APPENDIX

Appendix 1.1: Terms of Reference and Scope of Work

As a statutory requirement, the scope of the ESIA study was presented in the terms of reference (ToR) approved by the FMEnv. The ToR was prepared after the initial screening of the proposed project. This ESIA study is expected to be used by project developers (IUFMP) to enhance decisions before, during and after implementation of the Eleyele Dam. The scope of this ESIA is derived from FMEnv's guidelines for EIAs (Act 86, 1992) and the World Banks Environmental Assessment Safeguards Policies.

The basis for this study is the generation of baseline environmental and social information on the project area and characterizing conditions before the dam rehabilitation project is put in place. It is on these baseline data that the project conditions will be superimposed, to generate potential impacts (negative and/or positive) that are likely to result when the proposed work is implemented. Mitigation plans will be recommended to reduce or completely eliminate identified negative impacts. An environmental management plan will be developed and used to monitor the environmental attributes both during rehabilitation and post-rehabilitation periods. The scope of this baseline data generation process covers the following areas:

(a) Air Quality

Air quality measurements were carried out within the project area and analysed for:

i. Gases (SO_2, NO_2, H_2S, NH_3, CO, CO_2, VOC)
ii. Total Suspended Particulate
iii. Noise

(b.) Social Impact Assessment

This study shall focus on the determination of the different socio-cultural, demographic, and cultural resource changes that are likely to occur due to the project through contact interviews, and series of meetings with resident stakeholders and community development associations within the Eleyele dam project area.

(c) Dam Safety Evaluation

This aspect involved a thorough evaluation of the safety implications of the dam rehabilitation project in which all safety measures considered in the design, re-construction and operation of the project were assessed.

(d) Landuse/GIS

All existing landuse within the study area were documented. In addition, all degradations that had occurred were also identified.

(e) Soil Study

Soil samples were analysed for:

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i. *Physico-chemistry* - pH, particle size analysis (% clay, sand and silt), available phosphorus, heavy metals (Pb, Cd, Ni, Cr, Fe, Zn, Cu), exchangeable cations (Ca^{2+}, K^{+}, Mg^{2+}, Mn^{2+} Na^{+}), anions (NO_3^-, PO_4^{3-}, SO_4^{2-}, Cl^-), total hydrocarbons and total organic content
ii. *Microbiology* - Total heterotrophs, hydrocarbon utilizing bacteria and fungi, coliforms and microbial isolates

(f) Climate and Meteorology

This covers the description of the ambient temperature, magnitude and pattern of humidity and precipitation and the patterns of wind direction and speed

(g) Vegetation

Samples of vegetation in the project area were collected and analysed for:

i. Regional characterization and structure
ii. Vegetation typing to cover dominant species and community composition
iii. Identification and evaluation of the health status of dominant species
iv. Inventorisation and evaluation of economic and agricultural crops

(h) Water

This study involved the collection of both surface and groundwater samples. The following parameters were analysed for:

i. *Physico-chemistry* - pH, exchangeable cations (Ca^{2+}, K^{+}, Mg^{2+}, Mn^{2+} Na^{+}), anions (NO_3^-, PO_4^{3-}, SO_4^{2-}, Cl^-), heavy metals (Fe, Zn, Cu, Pb, Ni, Cd,), DO, BOD, COD, TDS, TSS and TS.
ii. *Microbiology* - Total heterotrophs, hydrocarbon utilizing bacteria and fungi, total pathogens

(i) Impacts and Mitigation

From the baseline environmental characterization of the project area and the proponent's project activities, positive and negative impacts of the project will be determined. Mitigation measures will be given to ameliorate or where possible, completely eliminate those identified negative impacts.

Appendix 1.2: Detailed Relevant Regulatory Provisions

International Regulatory Framework

World Bank OP/BP 4.01; Environmental Assessment (EA)

This is one of the 10+1 Environmental and Social Safeguard Policies of the World Bank. It is used in the Bank to examine the potential environmental risks and benefits associated with Bank lending operations. Under OP/BP 4.01, Bank lending operations are broadly defined to include investment lending, sector lending, rehabilitation lending through financial intermediaries, and investment components of hybrid lending. Prototype Carbon Fund (PCF) and Global Environmental Facility (GEF) co-financed projects are also subject to the provisions of OP/BP 4.01.

Under this guideline, The Bank requires environmental assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making. EA evaluates a project's potential environmental risks and impacts in its area of influence; examines project alternatives; identifies ways of improving project selection, siting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation. The Bank favours preventive measures over mitigatory or compensatory measures, whenever feasible.

EA takes into account the natural environment (air, water, and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples, and physical cultural resources); and trans-boundary and global environmental aspects. EA considers natural and social aspects in an integrated way. It also takes into account the variations in project and country conditions; the findings of country environmental studies; national environmental action plans; the country's overall policy framework, national legislation, and institutional capabilities related to the environment and social aspects; and obligations of the country, pertaining to project activities, under relevant international environmental treaties and agreements.

The Bank does not finance project activities that would contravene such country obligations, as identified during the EA. EA is initiated as early as possible in project processing and is integrated closely with the economic, financial, institutional, social, and technical analyses of a proposed project. The Bank undertakes environmental screening of each proposed project to determine the appropriate extent and type of EA. The Bank classifies the proposed project into one of four categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts.

***Category A*:** A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works. EA for a Category A project examines the project's potential negative and positive environmental impacts, compares them with those of feasible alternatives (including the "without project" situation), and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve

environmental performance. For a Category A project, the borrower is responsible for preparing a report, normally an EIA (or a suitably comprehensive regional or sectoral EA) that includes, as necessary, elements of the other instruments referred to in paragraph. 7.

***Category B*:** A proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas - including wetlands, forests, grasslands, and other natural habitats - are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigatory measures can be designed more readily than for Category A projects. The scope of EA for a Category B project may vary from project to project, but it is narrower than that of Category A EA. Like Category A EA, it examines the project's potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. The findings and results of Category B EA are described in the project documentation (Project Appraisal Document and Project Information Document).

***Category C*:** A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Category C project.

***Category FI*:** A proposed project is classified as Category FI if it involves investment of Bank funds through a financial intermediary, in subprojects that may result in adverse environmental impacts.

The borrower is responsible for carrying out the EA. For Category A projects, the borrower retains independent EA experts not affiliated with the project to carry out the EA. For Category A projects that are highly risky or contentious or that involve serious and multidimensional environmental concerns, the borrower should normally also engage an advisory panel of independent, internationally recognized environmental specialists to advise on all aspects of the project relevant to the EA. The role of the advisory panel depends on the degree to which project preparation has progressed, and on the extent and quality of any EA work completed, at the time the Bank begins to consider the project.

Depending on the project, a range of instruments can be used to satisfy the Bank's EA requirement: environmental impact assessment (EIA), regional or sectoral EA, environmental audit, hazard or risk assessment, and environmental management plan (EMP). EA applies one or more of these instruments, or elements of them, as appropriate. When the project is likely to have sectoral or regional impacts, sectoral or regional EA is required.

The Bank advises the borrower on the Bank's EA requirements and reviews the findings and recommendations of the EA to determine whether they provide an adequate basis for processing the project for Bank financing. When the borrower has completed or partially completed EA work prior to the Bank's involvement in a project, the Bank reviews the EA to ensure its consistency with this policy. The Bank may, if appropriate, require additional EA work, including public consultation and disclosure.

Other Bank’s guidelines and procedures that were considered in this study include the following:

- OP/BP 4.04, Natural Habitats;
- OP/BP 4.12, Involuntary Resettlement;
- OP 4.07, Water Resources Management;
- OP 4.11, Physical Cultural Resources;
- OP/BP 4.37, Plus 1 Safety of Dams;
- OP/BP 17.50 Public Disclosure.

