reserve in Cameroon. The terrain comprises numerous ridge systems and rocky outcrops. Elevations reach 1,700m in the Sankwala mountains in the south-west. The site is drained by the Oyi, Bemi and Okon rivers, all tributaries of the Cross river. Vegetation consists of two general types; lowland rainforest at lower elevations and montane grasslands (with relict forests in villages) along high ridge-tops. Areas of derived savannah occur in lowland parts where there has been intense forest degradation. Soils of the lowland areas are ferralitic and highly susceptible to leaching, while those of the grassland areas are ferruginous and very easily eroded when exposed. The area has marked wet (March-November) and dry (December-February) seasons. Up to 4,280mm of rain falls annually.

In Cross-River, Protected areas in include shrines, forest reserves, wildlife sanctuaries and games reserves. By and Large, Boki and Yakurr LGAs are highly reserved, save for insecurity arising from periodic communal clashes among the farming and communities and in some cases with Fulani herdsmen.

II. Description of Study Locations

Anambra State

Anambra is a State in south-eastern Nigeria. The Capital and the Seat of Government is Awka. Onitsha and Nnewi are the biggest commercial and industrial cities, respectively. Boundaries are formed by Delta State to the west, Imo State and Rivers State to the south, Enugu State to the east and Kogi State to the north. The indigenous ethnic groups in Anambra State are the Igbo (98% of population) and a small population of Igala (2% of the population) who live in the North western part of the state.

Anambra East LGA, Anambra State

Anambra East is a Local Government Area in Anambra State, South-central Nigeria. Towns that make up the local government are Aguleri, Enugwu Aguleri, Eziagulu Otu Aguleri, Enugu Otu Aguleri, Mpkunando Aguleri, Otuocha, Umuoba Anam, Umuleri, Igbariam, Nando, Nsugbe. Figure 3 shows map of Anambra East LGA.

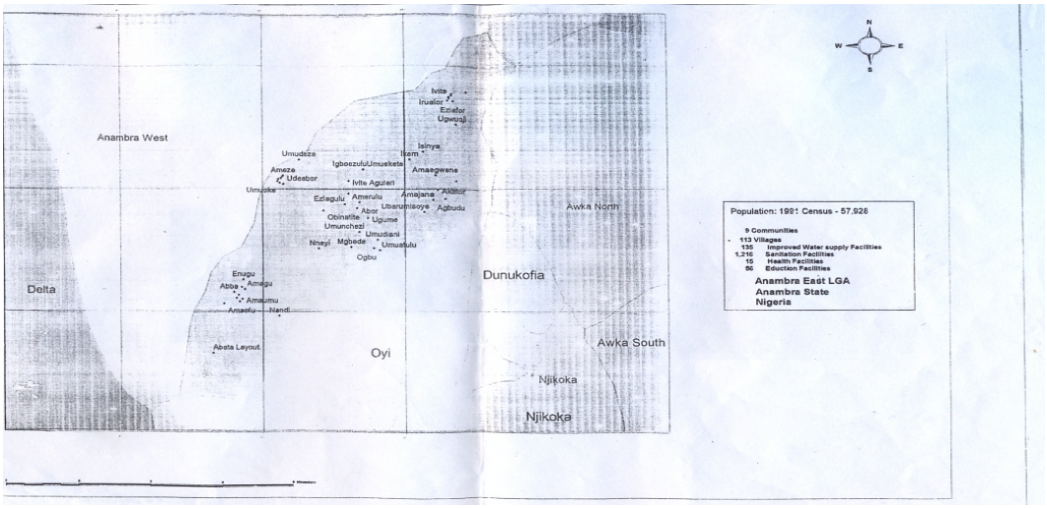


Fig. 3: Map of Anambra East LGA, Anambra State

Plate 1: Udabor-Umueri Community Leaders

Plate 2: PM Anambra RUWASA and Consultants

Aguata LGA, Anambra State

Aguata is a Local Government Area in Anambra State, Nigeria with its headquarters in Aguata (location of the headquarter office buildings) part of which falls into the city of Ekwulobia while the other part falls within Aguluezechukwu. Figure 4 shows map of Aguata LGA.

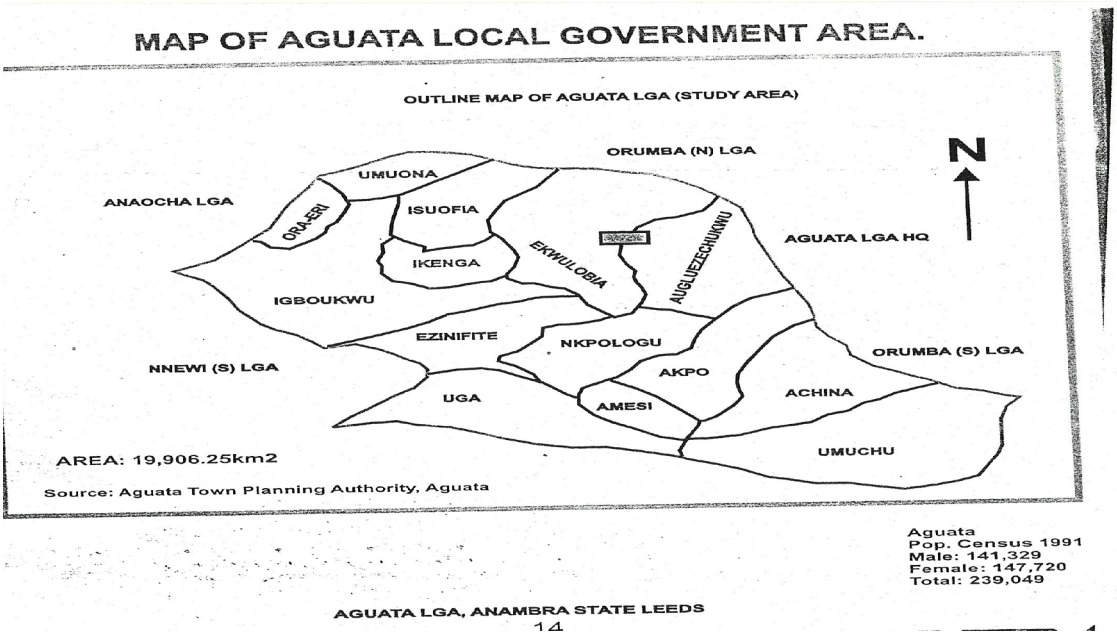


Fig. 4: Map of Aguata LGA, Anambra State

Plate 3: Interview with Obinabo Community Leaders

Plate 4: Non-functional community water supply project

Cross River State

Cross River State is a coastal state in southeastern Nigeria. Its capital is at Calabar, and it is named for the Cross River, which passes through the state. Located in the Niger Delta, Cross River State occupies 20,156 square kilometers. It shares boundaries with Benue State to the north, Enugu and Abia States to the west, to the east by Cameroon Republic and to the south by Akwa-Ibom and the Atlantic Ocean. Its major towns are Akamkpa, Biase, Ikom, Obubra, Odukpani, Ogoja, Ugep and Obudu.

Yakurr LGA, Cross River State

Yakurr is a Local Government Area of Cross River State, Nigeria. Its headquarters are in the town of Ugep. It has an area of 670 km² and a population of 196,450 at the 2006 census. Figure 5 shows map of Yakurr LGA.

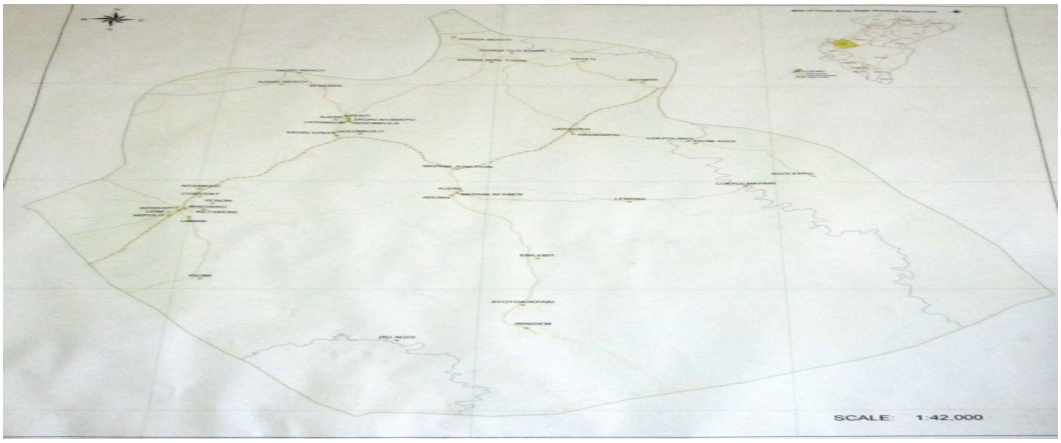


Fig. 5: Map of Yakurr LGA, Cross river State

Plate 5: Engr Ibah (CR-RUWATSA) and Consultant

Plate 6: Apostolic Primary School, Ugom, Latrine – Out of use

Boki LGA, Cross River State

Boki Local Government Area is a geographical territory in Cross River State of Nigeria. Its capital is Boje. It has a population of about 300,000 and a contiguous territories border with the Republic of Cameroun. Boki is bounded in the west by Ogoja, north by Obudu, south by Ikom Local Government Areas while in the east; it is bounded by the Republic of Cameroun. Figure 6 shows map of Boki LGA.

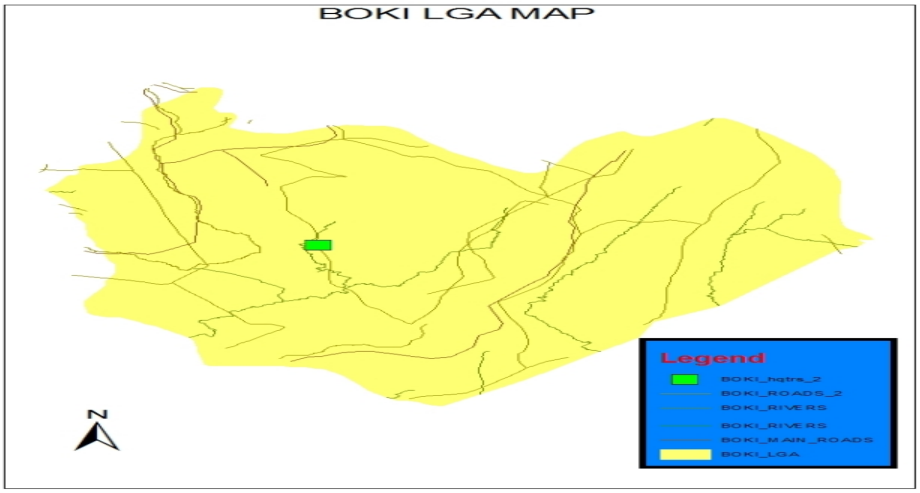


Fig. 6: Map of Yakurr LGA, Cross river State

Plate 7: Interview with Ugom Community Leader

Plate 8: Interview with Mr Nku – School head teacher

Osun State

Ọṣun State is an inlandstate in south-western Nigeria. Its capital is Osogbo. It is bounded in the north by Kwara State, in the east partly by Ekiti State and partly by Ondo State, in the south by Ogun State and in the west by Oyo State. Other important cities and towns include the ancient kingdom-capitals of Oke-Ila Orangun, Ede, Iwo, Ejigbo, Modakeke, Ibokun, Esa-Oke and Ilesa.

Ayedaade LGA, Osun State

Ayedaade is a Local Government Area in Osun State,Nigeria. Its headquarters are in the town of Gbongan in the north of the area and has an area of 1,113 km² and a population of 150,392 at the 2006 census. Figure 7 shows map of Ayedaade LGA.