Other International Conventions

In her responsiveness and responsibility in regional and global efforts towards sustainable development particularly in the safeguarding of the environment and natural resources, Nigeria has entered into a number of international treaties and conventions. Being signatory to the conventions, Nigeria pledges to uphold the principles of such conventions. Some of the conventions considered in this project are as follows:

African Convention on the Conservation of Nature and Natural Resources, Algiers, 1968
This convention came into force in Nigeria on 7th May, 1974. The objectives of the convention is to encourage individual and joint action for the conservation, utilization and development of soil, water flora and fauna for the present and future welfare of mankind, from an economic, nutritional, scientific, educational, cultural and aesthetic point of view.

Convention on Wetland of International Importance, Especially as Water Flow Habitat, Ramsar, Iran 1971
This provision came into force in Nigeria on 2nd February, 2001 with the objective to stem the progressive encroachment on and loss of wetlands now and in the future, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value.

Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal, 1987 (As Amended)
This came into force in Nigeria on 7th January, 1993 with the objective to protect the ozone layer by taking precautionary measure to control global emissions of substances that deplete it.

Convention on Biological Diversity, Rio de Janeiro, 1992
This convention came into force in Nigeria on 27th November, 1994. The objectives are to conserve biological diversity, promote the sustainable use of its components and encourage equitable sharing of the benefit arising out of the utilization of genetic resources. Such equitable sharing includes appropriate access to genetic resources as well as appropriate transfer of technology, taking into account existing rights over such resources.

<u>Administrative Structure for the Water Sector at the Federal Level</u>

Federal Ministry of Water Resources (FMWR)
The Federal Ministry of Water Resources (FMWR), initially created in 1976, is responsible for formulating and coordinating national water policies, management of water resources including

allocations between states, and approving developmental projects. Specifically, the functions of the FMWR include:

- Establishment and operation of the National Water Quality Laboratories and Monitoring Network and water quality standards.
- Maintenance of database on water supply and sanitation facilities and performance.
- Mobilization of national and international funding and technical support. Promote and coordinate other collaborative activities by other government and Non-governmental agencies in the sector.
- Provide technical support and assistance to the State and Local Government Water Supply and Sanitation Agencies and the community water supply and sanitation committees.
- Creation of an enabling environment for meaningful private sector participation in the sector.
- Provision of a framework for regulation of private sector participation in water supply and sanitation. Under Decree 101, formulate laws for private initiatives in the water supply industry.
- Assist individual agencies, and be responsible for the maintenance of the hydrological primary network.

River Basin Development Authority

The River Basin Development Authorities (RBDA's), now 12 in total were also created in 1976 for planning and developing water resources, irrigation work and the collection of hydrological, hydrogeological and meteorological data. Their main involvement in potable water supply has been the provision of multipurpose dams and the supply of water in bulk, some to urban water systems.

National Water Resources Institute (NWRI)

The National Water Resources Institute (NWRI) was legally established in 1985 and is responsible to the FMAWR for engineering research functions related to major water resources projects and training sector professionals and technicians.

<u>Administrative Structures for Environmental Management at Federal Level</u>

With regards to management of the biophysical environment throughout Nigeria, the overall responsibility was held by the now defunct Federal Environmental Protection Agency (FEPA), which was absorbed into the Federal Ministry of Environment (FMEnv) in 1999.

Federal Ministry of Environment (FMEnv)

FMEnv's mandate includes the establishment of federal water quality standards and effluent limitations, protection of air and atmospheric quality, protection of the ozone layer, control of discharge of hazardous substances, inter alia and ensures that all major development projects in Nigeria are subject to mandatory Environmental Impact Assessment (EIA) pursuant to EIA Act No. 86 (Decree No. 86) of 2004.

Within FMEnv, there is an Environmental Impact Assessment Division, headed by a Director, to take all responsibility for EIA related issues and within the EIA division in FMEnv is the Impact Mitigation Monitoring (IMM) arm, with a special responsibility for monitoring the implementation of Environmental Management Plans (EMP) contained in the approved EIAs.

As contained in FEPA Acts 58 of 1988 and 59 of 1992. FMEnv has put in place statutory documents to aid the monitoring, control and abatement of industrial waste. The statutory documents currently in place include:

i. National Policy on the Environment 1999
ii. National Environmental Protection (Effluent Limitations) Regulations (S.1.8) 1991;
iii. National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Wastes) (S.1.9) 2004;
iv. National Environmental Protection (Management of Solid and Hazardous Wastes) Regulations (S.1.15) 1991;
v. Guidelines and Standard for Environmental Pollution Control in Nigeria 1991;
vi. Sectoral Guidelines for EIA 1995
vii. Harmful Wastes (Criminal Provisions) ActNo. 42, 2004;
viii. National Policy on the Environment, 1989;
ix. Environmental Impact Assessment Procedural Guidelines 1995;
x. Environmental Impact Assessment (EIA) Act Act Cap E12 LFN, 2004; and
xi. National Guidelines and Standards for Water Quality 1999
xii. National Guidelines on Environmental Management Systems (EMS) 1999
xiii. National Guidelines on Environmental Audit in Nigeria 1999

These statutory documents clearly state the restrictions imposed on the release of toxic substances into the environment and the responsibilities of all industries whose operations are likely to pollute the environment. Such responsibilities include provision of antipollution equipment and adequate treatment of effluent before being discharged into the environment.

FMEnv has also put in place procedural and sectoral guidelines detailing the EIA process including a categorization of environmental projects into Categories I, II and III (referred to by the World Bank as categories A, B and C respectively). These guidelines require that a complete EIA be performed for category I projects. Category II projects may not require an EIA depending on the screening criteria, while Category III projects do not require an EIA.

The sectoral guidelines on infrastructural development apply to this project. This water supply expansion project is classified as a category II project.

In addition to the guidelines for EIA, Act No. 86 contains provisions for the screening of projects according to impact potential, including listed activities 3 for which mandatory EIA preparation is required

a. Category I projects will require a full Environmental Impact Assessment (EIA).
b. Category II projects may require only a partial EIA, which will focus on mitigation and environmental planning measures, unless the project is located near an "Environmentally Sensitive Area" (ESA in which case a full EIA is required).
c. Category III projects are considered to have "essentially beneficial impacts" on the

environment, for which an Environmental Impact Statement (EIS) will be prepared by the FMEnv.

EIA's are then submitted to the EIA Division of the FMEnv for approval and monitoring of the project during implementation and operation based on an Environmental Management Plan (EMP) in the EIA.

National Environmental Standards and Regulations Enforcement Agency (NESREA)

NESREA Act 27 of 2007 established the National Environmental Standards and Regulations Enforcement Agency (NESREA). The Agency, which works under the Federal Ministry of Environment (FMEnv), is saddled with the responsibility of protecting and developing the environment, conserving biodiversity, maintaining sustainable development of Nigeria's natural resources in general, overseeing environmental technology - including coordination and liaison with relevant stakeholders within and outside Nigeria on matters of enforcement of environmental standards, regulations, rules, laws, policies and guidelines.

Specifically, the functions of the Agency include:

- enforce compliance with laws, guidelines, policies and standards on environmental matters;
- coordinate and liaise with, stakeholders, within and outside Nigeria on matters of environmental standards, regulations and enforcement;
- enforce compliance with the provisions of international agreements, protocols, conventions and treaties on the environment including climate change, biodiversity conservation, desertification, forestry, oil and gas, chemicals, hazardous wastes, ozone depletion, marine and wild life, pollution, sanitation and such other environmental agreements as may from time to time come into force;
- enforce compliance with policies, standards, , legislation and guidelines on water quality, Environmental Health and Sanitation, including pollution abatement;
- enforce compliance with guidelines, and legislation on sustainable management of the ecosystem, biodiversity conservation and the development of Nigeria's natural resources;
- enforce compliance with any legislation on sound chemical management, safe use of pesticides and disposal of spent packages thereof;
- enforce compliance with regulations on the importation, exportation, production, distribution, storage, sale, use, handling and disposal of hazardous chemicals and waste, other than in the oil and gas sector;
- enforce through compliance monitoring, the environmental regulations and standards on noise, air, land, seas, oceans and other water bodies other than in the oil and gas sector;
- ensure that environmental projects funded by donor organizations and external support agencies adhere to regulations in environmental safety and protection;
- enforce environmental control measures through registration, licensing and permitting Systems other than in the oil and gas sector;
- conduct environmental audit and establish data bank on regulatory and enforcement mechanisms of environmental standards other than in the oil and gas sector;
- create public awareness and provide environmental education on sustainable environmental management, promote private sector compliance with environmental regulations other than in the oil and gas sector and publish general scientific or other data resulting from the

performance of its functions; and
- carry out such activities as are necessary or expedient for the performance of its functions.

Other Relevant National Policies and Regulations

Water Resources Decree 101 of 1993

This provision vests all water and water resources in the Federal Government of Nigeria and regulates the exploitation of water resources. It also vests in the Federal Government the rights and control of water in any water course affecting more than one state for the purpose, inter alia, of ensuring the application of appropriate standards and techniques for the investigation, use, control, protection, management and administration of water resources.

National Water Policy

A National Water Supply and Sanitation Policy (NWSSP) was adopted in January 2000. The centre piece of this policy is the provision of sufficient potable water and adequate sanitation to all Nigerians in an affordable and sustainable way through participatory investments by the three tiers of government, the private sector and the beneficiary. The targets of the policy are:

- To meet the national economic target of improving service coverage from 40% to 60% by the year 2003.
- Extension of service coverage to 80% of the population by the year 2007.
- Extension of service coverage to 100% of the population in the year 2011.
- Sustain 100% full coverage of water supply and wastewater services for the growing population beyond the year 2011.

The Policy sets consumption standards for:

- Semi – urban (small towns) which represent settlements with populations between 5,000 – 20,000 with a fair measure of social infrastructure and some level of economic activity with minimum supply standard of 90 litres per capita per day with reticulation and limited or full house connections.
- Urban Water supply at 120 litres per capita per day for urban areas with population greater than 20,000 inhabitants to be served by full reticulation and consumer premises connection.
- Among the policy objectives is the requirement to guarantee free access for the poor to basic human needs, level of water supply and sanitation services.

The Policy Strategies are:

- Increase service coverage for water supply and sanitation nationwide to meet the level of the socioeconomic demand of the nation on the sector.
- Ensure good water quality standards are maintained by water supply undertakings.

The WHO drinking water quality standards shall be the baseline for the national drinking water quality standard.

- Ensure affordability of water supply and sanitation services for the citizens.

- Guarantee free access for the poor to basic human need level of water supply and sanitation services.
- Enhance national capacity in the operation and management of water supply and sanitation undertaking

- Privatize water supply and wastewater services (where feasible) with adequate protection for the poor.
- Monitor the performance of the sector for sound policy adjustment through Legislation, Regulations, Standards and laws for water supply and sanitation.
- Reform the water supply and sanitation sector to attain and maintain internationally acceptable standards.

Natural Resources Conservation Council Act 286 of 1990

This provision is aimed at establishing the Natural Resources conservation council to be responsible for the conservation of natural resources of Nigeria and to formulate national policy for natural resources conservation.

The National Policy on the Environment 1989

The National Policy on the Environment, 1989 outlines strategies for water resources management, along with the Water Resources Decree No. 101 of the FMWR, and together they are concerned with:

- Environmental Impact of Water Resources development at the planning stages.
- Specification of water quality criteria for different users.
- Establishment of adequate control and enforcement procedures.
- Public health implications of water resources development projects.

Nigerian Environmental Management Act

This act was drafted following the amalgamation of the Federal Environmental Protection Agency into the Ministry of Environment (see section 2.1.2) but was never ratified. It repeals the 1988 Federal Environmental Protection Agency Decree No.58 (amended No.59 and No.14) and establishes FEPA as part of the Ministry with the Minister of Environment having primary responsibility for its implementation. It does not repeal any other environmentally related legislation. As well as the general environmental provisions, which include environmental sanitation and occupational health, it specifies the powers of authorized officers, penalties and fines. The Act gives the Minister the authority to grant environmental permits for prescribed activities which includes sand mining but not any other mining activities.

Land Use Act 1978

The legal basis for land acquisition and resettlement in Nigeria is the Land Use Act 1978 and modified in 1990. The following are selected relevant sections:

Section 1: Subject to the provision of this Act, all land comprised in the territory of each state in the Federation are hereby vested in the Governor of each state and such land shall be held in trust

and administered for the use and common benefit of all Nigerians in accordance with the provisions of this Act.

Section 2: (a) All land in urban areas shall be under the control and management of the Governor of each State; and (d) all other land shall be under the control and management of the local government within the area of jurisdiction in which the land is situated. Therefore, according to the Land Use Act, all land in Nigeria is vested in the Governor of each State, and shall be held in trust for the use and common benefit of all people. The administration of land area is divided into urban land which will be directly under the control and management of the Governor of each State; and non-urban land, which will be under the control and management of the Local Government. The Governor of each State will have the right to grant statutory rights of occupancy to any person or any purpose; and the Local Government will have the right to grant customary rights of occupancy to any person or organization for agricultural, residential and other purposes.

The Act gives the government the right to acquire land by revoking both statutory and customary rights of occupancy for the overriding public interest. In doing so, the Act specifies that the State or Local Government should pay compensation to the current holder or occupier with equal value.

Endangered Species Decree No 11 of 1985

Endangered Species (Control of International Trade and Traffic) Decree No 11, 1985 lists those animal species under absolute prohibition from international trade and those allowed for trade.

Administrative Structures for Environmental Management at State level

Oyo State Ministry of Environment

The statutory responsibility of protecting and/or ensuring the protection of the environment in Oyo State rests on the Oyo State Ministry of Environment. The Ministry has the following duties and responsibilities:

i. Responsible for formulation, enforcing and coordinating policies, statutory rules and regulation on Solid Waste collection and disposal, general environmental protection, flood control and regulation of the ecological, system and all activities related therein, throughout the State;

ii. Conduct public enlightenment campaign and disseminates vital information on environmental and ecological matters, and to mobilize the inhabitants of all areas for effective observance of environmental rules and guidelines, for the purpose of healthy and safe environment;

iii. Renders advisory services and support to all Local Government in the State in areas of Flood Control, Solid Waste Management Ecological and Sanitation Matters;

iv. Preparation of master plan for drainage, solid and liquid wastes, and general aesthetics, and of annual State of the environment report for the State and transmit same to the secretariat of the National Council of Environment;

v. Monitor of sources of toxic pollutants in air, land and water and offering of necessary advice to industrial establishments; Monitoring of the Implementation of the Environmental Impact

Assessment (EIA) and the Environmental Audit Report (EAR) guidelines and procedures on all development policies and projects within the State;

vi. To initiate measures to ensure pollution-free air, land and water throughout the State including other steps to obviate, mitigate or climate environmental discomfort to individuals or groups or danger to lives and properties;

vii. Develop strategies for settlement patterns with a view to integrating physical planning with economic programmes;

viii. Prepare master plans for major cities of the State;

ix. To ensure that the lawns and the surroundings of the departmental offices in the secretariat precincts are kept tidy and well-trimmed;

x. To plan, execute and maintain areas that may be designated public open spaces in the State;

xi. To obtain research findings from the relevant Federal and State Agencies for the purpose of policy formulation and dissemination of the supply and usage of water in the State;

xii. To carry out both administrative, supervision and establishment duties with a view to ensuring well-managed finances and administration of the Ministry in line with Government policies.