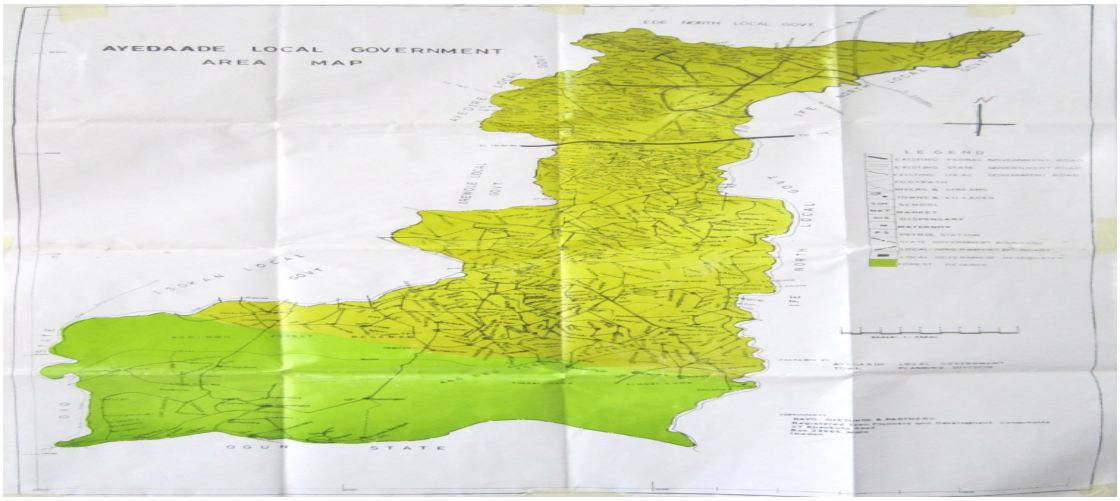


Fig. 7: Map of Ayedaade LGA, Osun State

Plate 9: Interview with Akiriboto 1 Leader

Plate 10: Community water supply community scheme - functional

Odo Otin LGA

Odo Otin is a Local Government Area in Osun State, Nigeria. Its headquarters are in the town of Okuku. It has an area of 294 km² and a population of 134,110 at the 2006 census. Figure 8 shows map of Odo Otin LGA.

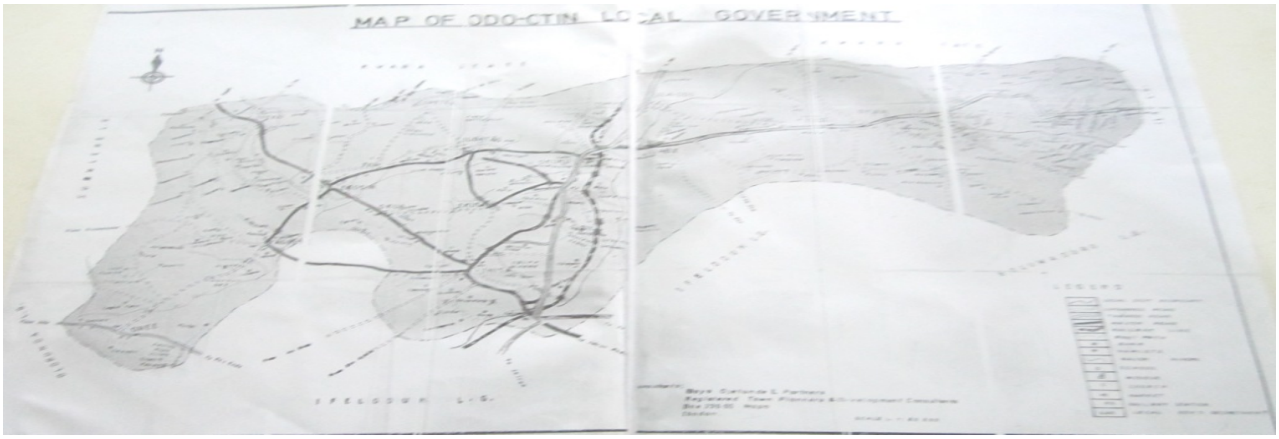


Fig. 8: Map of Odo Otin LGA, Osun State

Plate 11: Interview with Oponda Community Leader

Plate 12: Oponda Community Solar lighting system - functional

Kano State

Kano State is a state located in North-Western Nigeria. Created on May 27, 1967 from part of the Northernregion, Kano state borders Katsina State to the north-west, Jigawa State to the north-east, Bauchi State to the south-east and Kaduna State to the south-west. The capital of Kano State is Kano.

Madobi LGA, Kano State

Madobi is a Local Government Area in Kano State, Nigeria. Its headquarters are in the town of Madobi. It has an area of 273 km² and a population of 136,623 at the 2006 census. Figure 9 shows map of Madobi LGA.

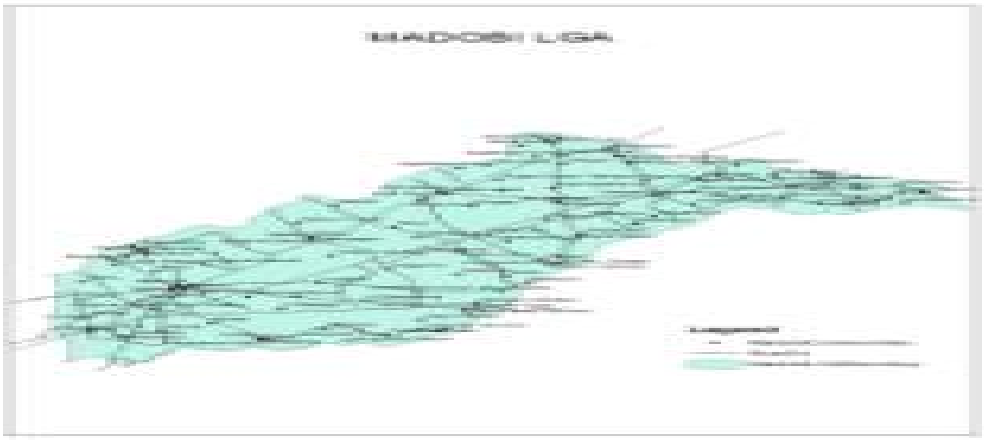


Figure 9: Map of Madobi LGA, Kano State

Plate 13: Engr Idris (MD, Kano RUWASA) Consultant

Plate 14: Meeting with Gara and Community

Takai LGA, Kano State

Takai is a Local Government Area in Kano State, Nigeria. Its headquarters are in the town of Takai to the north of the area. It has an area of 598 km² and a population of 202,743 at the 2006 census. Figure 10 shows map of Takai LGA.

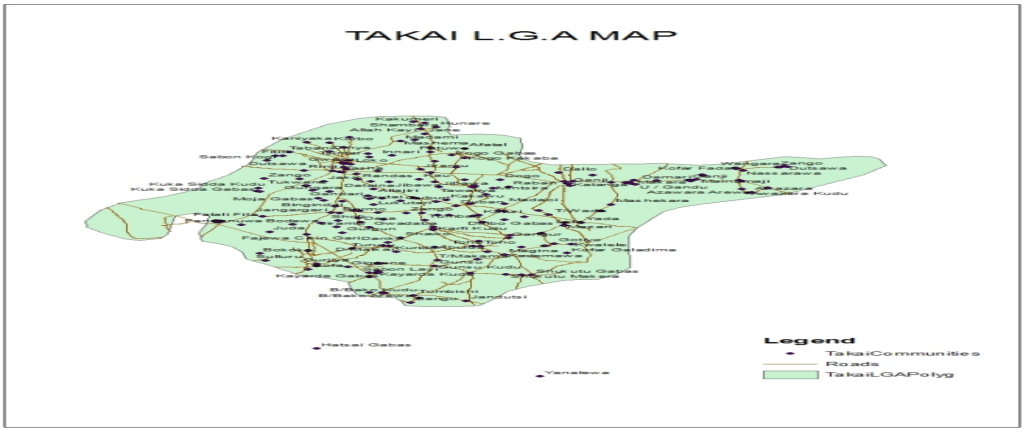


Fig. 10: Map of Takai LGA, Kano State

Plate 15: Meeting with Garandiya Community members

Plate 16: Erosion in Garandiya

Jigawa State

Jigawa State is is situated in the north-western part of Nigeria between latitudes 11.00°N to 13.00°N and longitudes 8.00°E to 10.15°E. Kano State and Katsina State border Jigawa to the west, Bauchi State to the east and Yobe State to the northeast. To the north, Jigawa shares an international border with Zinder region in The Republic of Niger. The state has a total land area of approximately 22,410 square kilometres. Its topography is characterized by undulating land, with sand dunes of various sizes spanning several kilometres in parts of the State. The southern part of Jigawa comprises the Basement Complex while the northeast is made up of sedimentary rocks of the Chad Formation. The main rivers are Haadejia, Kafin Hausa and Iggi Rivers with a number of tributaries feeding extensive

marshlands in north-eastern part of the State. Hadejia – Kafin Hausa River traverses the State from west to east through the Hadejia-Nguru wetlands and empties into the Lake Chad basin.

Taura LGA, Jigawa State

Taura is a Local Government area in the north of Jigawa State, Nigeria. Its headquarters are in the town of Taura. It has an area of 653 km² (252 sq mi) and a population of 131,757 at the 2006 census. Figure 11 shows map of Taura LGA.

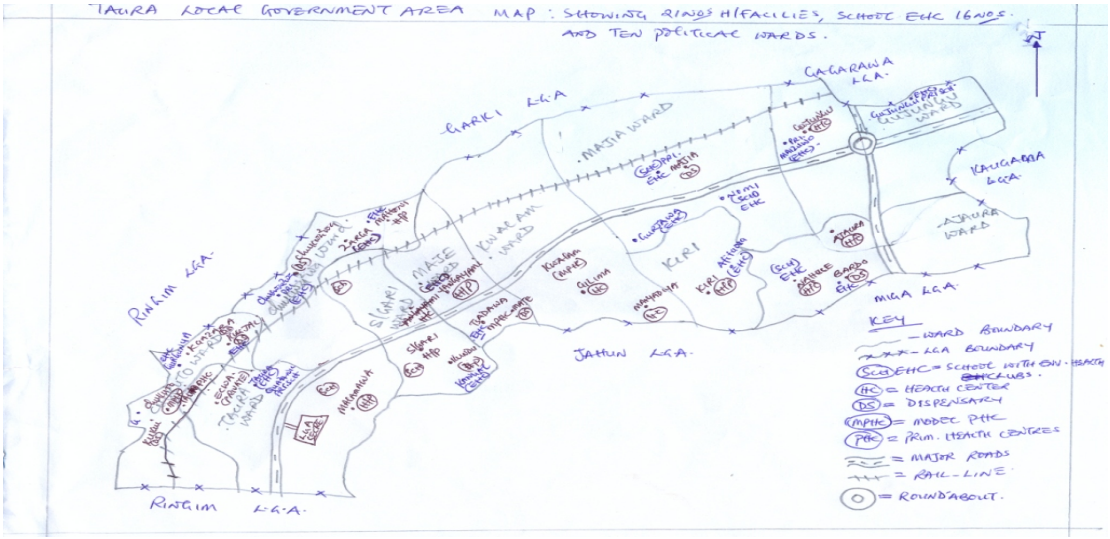


Fig. 11: Map of Taura LGA, Jigawa State

Plate 17: Alh. Medugu (MD, Jigawa) (RUWASA and Consultant

Plate 18: Abakura community members

Malammadori LGA, Jigawa

Malammadori is a Local Government area in the north of Jigawa State, Nigeria. Its headquarters are in the town of Malammadori. It has an area of 766 km² and a population of 161,413 at the 2006 census. Figure 12 shows map of Malammadori LGA.

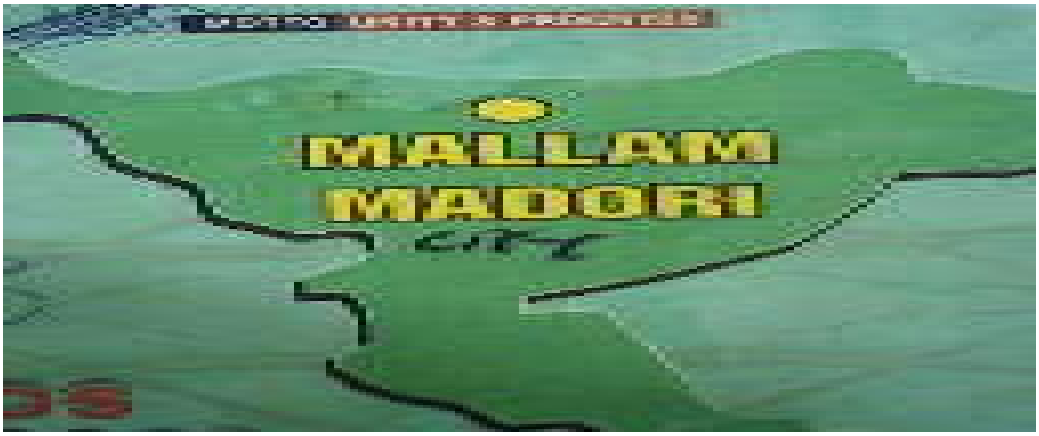


Fig. 12: Map of Malammadori LGA, Jigawa State

Plate 19: Garimanu community members

Plate 20: Babariga primary school teachers

Yobe State

Yobe State is a State located in Northern Nigeria. A mainly agricultural state, it was carved out of present-day Bornu State. The capital of is Damaturu. The state borders the Nigerian states of Bauchi, Borno, Gombe, and Jigawa. It borders the Diffa region and the Zinder Region to the north in The Republic of Niger. Because the state lies mainly in the dry savanna belt, the state is dry and hot for most of the year, except in the southern part of the state which has a milder climate.

Nguru LGA, Yobe State

Nguru is a Local Government Area in Yobe State, Nigeria. Its headquarters are in the town of Nguru near the Hadejia River. It has an area of 916 km² and a population of 150,632 at the 2006 census. The town probably dates from around the 15th century. There is a variety of landscape types in the area, including the protected Hadejia-Nguru wetlands of Nguru Lake, and the "Sand Dunes", a semi-desert area. Figure 13 shows map of Nguru LGA.

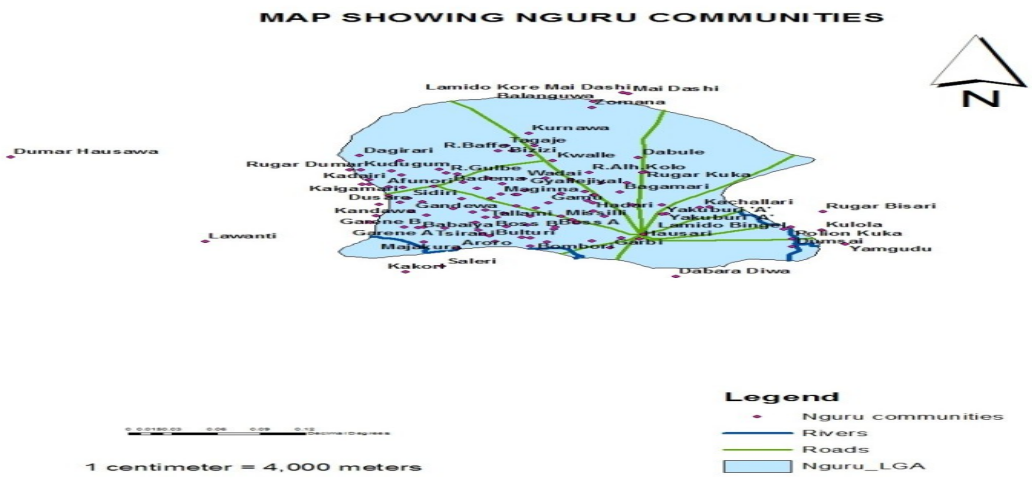


Fig. 13: Map of Nguru LGA, Yobe State

Plate 21: Interview with Alh. Kalli (Director of Personnel)

Plate 22: Interview with Kakori Community WASHCOM Chairman

Bade LGA, Yobe State

Bade is a Local Government Area in Yobe State, Nigeria. Its headquarters are in the town of Gashua. It has an area of 772 km² and a population of 139,782 at the 2006 census. Figure 14 shows map of Bade LGA.

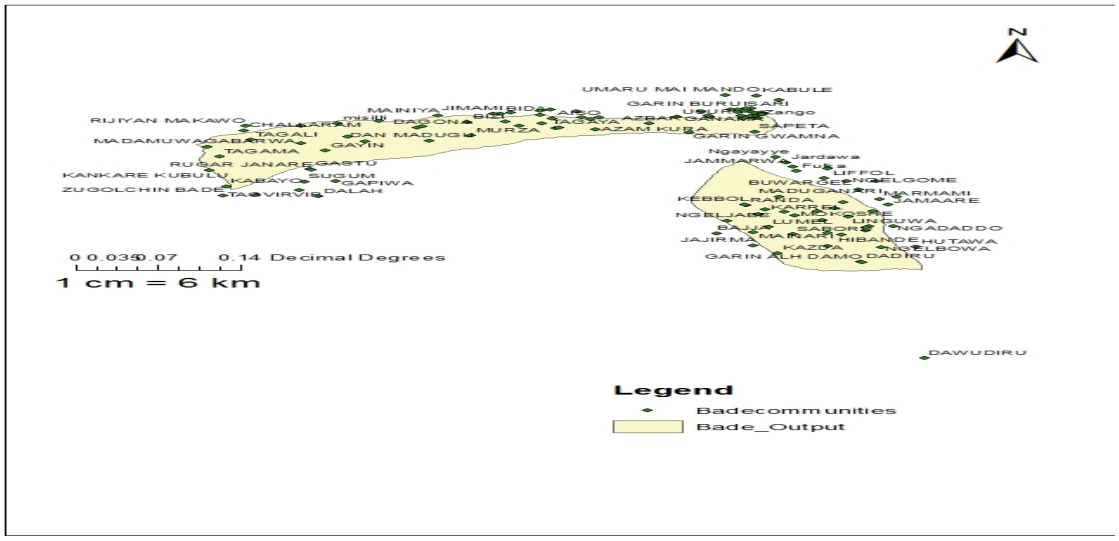


Fig. 14: Map of Bade LGA, Yobe State

Plate 23: Interview with Dawayo Community leader

Plate 24: Dawayo primary school teachers

C. Potential Environmental Impact and Mitigation Measures

A summary of community and primary school locations in the 12 self-selected Local Government Areas (LGAs) is presented in tables 1 and 2 respectively.

Table 1: Community locations in Anambra, Cross River, Osun, Kano, Jigawa and Yobe States

S/N	Community	LGA/State	Latitude (N)	Longitude (E)
1	Udabor-Umueri	Anambra East LGA, Anambra State	6º 20'	6º 50'
2	Obinabo Nkpologwu	Aguata LGA, Anambra State	5º 58'	7º 5'
3	Ugom	Yakurr LGA, Cross River State	5º 48'	8º 4'
4	Duala	Boki LGA, Cross River State	6º 25'	8º 47'
5	Akiriboto 1	Ayedaade LGA, Osun State	5º 14'	7º 34'
6	Oponda	Odo Otin LGA, Osun State	8º 2'	4º 40'
7	Gara	Madobi LGA, Kano State	11º 46'	8º 15'
8	Garandiya	Takai LGA, Kano State	11º 37'	9º 7'
9	Abakura	Taura LGA, Jigawa State	12º 12'	9º 15'
10	Garimanu	Malammadori LGA, Jigawa State	12º 28'	10º 0'
11	Kakori	Nguru LGA, Yobe State	12º 48'	10º 17'
12	Dawayo	Bade LGA, Yobe State	12º 52'	10º 51'

Table 2: School locations in Anambra, Cross River, Osun, Kano, Jigawa and Yobe States

S/N	School	LGA/State	Latitude (N)	Longitude (E)
1	Ovukwu Primary School	Anambra East LGA, Anambra State	6º 20'	6º 50'
2	Nkpologwu Primary School	Aguata LGA, Anambra State	5º 58'	7º 5'
3	Apostolic Primary School	Yakurr LGA, Cross River State	5º 48'	8º 4'
4	Duala Primary School	Boki LGA, Cross River State	6º 25'	8º 47'
5	Akiriboto 1 Primary School	Ayedaade LGA, Osun State	7º 27'	4º 40'
6	Imuleke-Oponda Primary School	Odo Otin LGA, Osun State	8º 2'	5º 40'
7	Gara Primary School	Madobi LGA, Kano State	11º 46'	8º 17'
8	Garandiya Primary School	Takai LGA, Kano State	11º 38'	9º 9'
9	Abakura Primary School	Taura LGA, Jigawa State	12º 13'	9º 16'
10	Babariga Primary School	Malammadori LGA, Jigawa State	12º 28'	10º 0'
11	Kakori Primary School	Nguru LGA, Yobe State	12º 48'	10º 17'
12	Dawayo Primary School	Bade LGA, Yobe State	12º 52'	10º 51'

A summary of the environmental checklist in the selected communities is presented in table 3. The environmental factors evaluated show the following statistical percentages: Potentially significant impact (0%); Less than significant with mitigation incorporated (1.29%); Less than significant impact (15.38%); and No impact (83.33%). This indicates that most of the environmental factors evaluated had ‘Less than significant’ and ‘No impact’ respectively (Table 3).

Table 3: Summary of Environmental Checklist in Communities/States (Anambra, Cross River, Osun, Kano, Jigawa and Yobe States)

S/N	Community Location/State	Potentially significant impact	Less than significant with mitigation incorporated	Less than significant impact	No impact
1	Udabor-Umueri (Anambra)	0	0	13	71
2	Obinabo Nkpologwu (Anambra)	0	0	21	63
3	Ugom (Cross River)	0	4	11	69
4	Duala (Cross River)	0	2	10	72
5	Akiriboto 1 (Osun)	0	2	12	70
6	Oponda (Osun)	0	2	12	70
7	Gara (Kano)	0	0	13	71
8	Garandiya (Kano)	0	0	9	75
9	Abakura (Jigawa)	0	0	12	72
10	Garimanu (Jigawa)	0	0	15	69
11	Kakori (Yobe)	0	2	12	70
12	Dawayo (Yobe)	0	1	15	68
	Sum	0	13	155	840
	Mean	0	1.08	12.92	70
	Percentage (%)	0	1.29	15.38	83.33

Environmental checklist survey in the selected communities indicates that most of the evaluated environmental factors would have no major impact on the proposed project (Fig. 15). WASH assessment in communities indicates a high demand for water supply, sanitation and hand washing facilities (Fig. 16). WASH assessment in primary schools indicates a higher demand for water supply, sanitation and hand washing facilities than in the communities (Fig. 17). WASH assessments in communities and schools are presented in appendix V and VI respectively. A list of key contacts is presented in appendix VII.