The Ministry comprises of 4 departments namely: Planning and Research, Administration and Supplies, Finance and Accounts, and Sanitation and Sewerage. The Department of Sanitation and Sewerage has 3 units namely: Engineering, Pollution control and Environmental Health. Some of the institutional roles and responsibilities of the Ministry include:

- To ensure the implementation of the provisions of the National Environmental Sanitation Policy and Guidelines;
- To enforce compliance with the provisions of these regulations;
- To issue permits as prescribed in the relevant section of these regulations;
- To ensure compliance with conditions of the permits as contained in the relevant schedules; and
- To ensure that waste management facilities comply with the Environmental Impact Statement.

Oyo State Ministry of Water Resources

The Ministry's law was enacted by the Oyo State House of Assembly in 2011 with the following departments: Water supply, dams, hydro-electricity, irrigation and drainage, quality control and sanitation, finance and administration, planning, research and statistics.

Some of the functions of the Ministry include:

- To control and manage all water resources facilities vested under the provisions of this law in the Ministry;

- To establish, control, manage, extend and develop such new water resources facilities and to extend and develop such existing ones as the Ministry may consider necessary for the purpose of providing water services in order to meet the requirements of the general public , agriculture, trade in various parts of the state;
- To ensure that water or waste water is supplied to or conveyed for the consumer thereof at reasonable charge and in potable quality and adequate quantity where applicable; and
- To monitor sources of toxic pollution in water and often necessary advice to industrial establishments.

Oyo State Emergency Management Agency (OYSEMA)

The Agency was established by Oyo State Emergency Management Agency Law, 2008.

Some of its functions include:

- Formulate policy on all actions relating to disaster management and coordinate plans and programmes for efficient and effective response to disasters at the state level;
- Co-ordinate and promote research activities relating to disaster management at the state level;
- Monitor the state of preparedness of all organizations or/ agencies which may contribute to disaster management in the state; and
- Collate data from relevant agencies on disaster risk areas in the state so as to enhance forecasting, planning and field operation in disaster management;
- Distribute emergency relief materials to victims of natural or other disasters including internally displaced persons within the State and assist in the rehabilitation of the victims where necessary; and
- Promote disaster management capacity building, training and education into school curriculum.

Oyo State Ministry of Lands and Housing

The Ministry of Lands is a service ministry and ensures that there is optimal utilization of land resources in the state in order to achieve maximum development.

The Ministry's functions include:

- To facilitate access to land so that Government, its agencies and private developers may own parcels of land for social and economic development of Oyo state through implementation of the provision of the general land policy;
- To Manage and control land and landed properties and valuation of the interest in land;
- To Formulate general housing policy for Government and the Management of the public servants' Housing Loan scheme;
- To Create, register and keep records of all interest in land in Oyo state; and
- Realize optimal revenue returns from all land transactions in state.

Oyo State Ministry of Works and Transport

The operational departments under the Ministry of Works and Transport include Public Buildings, Highways, Mechanical & Electrical and the State Fire Service. It also provides and monitors the construction of hydraulic structures across river crossings. The Ministry evolved from Public Works Department in charge of the execution of Government projects to become a full-fledged Ministry.

The Ministry's functions include:

- Advising Government on policy matters in respect of road transportation including efficient well maintained road network, road safety measures , creation of motor parks, identification of other modes of transportation and traffic management with a view to providing an effective and efficient movement of goods and services that will enhance socio-economic growth throughout the State;
- Increasing awareness on road safety including organization of annual road safety campaign;
- Advising Government on policy matters in respect of public buildings including construction of new Public Buildings and maintenance of existing ones;
- Advising Government on policy matters in respect of procurement, installations and maintenance of mechanical and electrical appliances and gadgets throughout the State; and
- Providing firefighting services, equipment and qualitative training of personnel to combat outbreak of fire and other disasters to safeguard lives and property of its citizens, including the creation of necessary awareness of dangers of fire outbreaks and other related hazards.

Oyo State Ministry of Physical Planning and Urban Development (MPP&UD)

The Ministry was formerly under the Oyo State Ministry of Environment. The Board was created in 2008 and enabling law was enacted in 2012. The Ministry's guidelines and functions are entrenched in the law. The Ministry is saddled with 4 technical departments namely: development planning, development control, urban renewal and environmental management, housing and rural development.

The functions of the Ministry include:

- Initiation, preparation and review of regional, sub-regional strategic Physical Development;
- Creation of Master Plans for major cities in Oyo State;
- Formulation of policy on collapsed buildings in Oyo State;
- Development of Plans to protect catchment areas of the public water reservoirs;
- Continuous monitoring and strict enforcement of Physical Planning laws, regulations & standards on developments along stream/river courses;
- Serving of contravention notices on illegal structures for registration and possible reconciliation;
- Carrying out publicity and enlightenment activities on physical planning;
- Tightening control over the reins of outdoor advertisement, signage & billboards in Oyo State;
- Carrying out state-wide inventory of Water bodies;
- Charting hydrological maps for Oyo State;
- Computerization of Town-planning operations;

- Establishment of Urban Environment Planning & Management Information Systems (UEPMIS);
- Preparation of Strategic Physical Development Plans for Oyo State;
- Verification of statuses of existing petrol stations & GSM telecoms base stations; and
- Establishment of proper & befitting offices for the ministry & its 33 local planning offices.

Oyo State Ministry of Health

The Ministry of Health is saddled with the responsibility of policy initiation and implementation on issues relating to the health and well being of the people of the State. It is one of the oldest in the State, having been established in 1957.

The Ministry's other major functions include: Planning Research & Statistics; Primary Health Care & Disease Control; Secondary Health Care & Training; Nursing Services; Pharmaceutical Services; Food, Water and Laboratory Services; Health and Hospital Monitoring.

Details of some of these functions include:

- To improve health status and social-economic advancement of individuals in the State using preventive and curative approaches;
- To ensure that satisfactory standards are maintained in both government and private health institutions throughout the state; and
- To provide essential infrastructure in all public health institutions in the State for efficient, qualitative, affordable and effective health services.

Oyo State Ministry of Women Affairs, Community Development, Social Welfare and Poverty Alleviation

The Ministry was created to provide an enabling environment where the rights to survival, protection and development of the people, most especially the most vulnerable groups, as well as their empowerment to participate in and benefit from the socio-economic, development processes are enhanced.

The objectives of the Ministry include:

- To ensure full positive participation of women in socio-economic programmes and elimination of all forms of discrimination against women in the state;
- To provide adequate health care, protection and social rehabilitation and re-integration services for the society's less privileged persons;
- To mobilize and encourage community members in the design and execution of self-help projects for community sustenance and advancement in all sectors;
- To encourage an all round positive participation of all stakeholders in the protection of the Right of the child for quality development;
- To coordinate and monitor all Poverty eradication activities of the State Government; and
- To initiate and implement schemes that could eradicate or alleviate poverty amongst the citizenry, as well as source for job placement for the unemployed in Industry, Agriculture and Mining.

Oyo State Ministry of Information and Orientation

The Ministry of Information and Orientation is saddled with the responsibility of disseminating information on Government Policies, programs and activities.

The objectives include**:**

- To publicize the day to day activities of the Government by means of various instruments of mass communication and available public relations skills in order to achieve mass awareness and citizens' participation in public affair;
- To act as catalyst for change among the people and ensure adequate feedback to Government as regards people's reactions to Government policies and actions;
- To project the image of the State Government and its activities through Modern Information and Communication Technology; and
- To play supervisory roles on the activities of the Broadcasting Corporation of Oyo State (BCOS), and the Government Printing Press.