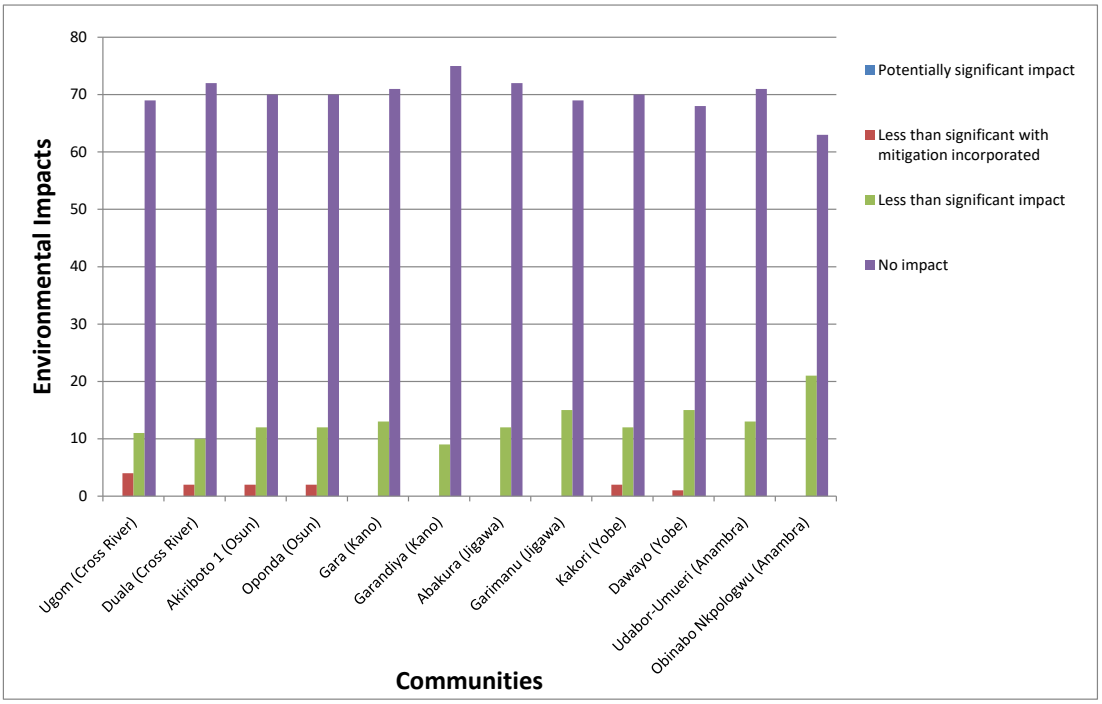


Fig. 15: Environmental Checklist Survey in Communities (Anambra, Cross River, Osun, Kano, Jigawa and Yobe States)

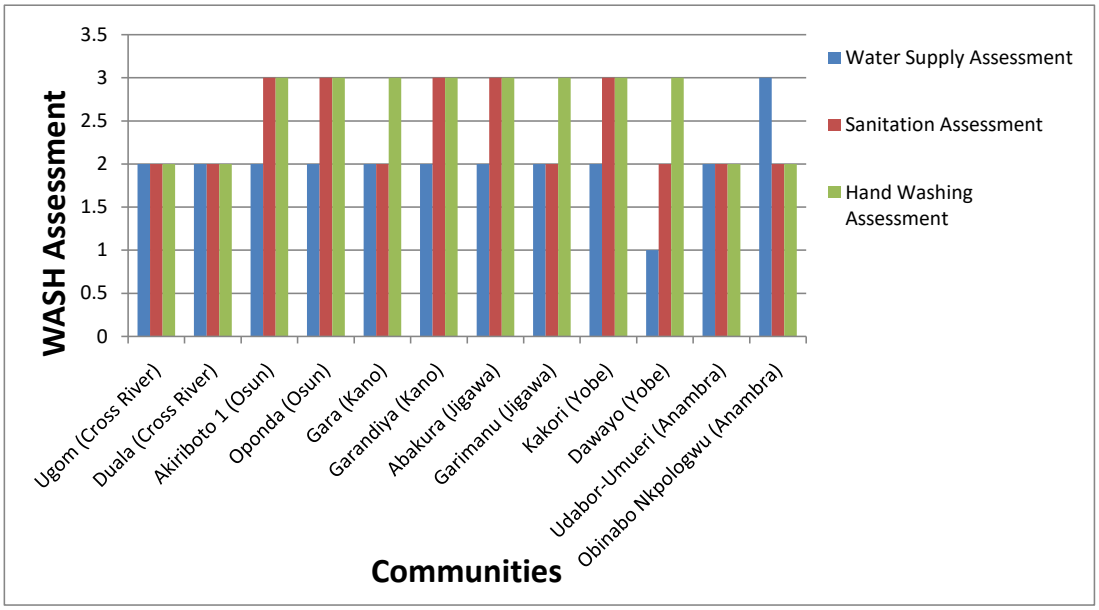


Fig. 16: WASH Assessment in Selected Communities (Anambra, Cross River, Osun, Kano, Jigawa and Yobe States)

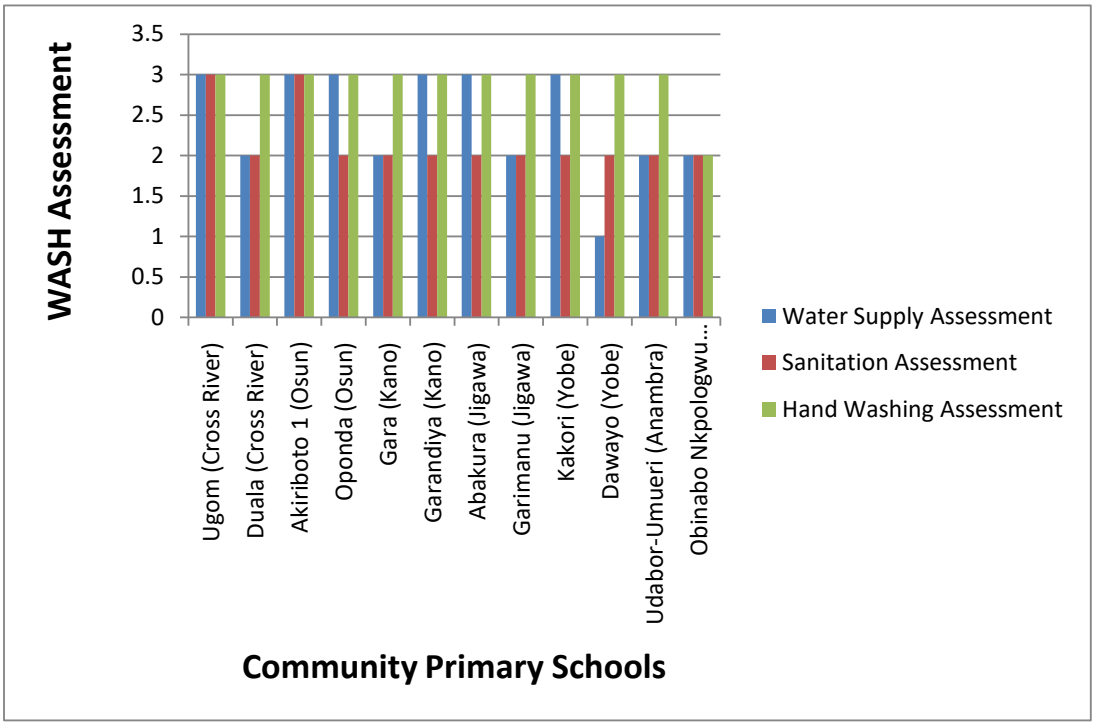


Fig. 17: WASH Assessment in Selected Primary Schools (Anambra, Cross River, Osun, Kano, Jigawa and Yobe States)

A. Screening out Areas of No Significant Impact

The implementation of project construction, operation and maintenance will affect land where the boreholes, water reticulation, latrines and hand washing facilities will be constructed in the community and schools. However, the construction work is not expected to cause major negative impacts on some environmental components and these can be screened out at this stage. Environmental factors where significant impacts are not expected are presented in table 4.

Table 4: Environmental factors where Significant Impacts are Not Expected

Environmental Components	Rationale
Aesthetics	Proposed project will not degrade the existing site quality and its surroundings
Biological resources	The project does not traverse through critical habitats and legally protected areas. The project also does not involve activities that would introduce invasive alien species
Cultural resources	No cultural resources or site would be affected as a result of the project
Geology and soils	Excavation activity would not be significant enough to affect these features
Land use and planning	There will be no major change in land use or conflict with any applicable land use plan
Mineral resources	There will be no loss in availability of a known mineral resource as a result of the project
Population and Housing	No substantial population growth will be induced as a result of the project
Public services	The project would not result in substantial adverse physical impacts associated with the provision of new or physically altered government facilities
Recreation	No construction or expansion of recreational facilities is required

These environmental factors have not been included in further assessment of the impacts due to the construction phase.

B. Methodology

1. Identification of Impacting Project Activities

On the whole, once the installation works are completed there will be a significant net positive social and environmental benefit to the benefiting communities and schools. However, limited negative environmental and social impacts will occur for brief periods during construction phase. Some impacts can also occur in operation phase and during operation and maintenance. Appropriate planning by the firms contracted to undertake the works; all the negative impacts can be mitigated. The impact assessment has been based on a generic assumption of typical impacts based on activities involved. The project related

activities are divided into two phases: the construction and the operational phase. Under each phase, specific project activities have been identified. They include:

I - Construction Phase

(i) Site preparation – vegetation clearance
(ii) Construction activity – excavation/trenching
(iii) Storage of debris/stockpiles generated from excavation and trenching (Construction activities)
(iv) Material transportation and haulage
(v) Construction vehicles
(vi) Labour camps
(vii) Repair of existing water supply

II – Operation Phase

(i) Leakage from pipes
(ii) Systems' malfunction/repair of elements
The significant impacts are as a result of the construction process rather than design or location, as they would occur if this did not involve trenching or ground disturbance.

2. Identification of Major Environmental Factors

(i) Air quality
(ii) Noise quality
(iii) Surface water quality
(iv) Ground water quality
(v) Soil quality
(vi) Flora and fauna
(vii) Resource depletion
(viii) Occupational and public health safety

3. Developing the Impact Identification and Assessment Matrix

Environmental matrices identify interactions between various activities and environmental components. An interaction matrix comprises of the project activities on one axis and the environmental components along the other. The effects of the project activity on the environmental component were assessed based on the following criteria:

1 – Very low
2 – Low
3 - Moderate
4 - High
5 – Very high

In order to identify the overall impacts on the environmental components, during the construction and operation phases, an analysis of the overall impact on each environmental component is presented in figures 18 and 19 respectively.

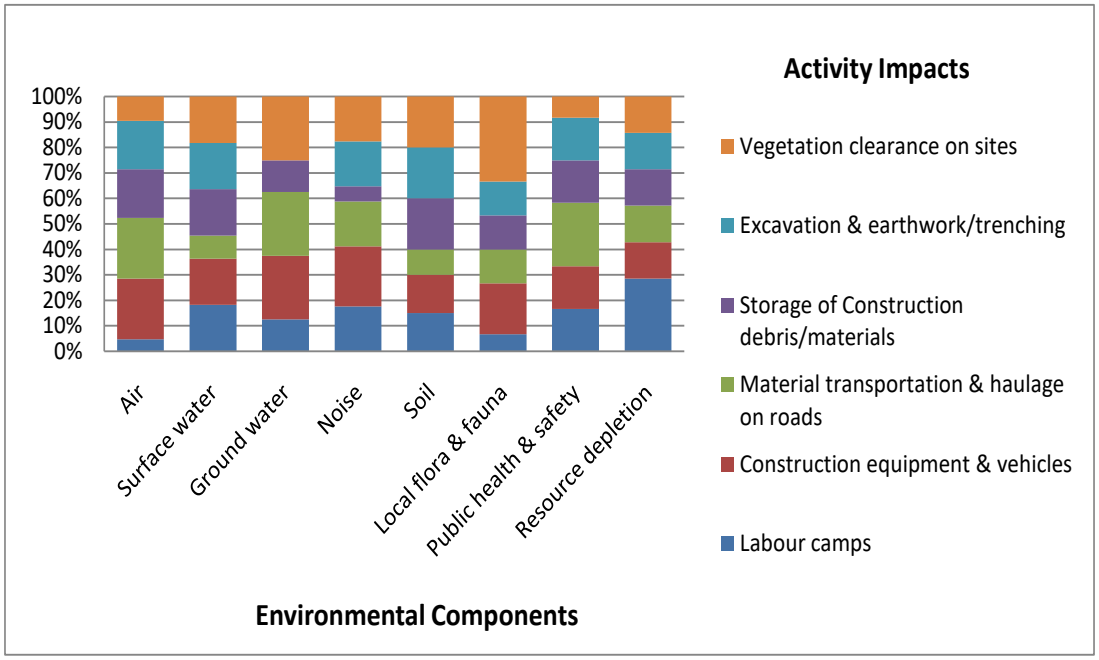


Fig. 18: Environmental Impacts due to Construction Activities

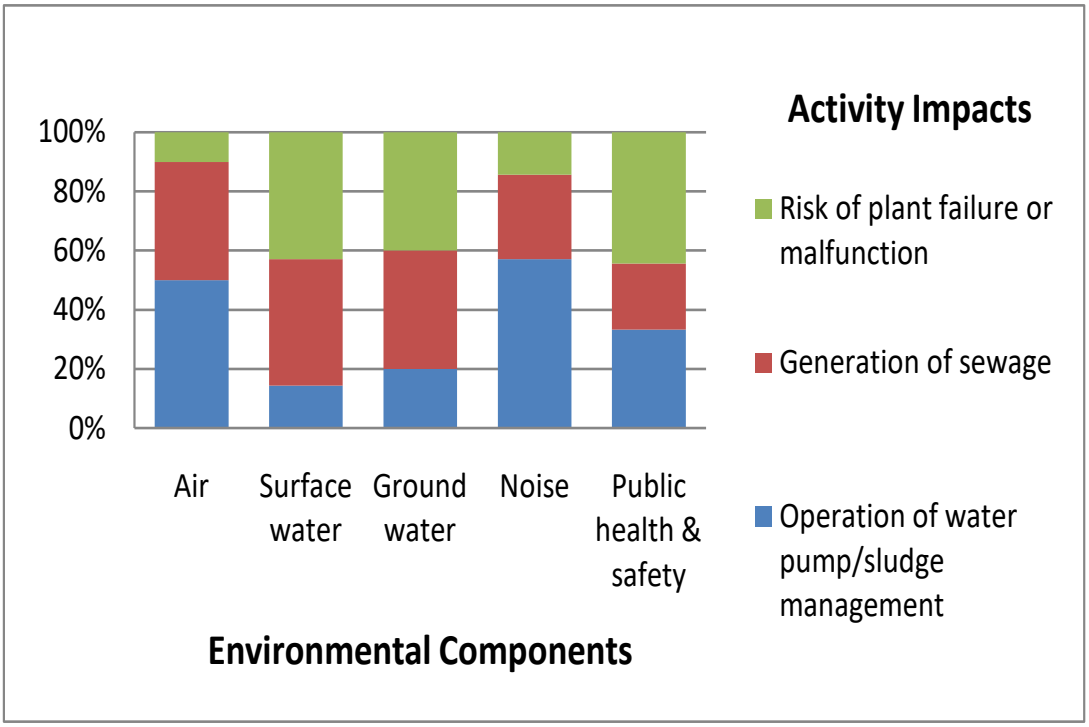


Fig. 19: Impacts of Project Activities during Operation Phase

The charts above indicate that the activity impacts on the environmental components are relatively more severe than the operational phase impacts. During the construction phase, the worst affected environmental components are air, noise, soil and resource depletion. The operational phase is characterized by an overall positive impact on public health and

safety due to augmentation in water supply, thus reducing the spread of disease vectors and unsafe water sources.

4. Summary of Environmental Impacts

A summary of environmental impacts is presented in table 5.

Table 5: Summary of Environmental Impacts

Activity	Adverse Impacts
Site acquisition, clearance and preparation	Loss of flora and fauna in the project sites (Communities and Schools)
Excavation, other preparatory construction activity and pipe laying	Generation of large amount of soil spoil, stones and debris
	Loss of top soil
Construction activity and operation of construction equipment in the community and schools	Generation of dust and other air emissions
	Generation of wastewater and pollution of nearby areas
	Generation of polluted wastes (solid and liquid)
	Generation of noise and vibrations
Establishment and operation labour camps	Generation of emissions to air, noise, water, land and depletion of resources
Pumping stations	Noise pollution due to pumps
Preventive maintenance of project infrastructure	Health and safety of workers, teachers, pupils and community residents could be at risk

C. Mitigation Measures

Based on the above mentioned Environment Impacts, an Environmental Management Plan (EMP) is suggested which discusses the impacts during the construction Phase followed by the operational phase and the mitigation measures provided at each stage for each environmental component. The EMP is proactive in nature and should be updated if facilities are being upgraded or existing facilities modified in future. The EMP has been developed to address mitigation measures/actions to be taken during construction and operation phases of the project for the significant environmental impacts previously identified. The monitoring requirements as well as primary responsibilities have been mapped for each of these mitigation measures. The EMP proposes an institutional framework within the State RUWASSA and the local government WASH unit to carry out the environmental and social mitigation tasks and coordinate its implementation. A summary of mitigation plans is presented in table 6.

Table 6: Environmental Management Plan

Activity	Adverse Impacts	Mitigation Measures	Monitoring Parameters & Frequency	Responsibility Implementation (Supervision)
Site Acquisition, Clearance & Preparation	Loss of flora and fauna in the project site (Communities and Schools)	Avoid removal of trees wherever practically possible Some of the large girth/ecologically important trees should be transplanted or nurseries of native species should be established	Number of trees to be Removed	Contractor
Excavation, other preparatory construction activity and pipe laying	Generation of large amount of soil spoil, stones and debris	Proper disposal of such soil at nearby low lying areas to reuse the soil	Volume / Weight of Soil Spoil	Contractor
	Loss of Top Soil	Top soil to relevant depth should be suitably stored till pipe laying activity is completed and then either replaced or reused in other cultivable lands.	Depth of top soil to be removed by location	Contractor
	Disruption / Congestion of traffic through the communities and adjoining areas	Ensure proper traffic diversions Inform commuters well in advance of proposed works across roads Ensure air, noise and wastewater impacts are minimized by following suitable operational practices	Traffic patterns to ensure that diversion mechanism is appropriate and working as desired	WASH unit, Contractor
Storage, and transportation of soil spoil generated due to excavation	Soil / Dust emission or spillage	Storage: Minimizing on-site storage time of removed soil, Stockpiles (to be used for backfilling) greater than 20 m3 volume should be adequately enclosed on three sides with walls extending above stockpiles Transport: Spray water on material to be transported and cover the truck tops to reduce dust re-suspension;	Monthly Audits	Contractor

Activity	Adverse Impacts	Mitigation Measures	Monitoring Parameters & Frequency	Responsibility Implementation (Supervision)
		Use of Water Sprays or Dust suppressants to suppress dust on site due to vehicle movement Restrict vehicular speed		
Transportation of Construction Materials / Debris	Generation of emissions to air and noise	Select transport routes that reduce disturbance to regular traffic or diversions No transportation allowed during heavy traffic periods Keep soil, vehicles, and machinery off roads where possible Vehicles used for transporting soil and sand to be covered on top Regular inspection and corrective actions on material loading / unloading practices Regular preventive maintenance of vehicles to be carried out by transporter Vehicle transporter to minimize use of horn Use of noise mufflers on vehicle exhaust Ensure that a proper signage system is followed in case of traffic diversions	Monthly Audits – Monthly monitoring	WASH unit, Contractor
Construction Activity and Operation of Construction Equipment in communities and schools	Generation of dust and other air emissions	Comply with relevant legal regulation on equipment Keep soil, vehicles, and machinery off	Monthly Audits	WASH unit, Contractor

Activity	Adverse Impacts	Mitigation Measures	Monitoring Parameters & Frequency	Responsibility Implementation (Supervision)
		Roads where possible Regular preventive maintenance of equipment to be carried out by contractor Use of Water (check availability of water) Sprays or Dust suppressants to suppress dust on site due to construction activities Construction in schools should be scheduled during holidays In case of Blasting in rock (Etsako West LGA, Edo State): Ensure proper blasting techniques (techniques such as wet blasting could be explored to minimize dust and noise generation etc.)		
	Generation of wastewater and pollution of nearby areas	Avoid excavation activities in rainy season In areas of shallow groundwater tables, discharge of pumped out water during excavation should be properly planned to avoid flooding / runoff to adjoining agricultural fields or stockpile areas At the same time reuse of such water in adjoining fields for irrigation or washing purposes should be explored and maximised Material stockpiles (to be used for backfilling) to be covered with waterproof covers		Contractor

Activity	Adverse Impacts	Mitigation Measures	Monitoring Parameters & Frequency	Responsibility Implementation (Supervision)
	Generation of polluted wastes (solid and liquid)	Wastes (oily, greasy wastes, waste or used oil, washwaters) from vehicle and equipment maintenance activities should be carefully stored and disposed off in a safe manner	Monthly Audits	Contractor
	Generation of Noise and Vibrations	Comply with relevant legal regulation on equipment Construction during night hours should not be allowed (2200 to 0600 hours) particularly near residential areas Installation of temporary sound barriers/ acoustic enclosures around equipment such as stone crushers, concrete mixers Adequate personal protective equipment to be provided to workers / labour in the construction area depending on the noise level exposure In case of blasting: neighbourhood residents to be informed in advance and evacuated if found necessary	Monthly Audits	Contractor
Establishment and Operation of Labour Camps	Generation of wastewater and Land Pollution	Provision of adequate number of temporary mobile sanitation facilities and / or septic tanks and soak pits for fixed facilities Disposal of collected sewage / wastewater to existing treatment plants	Monthly Audits	WASH unit, Contractor

Activity	Adverse Impacts	Mitigation Measures	Monitoring Parameters & Frequency	Responsibility Implementation (Supervision)
	Generation and Disposal of Solid Waste	Raise worker awareness on minimizing solid waste generation Provide adequate solid waste collection facilities and ensure proper disposal Discourage / disallow burning of solid waste	Monthly Audits	Contractor
	Emissions to air from fuel burning for domestic purposes	Arrangements should be made to provide a ration of a suitable clean fuel for domestic purposes to the labour Discourage / disallow use of biomass or local firewood for such purposes	Monthly Audits	Contractor
	Generation of employment	Maximize use of local labor (atleast 70%) for unskilled positions, in part to minimize the need for temporary camps, and also to ensure socioeconomic equity for the local population. Use of local skilled and unskilled labor could be one of the important contractor proposal evaluation criteria	Monthly Audits	Contractor
Pumping Stations	Noise Pollution due to pumps	Select low noise machinery; putting high noise equipment indoors; Install noise enclosures or buffers Wherever possible pump stations should be underground except flood prone areas; Establishing a suitable greenbelt buffer in the plant area	Quarterly Audits	Contractor

Activity	Adverse Impacts	Mitigation Measures	Monitoring Parameters & Frequency	Responsibility Implementation (Supervision)
Infrastructure not well maintained and systems malfunction (eg. Leakage of pipes)	Effect health and safety of residents	Adequate design of the pipes, choice of proper piping materials. WASH unit to develop a procedure/ mechanism to address citizens' complaints and respond to emergency leakage situations in the shortest possible time. Prepare detailed Operation & Maintenance (O&M) procedures for all infrastructure Inspect and maintain all systems as in O&M procedures Replace all parts and conduct repairs when necessary	Quarterly Audits	WASH unit, Maintenance Contractor
Water supply shut down for long periods for maintenance or due to emergency	People will be inconvenienced and their health may be at risk if water supply system is shut down for long periods	Plan work carefully to keep shutdown to a minimum Provide alternative water supply to affected residents and schools Inform communities and schools of any shutdown well in advance	Quarterly Audits	WASH unit, Maintenance Contractor
Repair of elements of Infrastructure	Health and safety of workers and the public could be at risk	Prepare and operate Health & Safety plan for all works	Quarterly Audits	WASH unit, Maintenance Contractor

D. Environmental Management and Monitoring Plan

The Environmental Management Plan (EMP) is developed to ensure that the Project is implemented in an environmentally sustainable manner where all stakeholders including the Project proponents, contractors and subcontractors, including consultants, understand the potential environmental risks arising from the proposed Project and take appropriate actions to properly manage the risk. The prime responsibility of EMP implementation and monitoring lies with the State Rural Water Supply and Sanitation Agencies (RUWASSA) in Anambra, Cross River, Osun, Kano, Jigawa and Yobe States and its contractors. Most of the implementation of the EMP during the construction phase will be the responsibility of the Project contractors. To ensure that the Contractor complies with the EMP requirements effectively, it should be made part of the special conditions of contract given by the State RUWASSA and the Contractor must include adherence to the specifications in their bid (the cost of mitigation is therefore assumed under the contractor's price proposal).