Oyo State Waste Management Authority

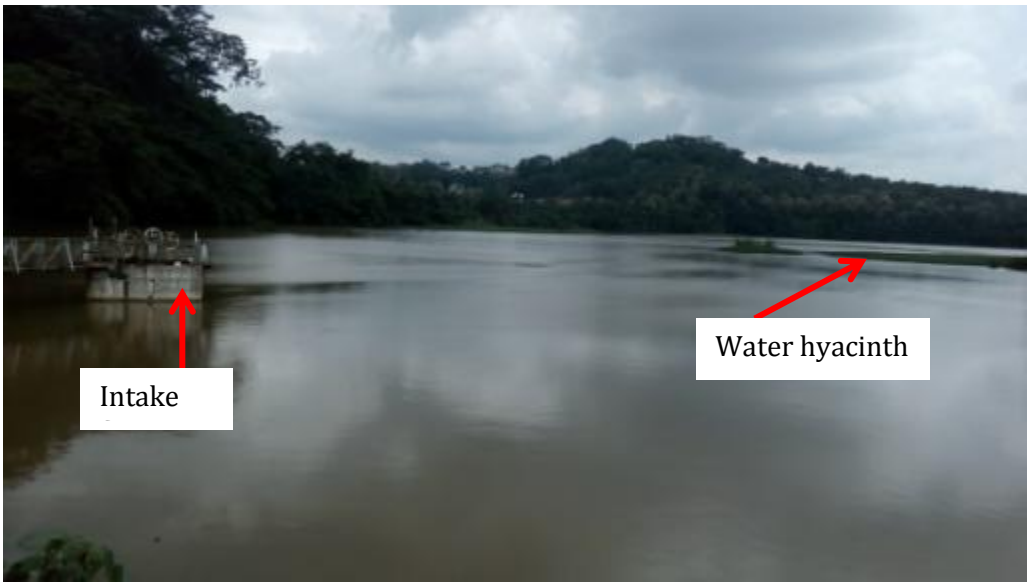
The edict establishing the Oyo State Solid Waste Management Board was enacted in 1992.
The functions of the Board include:

- To collect, transport and dispose of solid wastes in Oyo State; and
- To regulate and complement the functions of private contractors in collecting solid wastes from inaccessible areas.

Oyo State National Environmental Standards and Regulatory Enforcement Agency (NESREA)

The agency is responsible for the protection and development of the environmental, biodiversity conservation and sustainable development of Nigeria's natural resources in general and environmental technology including liaison with relevant stakeholders within and outside Nigeria on matters of enforcement of environmental standards, regulations, rules, laws, policies and guidelines.

Appendix 2.1: Dam Safety Assessment Site Visit Pictures



Reservoir with water hyacinth, and water treatment intake

Reservoir by spillway end with water weeds at the two extreme ends

Growth of water hyacinth on the reservoir end and a fisher on his canoe

This illustrates the complimentary usage of the dam apart from water supply and flood control.

Development around the catchment of the reservoir

The development around the catchment due to growth of Ibadan City is a threat to the reservoir in terms of reduction of storage capacity and pollution.

The link between the embankment and the raw water intake structure

The structure is a platform that has rusty steel chequerboard floor. The chequerboards are removable and are on steel angles and channels. All the components of this structure are corroded and serve as threat to the operators if not attended to immediately.

Platform for rusty control valves for the raw water intake

The picture as shown above indicates a rusty platform of the raw water intake for the treatment plants. On interrogation, it was learnt that adequate maintenance has not been given to this platform for long.

Dry well and rusty rod and casing for the intake structure

The platform has become a threat to the life of the operator and as reported by Ambiental, the structure is unsatisfactory.

The visit was made during rainy season, hence, detailed measurement of the dam components could not be done save visual observation.

Side view of the spillway and the embankment

The view of the spillway

Though, Ambiental reported that there was growth of weeds along the joints of the spillway, this was noticed during the dry season when the discharge of the spillway was low. It was observed during this last visit that was no such growth. The presence of weeds along the joints was due to relatively high discharge that flushes the weeds. Plate 3.11 shows the collapsed part of the spillway bottom slab. This collapsed has resulted in scouring of the foundation of the remaining slab.

Cracked wall on the embankment at the LHS of the spillway

Collapse part of spillway bottom slab on the LHS

Collapse of the RHD embankment protective wall (concrete and stone pitch) by the plant root

Cascade patterned slab just after the bottom trough of the spillway

It was learnt that there were flow breaker beams on each of the cascade slabs to reduce the velocity of flow of the discharged water from the spillway. These breaker beams have collapsed. The embankment protective retaining walls are in deplorable condition and need urgent attention to protect the embankment and prevent unguided channelization.

Channel retaining wall collapsing and gulley being created.

View of Channel towards downstream after the spillway

It was learnt that the flood of 2011 got access to the treatment plant area through the arrowed point in 2011.

Eroded fill at the back of the retaining wall on the embankment of the channel just after the spillway

Overview of the downstream channel

The picture indicates the convergence of the washout channel and the main river channel downstream. It also shows the stone pitching of the embankment of the washout and a cleared embankment at the downstream during the palliative exercise.

Wash out circular concrete channel

Buildings on both sides of the catchment of Ona River just before the Ologun Eru Bridge

The buildings were constructed within the flood zone of the River Ona downstream of the Dam just before Olugun Eru Bridge. It was reported that most often, they get flooded when the rainfall intensity is high.

Ologun Eru Bridge

The truck on the bridge and the team beside the truck are doing palliative activities around the bridge through clearing the river channel and removal of the trees that block the river channel.

Downstream of the Bridge on Ologun Eru

Car Wash by the river side

The Car Wash platform that is by the river bank was used to be a house. But the 2011 flood submerged the building on the land and it was demolished.