The State RUWASSA's will be the Executing Agency (EA) of the Project. Project Management Consultants (PMC) will provide project management support, and assure the technical quality of design and construction, and supervise the construction process.

An Environmental unit (EnvU), or its equivalent will be established within the State RUWASSA's, to supervise the implementation and monitoring of Environment Management Plan both in Construction and Operation Phase. To ensure long-term and effective institutional capacity building, the EnvU will comprise an Environment Officer (EO), and a Social Development Officer. Along with RUWASSA-wide functions, the EO will be responsible for the following tasks related to the environmental management plan (EMP) Project:

- Supervise and ensure implementation of the IEE/EMP by the contractor and other agencies involved in Project implementation;
- Coordinate mainstreaming environmental considerations in Project planning, design and execution;
- Identify and update regulatory and statutory requirements on environment applicable to the Project and other RUWASSA operations, and liaison with the relevant authorities for approvals and any other documents as required; and
- Liaise with external regulatory agencies such as the National Water Resource Institute (NWRI) and coordinate joint monitoring of the environmental performance according to government regulations and Federal Ministry of Environment environmental monitoring guidelines.
- Coordinate and supervise environmental monitoring/site compliance audits, as outlined in the EMP, collate and analyse data;
- Prepare and submit quarterly reports to regulatory authorities based on the monitoring and compliance evaluation; and
- Coordinate with all stakeholders and provide inputs to the RUWASSA Public Relations Officer for external communication on environmental issues as required/requested.

Some technical assistance may be required to build internal capacity to carry out the above tasks and strengthen the State RUWASSA's and LGA WASH units. Local technical

Institutes like the National Water Research Institute (NWRI) Kaduna, or consulting organizations could be approached for such support from time to time in the form of:

- providing training to officials of the State RUWASSA's and LGA WASH units in order to build technical expertise and capacity in the environmental and social aspects of Project development and implementation
- environmental monitoring and external auditing

The Project performance, monitoring, and evaluation will be done in accordance with construction and environmental standards as well as Federal Ministry of Environment guidelines.

A. Reporting

During the construction period, quarterly reporting on status of environmental and social issues is recommended on the basis of monitoring and inspections carried out on a monthly basis. In the operation phase a six monthly monitoring and reporting is recommended. These reports will be prepared by the State RUWASSA's and submitted to relevant local authorities for review and feedback.
The State RUWASSA's should also build capacity and preparedness on handling environmental emergency situations during construction and operating period and prepare a plan of action for responding to such situations. The State RUWASSA's will also house a grievance desk to accept and address grievances from interested parties related to the environmental and social issues in the Project implementation.

B. Grievance Redress Mechanism

The EO will address the grievances regarding environmental performance put forth by the affected persons. A register will be maintained to record the complaints with respect to environmental performance of the project. This will mainly be applicable in the construction phase during which most of the impacts have been anticipated. The grievances will be addressed within seven days and a maximum of fifteen days depending on the severity of the grievance.

E. Public Consultation and Information Disclosure

Public consultations were carried out to identify perceptions on environmental factors due to the Project. Discussions were held with State RUWASSA Officials, local community representatives, school heads and individuals in the Project area.
During the consultation with the Project affected people, it was found that there was a general lack of awareness on environmental issues due to the Project. There is a need to formulate and create awareness programmes about the environment among local people, particularly on impacts during the construction stage.

F. Conclusion

The IEE identified impacts as a result of construction and operation phases, shows that none are expected to be highly significant, and all can be mitigated by relatively

straightforward measures. The mitigation measures proposed should reduce all impacts to the level of no significance.

Thus the findings of the IEE are that, provided mitigation measures are implemented and monitored, the negative impacts from constructing or operating the Project should be mitigable.

The overall impact of the Project is highly beneficial, as once the infrastructure is in operation, the peoples of Anambra, Cross River, Osun, Kano, Jigawa and Yobe will be provided with a constant supply of better quality water, which will serve a greater proportion of the population. This should improve the quality of life of the people and benefit individual and public health by improving hygiene and reducing the incidence of water-borne diseases.

The IEE has assessed the environmental impacts of all infrastructure proposed by the Project and has concluded that all negative impacts will be successfully mitigated and that the Project is expected to deliver major benefits to the benefiting communities and schools.

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Appendices

APPENDIX 1: TERMS OF REFERENCE
NATIONAL WASH CONSULTANT – INITIAL ENVIRONMENTAL EXAMINATION (IEE) FOR RURAL WATER SUPPLY AND SANITTAION PROGRAMMES IN 14 FOCUS STATES
SECTION: WASH

Background

The Water Supply and Sanitation Sector Reform Programmes (WSSSRP II and III) and the Water Supply and Sanitation Components of the Niger Delta Support Programme (NDSP) under the 10th EDF are part of the overall efforts in consolidation the on-going reforms in the WASH Sector. These Programmes aim at consolidating the achievements of the predecessor programme with a view to addressing most of the remaining fundamental issues of the Nigerian Water and Sanitation Sector; including the lack of or inadequate legal and institutional framework at both the Federal and State levels. These Programmes are across 14 States of the Country (WSSSRP_II – Anambra, Cross River, Osun, Jigawa, Kano and Yobe; WSSSRP_III – Adamawa, Plateau and Ekiti; NDSP – Akwa Ibom, Delta, Edo, Bayelsa and Rivers). These Programmes are designed to sustain the improvements on water governance made under WSSSRP_I.UNICEF manages the implementation of the Rural Water Supplya and Sanitation Programmes (RWSS-rural components) of these Programmes through a joint management agreement with the EU. These efforts cover support for capacity building of State and LGA rural water supply and sanitation institutions and as well provide support for the delivery of WASH services within rural communities in the project LGAs.In addition, there is need to address critical environmental issues associated with the project implementation, while supporting the government's priorities to provide WASH services.

In recent years, environmentally sustainable development has remained one of the major challenges facing development programming in most developing countries, including Nigeria. Accordingly, the Ministry of Environment has introduced a variety of instruments into the country's development planning. Initial Environmental Examination (IEE) is one of the tools used for environmentally sustainable development planning and intervention for small scale development projects. Within the implementation of these EU/UNICEF supported Programmes; IEE has been proposed to forsee the possible positive and negative impacts of the project as one of the measures for promoting sustainable development. Indeed it is the requirement of EU to ensure that the adverse effects of development interventions are minimum and can be mitigated cost effectively.

This Terms of Reference is hence prepared for the engagement of WASH Consultant for the conduct of Initial Environmental Examination (IEE) prior to the construction of water supply and sanitation facilities in 28 project LGAs under three Programmes. Considering the scope of this work and concentration of the project States in the South, the Consultant will be a National Consultant but will be based in Edo State RUWASSA. This Consultant will be involved in field assessments, public presentations as well provide technical support to the project States in integrating the outcomes of this study into programme implementation design as indicated in the programmed description of action documents.

Purpose

The aim of this consultancy is to engage a Consultant who will, under the overall guidance of the WASH Specialist, carry out Initial Environmental Examination (IEE) for Rural Water Supply and Sanitation Projects (RWSSP) under the WSSSRP_II, WSSSRP_III and NDSP. Further to identify and analyse the potential environmental impacts (both positive or adverse) on physical, biological, socio--economic & cultural environments of the project and propose Environmental Management Plan (EMP) .

The objectives are:

1. To conduct IEE for RWSSP in 28 Project LGAs of 14 Focus States and
2. To propose Environmental Management Plan which will mitigate the adverse impacts and enhance the positive impacts of the project. The main components of an EMP should contain the following:

- summary of the potential impacts of the proposal;
- description of the recommended mitigation measures;
- statement of their compliance with relevant standards;
- allocation of resources and responsibilities for plan implementation;
- schedule of the actions to be taken;
- programme for surveillance, monitoring and auditing; and
- contingency plan when impacts are greater than expected.

Scope

The consultant will be managed through a third party contractor who will provide administrative support to ensure effective implementation of all the planned activities as indicated in the terms of reference. The IEE will cover the 28 project LGAs under the programmes and will assess all the activities that are proposed for the programmes, so as to ensure environmentally--sound project design and implementation.

As a key component of the study, the consultancy will provide clear recommendations centering on the environmental externalities associated with projects implementation involving infrastructure development such as boreholes construction, latrines, sewage systems, etc. The Consultant shall, in line with statutory requirement for managing the environment, facilitate, in collaboration with the State RUWASSAs, the following activities as part of IEE study:

Sanitation

1. Conduct a site assessment of at least proposed sanitation installations (public/school latrines if any) to confirm
   - Potential contamination of waterways;
   - Potential contamination of underground aquifers.
2. Analyze the role of vegetation surrounding sanitation installations to limit surface run off into latrine or sanitation pits;
3. The consultant will conduct a brief comparative analysis of different sanitation technologies, including an estimation of the environmental impact of each, the unit cost of adequate management measures and the long-term sustainability.
4. The consultant will analyze the expected intensity of use of latrines or other proposed solutions, determining the necessary management measures to ensure that sanitation services are maintained in good conditions of use.

5. An analysis will be conducted of the alternative final disposal and treatment methods of excreta from pits, septic tanks or wetlands, taking into account the need for cost effective and sustainable solutions.

Water Supply

The results to be achieved of the IEE under water supply services will include the following:

1. Consultant will analyze the potential environmental impact on water source sustainability of each proposed system.
2. Confirm the suitability of siting of proposed deep and shallow wells as to ensure minimum surface environmental damage;
3. Analyze the potential impact of selected deep wells on aquifer stability and the expected hydrological balance over the medium and long term;
4. Develop appropriate environmental mitigation measures to ensure that water sources developed under the programme are sustainable over the long term;
5. Analyze the environmental awareness among LGAs, urban and rural dwellers;
6. Identify appropriate interventions for the education component (WASH in School) of this project to promote environmental awareness;
7. Develop a brief analysis of other major initiatives within the State urban water resource authorities to enhance understanding of the need for appropriate environmental and integrated water resource management;
8. Develop environmental management plans and the outline of key targets to ensure the sustainability of water sources for the life of project (LOP).
9. If possible, identify appropriate policy and advocacy strategies that would have a positive impact on environmental awareness

Specific Tasks

1. The consultant will be responsible for carrying out IEE and prepare IEE report using all the prevalent guidelines, acts, policies and rules. Project Implementation Agency (RUWASSAs) will coordinate the IEE.
2. Identify and analyse the potential environmental impacts (whether positive or adverse) on physical, biological, socio--economic & cultural resources, from the location, design & construction of project structures & associated facilities in the project areas.
3. Propose the suitable mitigation measures for minimizing the potential negative environmental impacts and to augment the positive ones to improve overall performance of the project.
4. Define and prepare appropriate environmental monitoring and management plan.
5. Determine the potentials for the improvements to natural resources and environmental management and socio--economic benefits to the communities in the project areas and its surroundings.
6. Collate public feedback for safeguarding the natural environment with least negative impact on its natural settings and also to adequately assess & document community requirements relating socio--economic & cultural aspects in the project areas.
7. Prepare IEE report as per approved format
8. Support and assist the sector promoting and supporting training and capacity building initiatives for the project state and communities.

9. Organize a consultative forum for key sector players to share finding of the study and integrate feedbacks into the final report
10. Compile and provide periodic progress reports as well as summary of studies/ assessment and their findings, as required.
11. Liaise with UNICEF Field Offices (WASH POs) during the study..

The Consultant will follow the following Procedure

1) Desk Review

The following steps will be followed during the desk review:

- Collection and review of secondary sources of information from various sources
- Initial interaction and consultation with the local community and LGA/State level stakeholders
- Delineation of geographical boundary of the influence area on the topo-map

It is necessary to specify area that shall be covered for assessment of environmental impacts so as to avoid future confusion. Depending upon nature and extent of expected impact area the geographical area is categories into Direct Impact Area (DIA) and Indirect Impact Area (IIA).
For the collection of environmental features related to biophysical environment, maximum 100 meter distance observable from the structures will be taken as an influence area. The impacts shall be classified in terms of extent (site specific, local and regional), magnitude (low, medium and high) and duration (short term, medium term and long term) as well as nature (reversible, irreversible), level (low, moderate and significant). The methodology adopted for impact identification and prediction will be checklists and matrix method. The likely impacts/issues of the proposed project construction as well as operation are described in the following sections. The likely impacts/issues shall be assessed covering both adverse and beneficial ones.

Preparation of project specific checklist

The consultant will prepare the Environmental checklist and Questionnaire Survey in order to conduct the detail field study and to collect baseline environmental information of the project area.

2) Field survey

- Focus group discussion (FGD) - To conduct consultation with the local communities at different settlements, FGD will be organized with key informants and other knowledgeable persons. It was done to collect biological, socio-economic and cultural environment related information using a checklist.

- Topographical map - It was used to show environmental features on the map during walkthrough survey.

- Photographs - Necessary photographs were taken to show different environmental features.

3) Public consultation

In order to ensure the public involvement, the following procedures were followed during IEE report preparation:

- IEE Consultant will also carry out interaction with local communities and related stakeholders during field survey to collect the public concerns and suggestions. Moreover, focus group discussions (FGDs) will be conducted to collect and solicit information regarding the bio-physical and socio-economic and cultural aspects of the proposed project. The FGDs will be held at different sample communities.
- After reviewing draft IEE report and incorporating the suggestions from the concerned stakeholders, final IEE report will be prepared and sent to State RUWASSA for approval.
- The approved IEE report will be accessible to interested parties and general public through the concerned RUWASSA.

4) Mitigation Measures and Monitoring Plan

Based on the identified impacts their nature, extent and magnitude, the mitigation and monitoring prescriptions will be developed. A realistic approach will be applied for the application of the mitigation measures in the local context. Environmental monitoring plan will be developed to assess the effectiveness of the mitigation measures and implementation status.

5) The Final Report

The IEE report will be prepared by Consultant and submitted to UNICEF for review. After reviewing the final IEE report according to ToR, it will be submitted to respective 14 Rural Water Supply and Sanitation Agencies.

6) Information Disclosure

Information about the proposed project and IEE study will be disseminated through person to person contacts and interviews and group discussions during field study of IEE. Available institutions at the local level will be informed through notice distribution or posting at concerned LGAs, The approved IEE report will be accessible to interested parties and general public through following agencies:

1. LGA WASH Department/Units
2. RUWASSAs
3. State Ministries of Water Resources and Equivalent

Programme ID & Specific Project Involved: Grant SC/120422 & SC120815 (WASH)

Duty Station: Edo State (Nigeria) **Supervisor:** Bishnu Timilsina

Deliverables

The Consultant shall submit fifteen copies of the final IEE report of this project to the concerned Ministry (State) through UNICEF in accordance with Rule 10 of the Environmental Protection Rules.

Qualifications or specialized knowledge/experience required:

- University degree in social and behavioral sciences, international development or statistics. Sanitary Engineering, Geology, Hydrology will be an asset and considered together with relevant experience in EIA, IEE, etc.
- The consultant should have at least 5 years of experience in environmental management and assessment experience in Rural, Peri-urban and urban areas of Nigeria or similar.
- The consultant should also have experience in the fields of water source contamination studies; similar studies or EIAs and evaluation of the environmental impact of different potential technologies for water supply and sanitation will be essential.
- Analytical skills and report writing ability are essential together with IT skills, including experience of MIS development and implementation and use of statistical software.
- Experience in networking amongst government agencies, NGOs, the private sector and development partners are essential.
- Fluency in written and spoken English is essential. Knowledge of local languages would be an advantage.
- Communication, presentation and training skills (including ability to explain data analysis to the stakeholders)
- Computer knowledge (MS Windows systems, email communication, other relevant IT skills
- Analytical skills and ability to formulate strategies and concepts
- Effectively work as part of a team in difficult circumstances and manage relationships with government officials and other UNICEF partners.
- Judgement and networking skills as well as drive for results.
- Demonstrated ability to work in a multi-cultural environment and establish harmonious and effective working relationships both within and outside the organization.

Duration:

This initial engagement will be for 6months (1st June to 30th November).

Budgeted cost of consultancy:

Remunerations and payments will be in line with approved AWD third party contract arrangement for National WASH Consultants

Requesting Officer: Bishnu Timilsina

Signature Date:

14. **Approval of activity by Chief - WASH Section:**Kannan Nadar

Remarks:

Signature:

Date:

15. **Approval of Terms of Reference by Deputy Rep : Jacques Boyer (Dep. Rep)**

Remarks:

Signature Date:

APPENDIX II: COMMUNITY ENVIRONMENTAL CHECKLIST

STATE:

LGA:

COMMUNITY:

DATE:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
I. AESTHETICS -- Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☐
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☐
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☐	☐
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
II. AIR QUALITY -- Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☐
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☐	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant (including ozone depleting emissions)?				
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☐
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☐	☐
III. BIOLOGICAL RESOURCES -- Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations?	☐	☐	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations?	☐	☐	☐	☐
c) Have a substantial adverse effect on federally protected wetlands (including, but not limited to, marsh, coastal areas, etc.) through direct removal,	☐	☐	☐	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
filling, hydrological interruption, or other means?				
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☐
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☐
IV. CULTURAL RESOURCES -- Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource?	☐	☐	☐	☐
b) Cause a substantial adverse change in the significance of an archaeological resource?	☐	☐	☐	☐
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☐
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	☐
V. GEOLOGY AND SOILS -- Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:	☐	☐	☐	☐
i) Rupture of a known earthquake fault?	☐	☐	☐	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
ii) Strong seismic ground shaking?	☐	☐	☐	☐
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	☐
iv) Landslides?	☐	☐	☐	☐
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☐
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?				
d) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☐
VI. HAZARDS AND HAZARDOUS MATERIALS -- Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
	☐	☐	☐	☐
d) Be located on a site which is included on a list of hazardous materials sites and, as a result, would it create a significant hazard to the public or the environment?				
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☐
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☐
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☐
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☐
VII. HYDROLOGY AND WATER QUALITY -- Would the project:	☐	☐	☐	☐
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☐	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level?				
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or	☐	☐	☐	☐

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
river, in a manner which would result in substantial erosion or siltation on- or off-site?				
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☐	☐
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	☐
f) Otherwise substantially degrade water quality?	☐	☐	☐	☐
g) Place housing within a flood hazard area?	☐	☐	☐	☐
h) Place structures within a flood hazard area which would impede or redirect flood flows?	☐	☐	☐	☐
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☐
j) Inundation by tsunami, or mudflow?	☐	☐	☐	☐
VIII. LAND USE AND PLANNING - Would the project:				
a) Physically divide an established community?	☐	☐	☐	☐
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan or specific plan) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☐
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
IX. MINERAL RESOURCES -- Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the community and the residents of the state?	☐	☐	☐	☐
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☐
X. NOISE -- Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan, or applicable standards of other agencies?	☐	☐	☐	☐
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☐
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☐
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☐
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XI. POPULATION AND HOUSING -- Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☐
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☐
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☐
XII. PUBLIC SERVICES				
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:	☐	☐	☐	☐
Fire protection?	☐	☐	☐	☐
Police protection?	☐	☐	☐	☐
Schools?	☐	☐	☐	☐
Parks?	☐	☐	☐	☐
Other facilities	☐	☐	☐	☐
XIII. RECREATION				
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☐
XIV. TRANSPORTATION/TRAFFIC -- Would the project:				
a) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?	☐	☐	☐	☐
b) Exceed, either individually or cumulatively, a level of service standard established by the management agency for designated roads or highways?	☐	☐	☐	☐
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☐
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☐
e) Result in inadequate emergency access?	☐	☐	☐	☐
f) Result in inadequate parking capacity?	☐	☐	☐	☐
g) Conflict with adopted policies, plans, or programs supporting alternative transportation?	☐	☐	☐	☐
XV. UTILITIES AND SERVICE SYSTEMS -- Would the project:				
a) Exceed wastewater treatment requirements of the Water Quality Control Board?	☐	☐	☐	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☐
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☐
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☐
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☐
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☐
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☐
XVI. MANDATORY FINDINGS OF SIGNIFICANCE				
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of community history or prehistory?	☐	☐	☐	☐
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental	☐	☐	☐	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?				
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☐

Evaluation of Environmental Impacts

Potentially Significant Impact

‘Potentially Significant Impact’ is appropriate if there is substantial evidence that an effect may be significant.

Less than Significant With Mitigation Incorporated

‘Less than Significant With Mitigation Incorporated’ applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact.

Less than Significant Impact

‘Less than Significant Impact’ is appropriate if there is substantial evidence that an impact may be insignificant.

No Impact

A ‘No Impact’ answer is adequately supported if the information sources show that the impact simply does not apply to the project.

APPENDIX III: COMMUNITY WASH ASSESSMENT

Community Name –

Traditional Ruler:

Community location:

Population:

Number of houses:

Primary school (Y/N):

Secondary School (Y/N):

Health centre (Y/N):

Water supply project:

Water supply source:

Water, Sanitation and Hand washing Facilities Assessment in Community

WASH ASSESSMENT **SCORES**

	0	**1**	**2**	**3**	**Score**
Water Supply Assessment					
Sanitation Assessment					
Hand washing Assessment					

Scores
0 – The existing situation and facilities are acceptable. No improvement is necessary.
1 - The existing situation and facilities are reasonable, but would benefit from improvement. Action is not necessarily a priority.
2 - The existing situation and facilities are very poor. Improvement is urgently required.
3 - There are no facilities. Provision is the highest priority.

Environmental Impacts on Community Environment
(1) Impact of borehole construction, operation and maintenance on community environment:
i)

ii)

iii)

(2) Impact of latrine construction, operation and maintenance on community environment:
i)

ii)

iii)

(3) Impact of dug well construction, operation and maintenance on community environment:
i)

ii)

iii)

(4) Impact of Hand pump operation and maintenance on community environment:
i)

ii)

iii)

(5) Impact of diesel powered motorised pump operation and maintenance on community environment:
i)

ii)

iii)

Observation:

APPENDIX IV: SCHOOL WASH ASSESSMENT

School name –

Head teacher:

School location:

Primary school (Pop):

Sec. School (Pop):

Water supply source:

Water, Sanitation and Hand washing Facilities Assessment in School

WASH ASSESSMENT **SCORES**

	0	**1**	**2**	**3**	**Score**
Water Supply Assessment					
Sanitation Assessment					
Hand washing Assessment					

Scores
0 – The existing situation and facilities are acceptable. No improvement is necessary.
1 - The existing situation and facilities are reasonable, but would benefit from improvement. Action is not necessarily a priority.
2 - The existing situation and facilities are very poor. Improvement is urgently required.
3. There are no facilities. Provision is the highest priority.