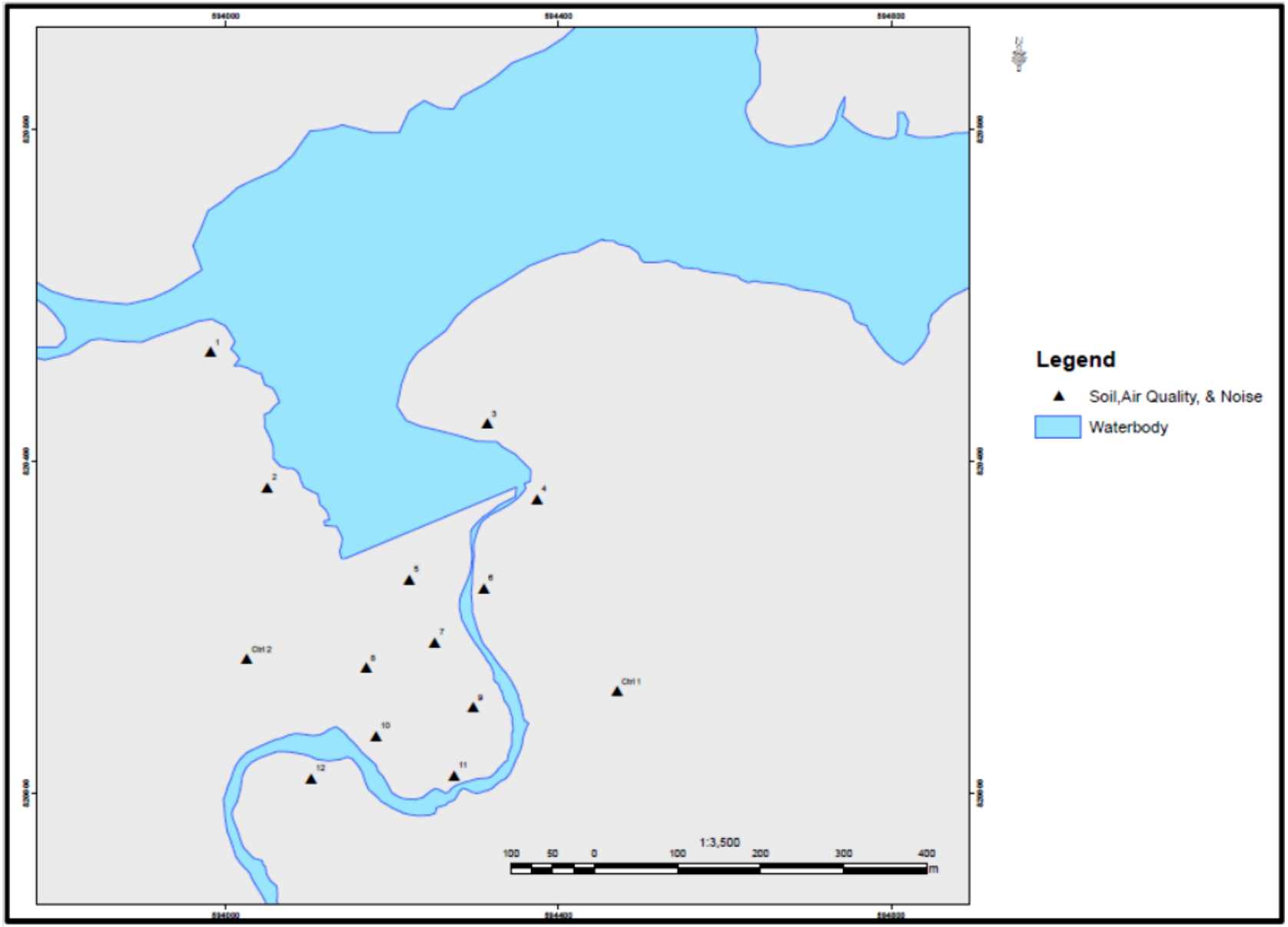
Flood plain zone

The picture shows the grass around here having brownish colour. This is due to occurrence of flood around this area whenever it rains. This is close to carwash arena.

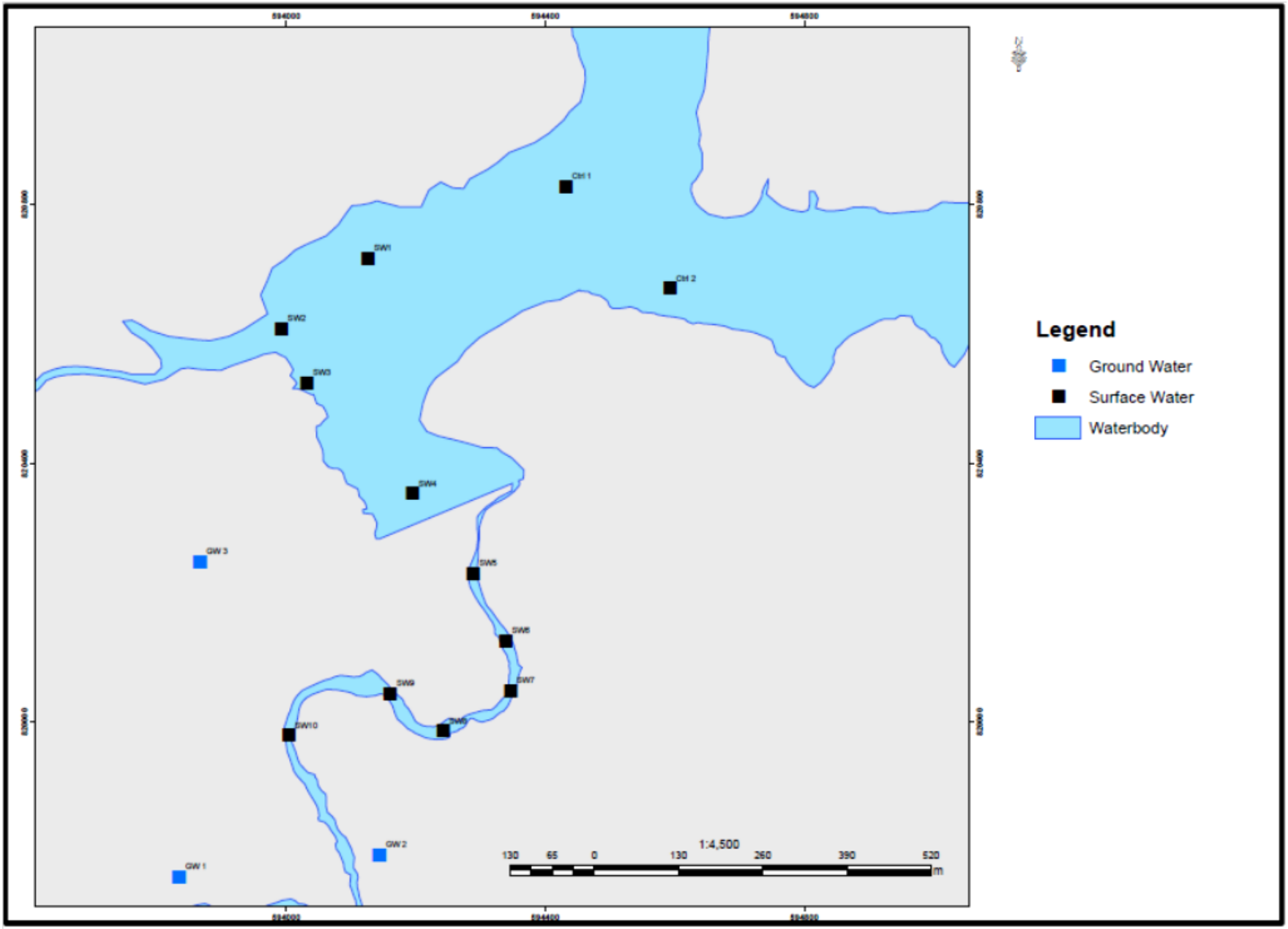
Appendix 3.1: Sampling and Laboratory Analytical Methods

FIELD SURVEY METHODS

The objective of the field data acquisition was to establish the existing biophysical status of the study area. Field activity was preceded by site inspection visit by the officials of the Federal Ministry of the Environment in March 2016. The laboratory methodologies used for sample analyses were based on the American Society for Testing and Materials (ASTM) and American Public Health Association (APHA). The laboratory analyses were conducted in Triple 'E' Systems Associates Laboratory and Anila Resources laboratory. QA/QC protocol during sampling collection, handling, preservation and laboratory analysis were enforced to ensure that quality data was generated to characterise the baseline conditions of the study area.



Soil Air Quality and Noise Sampling Stations



Surface and Ground Water Sampling Stations

Air Quality and Noise Field Study

Measurement of ambient air quality was carried out in-situ using digital air quality monitoring equipment. Measurements were taken at twelve (12) locations within and around the project area. The measurements were taken with due considerations to wind direction.

Air Quality Measurement

Sediment Sampling Methods

Sediment samples were collected using the modified Van-Veen sediment grab sampler attached to a rope of at least 20m above the expected survey depth, deployed and retrieved. Two sediment hauls were taken at each station. When the grab is deployed and retrieved, each grab sample was inspected for disturbance, such as washout and low volume and a description of the sample was recorded in the station log. Where significant disturbance or poor retrieval of the sediment sample was observed, it was discarded and another haul collected as replacement. The top 1-2cm of the sediment was scooped for physico-chemical analysis.

An appreciable portion that will be adequate for trace and heavy metals was collected and kept in well-labelled polyethylene bags and stored at -4°C. Similarly, sediment samples to be analyzed for Total Hydrocarbon Content (THC) was collected in pre-labeled aluminum foils and stored at -4°C. Details of the sediment physico-chemical analyses are discussed in the laboratory analysis section of this report.

Sediment microbiology samples were collected in sterilized pre-labeled McCartney bottles and stored at 4°C. Details of sediment microbiology are equally discussed in the laboratory analysis section of this document.

Benthic Macro-invertebrate Sampling

As discussed above, the remainder of the two sediment hauls for physico-chemical sample were poured into a plastic bowl and sieved with two stainless steel sieves of 1.0mm and 0.5mm mesh-sizes respectively. The residue retained by the two sieves after sieving was poured into plastic containers and preserved in 10% Formalin mixed with Rose Bengal. The preserved benthos was taken to the laboratory for sorting and identification to species level and result collation for species diversity, abundance and community structure.

At the end of each sampling, the grab and other sampling equipment were adequately washed with brackish water typical of the environment. Equipment was decontaminated prior to use as described below:

- Physically scrub equipment with brushes and liquid soap-and-water mixture (or Alconox non-phosphate powder) to remove any accumulated sediment.
- Rinse with brackish water (from hose or buckets, as appropriate), then rinse with distilled water, then rinse with isopropanol, methanol or hexane solvent and then optionally rinse with deionized water.
- Wipe clean with an absorbent pad, paper towel, or rag if necessary
- Use disposable nitrile gloves during sampling and change them after each sample collection.

This is a quality control measure to prevent contamination of samples.

Aquatic and Hydro biological Studies

Water Sampling Method

Surface water samples were collected using a water sampler. At each sampling location, water samples were collected in 2 litre plastic bottles and stored at a temperature of -4^{0}C. Water samples to be analyzed for THC were stored in glass sample bottles at -4°C to prevent contamination and were analysed with a Gas Chromatograph (GC). Plastic sampling containers were not used in storing water samples to be analyzed for THC because of the risk of being contaminated. However, water samples for heavy and trace metal analysis were kept in plastic bottles and fixed with a mixture of conc. HNO_3 and HCl at pH of 2.

Ground water samples were collected from existing boreholes around the study area. Samples were collected in clean PVC sample containers and sub sampled into appropriate sample containers for the various parameters analyses.

Plankton Sampling Method

Plankton samples were collected through horizontal and vertical hauls at each sample station. Phytoplankton and Zooplankton were sampled with 50µm plankton net. The phytoplankton was sampled with horizontal tow, while the zooplankton was sampled with a vertical tow. The plankton net was tied onto the rear of the survey vessel with a rope of about 3m length and towed at a speed of 3 knots for 5minutes. The plankton nets used for the sampling have opening diameters of 45cm and depths of 110cm. A 100ml removable bottle was attached to the end of the net to trap the collected plankton while the wide end of the net was kept open by a metal loop onto which was attached the tow rope.

At each sampling location, phytoplankton samples were collected by towing the plankton sampling net for 5 minutes. After the time lag the net was quickly hauled in, and a water sprinkler was used to wash around the plankton net to ensure that samples trapped on the net were thoroughly washed into the collection bottle. The samples trapped in the collection bottles were then emptied and preserved in a separate sample bottle and fixed with 10% formaldehyde. The preserved organisms were taken to the laboratory for detailed analysis.

Plankton Sampling

Water Microbiology Study

Water samples were collected into labeled 10ml sterile Macartney bottles and stored at 4°C temperature. The samples were transported to the laboratory for analysis using a salt nutrient agar medium and incubated for 36 – 38 hours. Each microbiology samples were analyzed for total heterotrophic fungi, total hydrocarbon utilizing bacteria, total hydrocarbon utilizing fungi, total anaerobic bacteria count.

<u>Soil Studies</u>

Soil samples were collected using a hand-screw bucket auger. Top and subsoil samples were collected at depths of 0-15cm and 15-30cm respectively. Samples were collected at three points around each location, thoroughly mixed and sub sampled into various categories of analyses to be conducted. Samples for physico-chemical analyses were collected in polythene bags; those for total hydrocarbon were collected in aluminium foil bags, while samples for microbiological analysis were collected in sterile McCartney bottles and kept under 4^{0}C in a refrigerator. All samples were properly labelled and transported to the laboratory for analyses.

Representative soil samples were collected from fourteen (14) sampling stations. At each sample station, a hand screw auger was used to collect soil samples at two different depths (0-15cm and 15-30cm) representing surface soil and subsurface soil conditions respectively. Soil samples were stored in pre-labeled sampling polyethylene bags, while those for THC and microbiological analysis were collected in pre-labeled aluminium foils and sterile McCartney bottles. The soil auger and sampling spatula were decontaminated before and after each sampling event. All soil samples for physico-chemical and microbiological analyses were preserved in a refrigerator.

Soil Sampling

Vegetation Study

Prior to sampling a reconnaissance visit was undertaken to all areas that are likely to be affected by the rehabilitation project activities and subsequent development on the shoreline, downstream as well as upstream, enclosing the reservoir of the Dam. A reconnaissance tour of the entire area including the shoreline was to carefully examine the site characteristics so as to assist in designing the best strategy for field investigations. Based on the reconnaissance visit, the vegetation types of the study area (shoreline, downstream as well as upstream of the Dam) were identified and photographs taken. For effective spatial coverage of the area, boats, footpaths and transects were used for the sampling. All observations and sampling points were geo-referenced using hand held Global Positioning System (GPS) receivers while photographs of the major vegetation types were taken.

Species composition, density and habitat conditions were studied in detail using the Quadrat and Belt Transect Methods. Sampling was carried out along transects at each site. The quadrat for the determination of frequency and density of the species within a specific diagnosis sampling technique, 10m x 10m quadrat at every 20-meter interval for a length of 100 meter was employed to provide maximum chance of encountering most of the species. The name and co-ordinates of each sampling point were recorded. All plants within each quadrat were systematically evaluated, identified to species level and the number of individuals of each species enumerated. Specimens of plant species that could not be readily identified on the field were collected and pressed in a plant press and taken to IFE Herbarium (Obafemi Awolowo University) for proper identification.

Vegetation Study

The number of strata in the vegetation on the river bank, aquatic macrophytes were noted and the dominant species recorded. The height of the plants on the shoreline was measured with measuring tape and Haga altimeter. Where counting of individuals was not possible in situations where there are creeping plants (aquatic macrophytes), cover was measured according to Greig-smith (1983).

Land-use investigation was carried out along four cardinal points with the tracks serving as the baseline. The major crop species, farming system, habitat and non-farming activities along each of the cardinal points were documented. Plants that were of economic importance were identified and counted.

Along each transect the phenology of the dominant vegetation was observed and abnormal senescence, yellowing and shedding of leaves when present, noted. Whole plants and leaves were observed for infections and insect damage.

Wildlife Study

Wildlife studies within the areas adjoining the project site were conducted between 9.00am and 6.00pm local time respectively during the reconnaissance visits. The area was delineated into four quadrats and the hunt for wildlife was carried out in each of the 4 quadrats and in the entire habitat types identified, namely, the secondary forest, fallow land with its low vegetation, the farmland vegetation, weeds and herbaceous vegetation.

Population census of the mammals, reptiles, amphibians and avifauna which readily offered themselves for observation was carried out by the Direct Count method and with the aid of a pair of powerful binoculars.

By probing the humid habitats such as logs, heaps of dry or decaying leaves, forest undergrowth and burrows, the presence of some animals like amphibians, reptiles and other small mammals, was detected. All sighted or captured animals were identified often on the spot to possible taxonomic levels using various keys and field guides by Walter *et al*., 1968; Happold, 1987 and Branch, 1988.

LABORATORY METHODOLOGIES

Water Quality Analysis

Parameters, such as pH, salinity, conductivity etc. were measured on the field with pre-calibrated in-situ field equipment. This is one of our QA/QC protocol for ensuring that reliable and accurate environmental baseline data is generated. Methodology deployed for each parameter is hereby discussed.

Electrical Conductivity and pH:

The electrical conductivity and pH of the water samples were determined with the aid of a Hanna meter (Model 7020). The calibration of the equipment was first carried out using standard potassium chloride solution after which the probe of the conductivity meter was inserted into sub-samples of the water to measure the pH and the electrical conductivity directly.

Turbidity

The turbidity of the water samples was determined using the spectrophotometric method. Here, the raw sample was poured into the Spectrophotometer's cuvette and the reading taken using

the appropriate wavelength. A blank reading of a freshly prepared distilled water was used to zero (calibrate) the Spectrophotometer. The turbidity value was thereafter read off from the Spectrophotometer screen.