Environmental Impacts on School Environment
(1) Impact of borehole construction, operation and maintenance on school environment:
i)

ii)

iii)
(2) Impact of latrine construction, operation and maintenance on school environment:
i)
ii)
iii)
(3) Impact of dug well construction, operation and maintenance on school environment:
i)
ii)
iii)
(4) Impact of Hand pump operation and maintenance on school environment:

i)
ii)
iii)
(5) Impact of diesel powered motorised pump operation and maintenance on school environment:
i)
ii)
iii)

Observation:

APPENDIX V: WASH ASSESSMENT IN COMMUNITIES

Community/LGA/State	Water Supply Assessment	Sanitation Assessment	Hand Washing Assessment
Udabor-Umueri, Anambra East LGA, Anambra State	2	2	2
Obinabo Nkpologwu, Aguata LGA, Anambra State	3	2	2
Ugom, Yakurr LGA, Cross River State	2	2	2
Duala, Boki LGA, Cross River State	2	2	2
Akiriboto 1, Ayedaade LGA, Osun State	2	3	3
Oponda, Odo Otin LGA, Osun State	2	3	3
Gara, Madobi LGA, Kano State	2	2	3
Garandiya, Takai LGA, Kano State	2	3	3
Abakura, Taura LGA, Jigawa State	2	3	3
Garimanu, Malammadori LGA, Jigawa State	2	2	3
Kakori, Nguru LGA, Yobe State	2	3	3
Dawayo, Bade LGA, Yobe State	1	2	3

Scores
0 – The existing situation and facilities are acceptable. No improvement is necessary.
1 - The existing situation and facilities are reasonable, but would benefit from improvement. Action is not necessarily a priority.
2 - The existing situation and facilities are very poor. Improvement is urgently required.
3. There are no facilities. Provision is the highest priority.

APPENDIX VI: WASH ASSESSMENT IN SCHOOLS

School name/LGA/State	Water Supply Assessment	Sanitation Assessment	Hand Washing Assessment
Ovukwu Primary School, Anambra East LGA, Anambra State	2	2	3
Nkpologwu Primary School, Aguata LGA, Anambra State	2	2	2
Apostolic Primary School, Yakurr LGA, Cross River State	3	3	3
Duala Primary School, Boki LGA, Cross River State	2	2	3
Akiriboto 1 Primary School, Ayedaade LGA, Osun State	3	3	3
Imuleke-Oponda Primary School, Odo Otin LGA, Osun State	3	2	3
Gara Primary School, Madobi LGA, Kano State	2	2	3
Garandiya Primary School, Takai LGA, Kano State	3	2	3
Abakura Primary School, Taura LGA, Jigawa State	3	2	3
Babariga Primary School, Malammadori LGA, Jigawa State	2	2	3
Kakori Primary School, Nguru LGA, Yobe State	3	2	3
Dawayo Primary School, Bade LGA, Yobe State	1	2	3

Scores
0 – The existing situation and facilities are acceptable. No improvement is necessary.

1 - The existing situation and facilities are reasonable, but would benefit from improvement. Action is not necessarily a priority.
2 - The existing situation and facilities are very poor. Improvement is urgently required.
3. There are no facilities. Provision is the highest priority.

Appendix VII: LIST OF KEY CONTACTS

A. Government Officials

S/N	Name	Organization	Position
1.	Mr. Victor Ekwobi	RUWASA, Anambra State	PM
2.	Mrs Theresa Nwanta	RUWASA, Anambra State	Sanitation Officer
3.	Mr. Andrew Nwanze	RUWASA, Anambra State	Planning Officer
4.	Mrs B. Ozuruonye	RUWASA, Anambra State	Health officer
5.	Mrs Ejide Amuche	RUWASA, Anambra State	Community Mobilization Officer
6.	Mr. Kevin Anazodo	Anambra East LGA, Anambra State	WASH Coordinator
7.	Mrs Helen Offor	Anambra East LGA, Anambra State	Sanitation Officer
8.	Mr. Clement Egbuche	Ovukwu Primary School, Anambra East LGA, Anambra State	Head Teacher
9.	Sir Michael Attoh	Aguata LGA, Anambra State	Head of Service
10.	Mr. Peter Akwobi	Aguata LGA, Anambra State	WASH Coordinator
11.	Mrs Christiana Omeiheoma	Nkpologwu Primary School, Aguata LGA, Anambra State	Head Teacher
12.	Mr. Patrick Emori	RUWATSA, Cross River State	PM
13.	Engr. Ekpenyong Ibah	RUWATSA, Cross River State	Director, Water
14.	Mr. Collins Osani	Yakurr LGA, Cross River State	WASH Coordinator
15.	Mr. Patrick Ejeji	Yakurr LGA, Cross River State	Planning Officer
16.	Mr Gabriel Ibah	Boki LGA, Cross River State	DG, Services and Administration
17.	Mr. Emma Agbor	Boki LGA, Cross River State	WASH Coordinator
18.	Mr. Joe Hans	Boki LGA, Cross River State	Planning Officer
19.	Alh. Olaposi Adeatu	RUWESA, Osun State	PM
20.	Mr. Olanrewaju	RUWESA, Osun State	Director, PME
21.	Mrs Ayodele	RUWESA, Osun State	PME Officer
22.	Mr. Adegoke	RUWESA, Osun State	PME Unit
23.	Mr. sangodipe	Ayedaade LGA, Osun State	Director, WASH
24.	Mr. Ilori	Ayedaade LGA, Osun State	Water Officer
25.	Mr. Adediran	Akiriboto 1 Primary School, Ayedaade LGA,	Head Teacher

		Osun State	
26.	Mr. Alawode Opeyemi	Odo Otin LGA, Osun State	Director, WASH
27.	Mr. Eunuch Oke	Odo Otin LGA, Osun State	PME Unit
28.	Mr. Abubakar Mohammed	Imuleke-Oponda Primary School, Odo Otin LGA, Osun State	Head Teacher
29.	Engr. Abdullahi Idris	RUWASA, Kano State	MD
30.	Alh. Auwal Garba	RUWASA, Kano State	Director, Planning and Community mobilization
31.	Alh. Auwalu Tudunwada	Madobi LGA, Kano State	Chairman
32.	Mallam Yusuf sarki	Madobi LGA, Kano State	WASH Coordinator
33.	Mallam Habibu Ado	Madobi LGA, Kano State	Sanitation Officer
34.	Mallam Abdul Mohammed	Gara Primary School, Madobi LGA, Kano State	Head Teacher
35.	Alh. Hamza said Giali	Takai LGA, Kano State	Chairman
36.	Alh. Yakubu Gambo	Takai LGA, Kano State	WASH Coordinator
37.	Mallam Hussemi Musa	Takai LGA, Kano State	Community Mobilization Officer
38.	Mallam Issa	Garandiya Primary School, Takai LGA, Kano State	Head Teacher
39.	Alh. Musa Medugu	RUWASA, Jigawa State	MD
40.	Engr. H.A. Marke	RUWASA, Kano State	Agm, Planning
41.	Mallam Mansur Adamu	Taura LGA, Jigawa State	WASH Coordinator
42.	Mr. Abdullahi Ahmed	Taura LGA, Jigawa State	Water Supply Officer
43.	Mr. Aliyu Inuwa	Taura LGA, Jigawa State	Mobilization Officer
44.	Mr. Bala Dahiru	Taura LGA, Jigawa State	Planning Officer
45.	Mallam Idris Haruna	Abakura Primary School, Taura LGA, Jigawa State	Head Teacher
46.	Mallam Babandi Alhassan	Mallammadori LGA, Jigawa State	WASH Coordinator
47.	Mallam Isiaka Ismaila	Babariga Primary School, Malammadori LGA, Jigawa State	Head Teacher
48.	Alh. Mohammed Bukar	RUWASA, Yobe State	MD
49.	Alh. Abubakar Liman	RUWASA, Yobe State	Director
50.	Mallam Umar abdullahi	RUWASA, Yobe State	M&E Officer
51.	Alh. Ali Mai-Dami	Nguru LGA, Yobe State	Chairman
52.	Alh. Mohammad Kalli	Nguru LGA, Yobe State	Director of Personnel
53.	Alh. Haman Gana	Nguru LGA, Yobe State	WASH Coordinator
54.	Mallam Usman Danyaro	Nguru LGA, Yobe State	M&E Officer
55.	Malam Usman Mukaila	Kakori Primary School, Nguru LGA, Yobe State	Head Teacher
56.	Mallam Adamu Daguana	Bade LGA, Yobe State	WASH Coordinator
57.	Alh. Danladi Aminu	Bade LGA, Yobe State	Head Teacher

B. Community Members

S/N	Name	Community/LGA/State	Position
1.	HRH Ebobo Nwabeze	Udabor-Umueri, Anambra East LGA, Anambra State	Traditional Ruler
2.	Chief Albert Nnaluwe	Udabor-Umueri, Anambra East LGA, Anambra State	Community leader
3.	Chief Ekoku Nwagogu	Udabor-Umueri, Anambra East LGA, Anambra State	Community leader
4.	Chief Simeon Nwagogu	Udabor-Umueri, Anambra East LGA, Anambra State	Community leader
5.	Chief Odogwu Anikwobi	Udabor-Umueri, Anambra East LGA, Anambra State	Community leader
6.	Chief Chukwu Nwaibeh	Udabor-Umueri, Anambra East LGA, Anambra State	Community leader
7.	Chief Anamule Nwafor	Udabor-Umueri, Anambra East LGA, Anambra State	Community leader
8.	Samuel Igwe	Udabor-Umueri, Anambra East LGA, Anambra State	Youth leader
9.	Igwe N.O. Obi	Obinabo Nkpologwu, Aguata LGA, Anambra State	Traditional Ruler
10.	Chief Alex Ezebosi	Obinabo Nkpologwu, Aguata LGA, Anambra State	Community leader
11.	Mr. Ezeonye Kuluje	Obinabo Nkpologwu, Aguata LGA, Anambra State	Youth leader
12.	HRH Otoh Otoh	Ugom, Yakurr LGA, Cross River State	Traditional Ruler
13.	Rev. Iwara Iwara	Ugom, Yakurr LGA, Cross River State	Youth leader
14.	HRH Matthias Baku	Duala, Boki LGA, Cross River State	Traditional Ruler
15.	Elder Fidelis Agabi	Duala, Boki LGA, Cross River State	Community leader
16.	Chief Hamza Ajibade	Akiriboto 1, Ayedaade LGA, Osun State	Traditional Ruler
17.	Oba Mustapha Adedotun	Oponda, Odo Otin LGA, Osun State	Traditional Ruler
18.	Chief Lambe Lawal	Oponda, Odo Otin LGA, Osun State	Community leader
19.	Mrs A. Adisa	Oponda, Odo Otin LGA, Osun State	Women leader
20.	Sarkin Rufai Idris	Gara, Madobi LGA, Kano State	Traditional Ruler
21.	Mallam Usman Shehu	Gara, Madobi LGA, Kano State	WASHCOM Chairman
22.	Mallam Bala Mukaila	Gara, Madobi LGA, Kano State	WASHCOM Secretary
23.	Sarkin Mohammed Bello	Garandiya, Takai LGA, Kano State	Traditional Ruler

24.	Sarkin Haladu Yawu	Abakura, Taura LGA, Jigawa State	Traditional Ruler
25.	Bashiru Abdu	Abakura, Taura LGA, Jigawa State	WASHCOM Secretary
26.	Sarkin Ali Usman	Garimanu, Malammadori LGA, Jigawa State	Traditional Ruler
27.	Mallam Adamu Usman	Garimanu, Malammadori LGA, Jigawa State	WASHCOM Chairman
28.	Mallam Ibrahim Yahaya	Garimanu, Malammadori LGA, Jigawa State	WASHCOM Secretary
29.	Sarkin Lawan Kakado	Kakori, Nguru LGA, Yobe State	Traditional Ruler
30.	Mallam Garba Musa	Kakori, Nguru LGA, Yobe State	WASHCOM Chairman
31.	Alh. Mohammed Lawal	Dawayo, Bade LGA, Yobe State	Traditional Ruler