Dissolved Oxygen (DO)

A Jenway hand-held DO meter (Model HI 98129) was used. This DO Meter consists of a 'Clark' type polarographic oxygen electrode and an oxygen meter. The reading displayed by the meter in mg/L or ppm was recorded when the probe was dipped into the sample. Other specifications include:

DO Meter Calibration Procedure

The DO meter was calibrated using 5% KCl and sodium sulphite solution. The probe was then immersed in water sample to be measured (40mm-depth minimum). This was allowed to stay in the sample for a sufficient time for the two temperature compensating elements attached to the probe to respond. The probe was afterward rinsed in de-ionized water after each test. This procedure was specifically used for in-situ measurement.

Biochemical Oxygen Demand (BOD)

For water with pH values of less than 6.5 and higher than 8.5, sufficient alkali or acid was added to bring the pH to acceptable range. The amount of acid or alkali was determined by neutralizing a separate portion of the sample to about pH 7.0 with a 1molar solution of alkali or acid, using an appropriate indicator (e.g. bromothymol blue), or pH meter. Known volume of acid or alkali was added to the sample for the BOD test. The sample was incubated in an air-proof BOD reagent bottles for five days at 25^0C. However, samples with pH values within 6.5 and 8.5 were incubated without pre-treatment with either alkali or acid. After the incubation period, the oxygen content of the sample was determined using the methods for dissolved oxygen.

Chemical Oxygen Demand (COD)

The test was performed by measuring the amount of oxidizing reagent (potassium dichromate or chromic acid) consumed during oxidation of organic matter present in the sample while titrating with Ferrous Ammonium Sulphate (APHA, 1985). This was mixed with 1g of powdered Mercuric Sulphate ($HgSO_4$) with 100ml of the sample contained in a conical flask after which 30ml of an oxidation mixture containing sulphuric acid (H_2SO_4), Silver Sulphate (Ag_2SO_4) and Potassium Dichromate ($K_2Cr_2O_7$) (200ml H_2SO_4, 1g Ag_2SO_4 and 100ml $K_2Cr_2O_7$) was added and heated in a water bath for 3-6 hours and allowed to cool. The mixture was titrated using 0.25M Ferrous Ammonium Sulphate ($Fe(NH_4)_2(SO_4)_2$) with 0.5% Diphenylamine as indicator (Golterman et al., 1978). The colour of the reaction changed from turbid blue to brilliant green at the end point and the volume of the Ferrous Ammonium Sulphate used in the titration recorded. The same procedure was conducted for the blank, (distilled water). The COD of the sample in mg/l was then calculated using the formula:

$$X = \frac{8.0\, C_t\, (V_{ab} - V_{as})}{\text{----------}}$$

V_s

C_t = Concentration of Titrant (Ferrous Ammonium Sulphate)

V_{ab} = Volume of Titration of the Blank

V_{as} = Volume of Titration of the sample ($Fe(NH_4)_2(SO_4)_2$)

V_s = Volume of water sample

Total Suspended Solid (TSS) in Water Samples

The APHA 2540D test method was adopted using the glass fibre filter. The TSS content was calculated as follows:

$$\text{TSS (mg/l)} = \frac{(A-B)\ 1000 \times 1000}{\text{Sample volume (ml)}}$$

Where A = weight of filter paper + residue (mg)

B = weight of filter paper (mg)

Total Dissolved Solids (TDS)

This was determined using Horiba Water Quality Equipment. The dissolved solids in the water sample was determined by inserting the probe of the equipment in the water sample collected in a specially designed cup, and the value of TDS in mg/L read off the Visual Display Unit of the equipment. This value summed with the value for the previous parameter (TSS) gave the Total Solid (TS) in the water sample.

Anions (Cl^-, NO_3^-, PO_4^{3-}, SO_4^{2-})

The chloride was determined using the argentometric method. Standard 0.0141N $AgNO_3$ (Silver nitrate) solution was used to titrate 50ml of the sample using 1ml of Potassium chromate as indicator. The colour changes from orange to pink as the endpoint (APHA 4500 -Cl- B). Phosphate was determined as orthophosphate with ascorbic acid using Spectrophotometric procedure. The phenol disulphonic acid Spectophotometric method was used for the determination. Sulphate was determined by the turbidimetric procedure. In each case, a standard calibration curve was prepared and the respective anions concentration read from the curve.

Exchangeable Cations in Water

Exchangeable cations (Mg^{2+}, Ca^{2+}, K^+, and Na^+) were determined as described by APHA 18th edition 3111B and ASTM D3561. The concentration was calculated thus:

$$\text{Concentration (mg/l)} = \frac{C \times Y}{X}$$

Where C = concentration of cation determined from calibration curve

Y = final volume, ml

X = volume of sample, ml

Extractable Heavy Metals and Trace Metals

Heavy metals in each water sample were digested using concentrated Nitric acid with a known volume (c. 10ml). The concentrations of the metals in the solutions were measured using an Atomic Absorption Spectrometer (Spectra AA 400 Plus Varian Spectrometer) after bringing the analyte into the acid solution by boiling for 15-20 minutes and cooling thereafter.

Total Hydrocarbon Content (THC)

The total hydrocarbon content of the water samples was determined by the chromatographic method. Specific volume of the sample was extracted with hexane and dichloromethane using a silica gel column. The hexane was used to extract for the aliphatic hydrocarbons while the dichloromethane was used to extract for the polycyclic aromatic hydrocarbons (PAH). The total hydrocarbon was then determined with the Agilent 4890 Gas Chromatograph (with Flame Ionization Detection) using the standard methods prescribed by Agilent Technologies, 2001.

Calibration of the Gas Chromatograph

Squalene or Chloro-octadecane was used as the internal standard. Extract of each sample or standard mixture of known alkanes was spiked with a known amount of the internal standard and injected into the GC for both identification and quantification. The chromatograms after the analysis give the concentrations of both the alkanes and the internal standard and by this; routine recovery of the internal standard is maintained at greater than 90%.

<u>Soil Analysis</u>

Soil Physical Properties

Particle size analysis

To obtain a complete separation of the soil sample into discrete particles and to facilitate the destruction of organic matter, 30% sodium hexametaphosphate solution was added as a dispersing agent. Homogeneity of the particles was then attained using a mixer. Readings were made with a standard Bouycous hydrometer at 40 seconds and 8 hours. The latter reading gave the concentration of clay, while the former yielded the combine concentration of both clay and silt (I.I.T.A Laboratory Manual, 1999).

The various particle grades (sand, silt and clay) and their percentage proportions, determined from the particle grain size analyses, were used to classify the sediments into textural composition using the triangular graph method (Holme and Mcintyx, 1972).

Soil Chemical Properties

Prior to the commencement of the laboratory analysis of the chemical properties, the soil samples were air-dried, sieved through a 2mm mesh and stored for use. Except for pH, the classifications used were those suggested by Sobulo and Adepetu (1987).

Total Organic Carbon

The organic carbon content was determined titrimetrically employing the rapid wet oxidation method based on Walkey and Black procedure using a mixture of the sample and acidified potassium dichromate. Ferrous ammonium Sulphate was used as titrant with phenanthroline as indicator. The TOC was calculated thus:

$$\text{Organic Carbon (mg/l)} = \frac{(\text{meq } K_2Cr_2O_7 - \text{meq } FeSO_4) \times 0.003 \times 1000 \times 1.3}{\text{Volume of Sample (ml)}}$$

Total Organic Matter (mg/l) = Total organic carbon (g/kg) x 1.729

Where, meq K_2CrO_7 = 1N x 10ml

meq $FeSO_4$ = 0.5N x volume of titrant in ml

0.003 = milliequivalent weight of carbon.

1.30 = Correction factor

1000 = Conversion factor to litres

Exchangeable Cations (Ca^{2+}, K^+, Mg^{2+}, Na^+)

Exchangeable cations were extracted from the soil using 1N neutral ammonium acetate solution. Concentrations of the cations were determined using Atomic Absorption Spectrometer (AAS) varian SpectrAA 400 Plus.

Anions (NO_3^-, SO_4^{2-}, PO_4^{3-},Cl^-)

20g of soil sample was added to 100ml of potassium chloride solution and the resulting mixture was shaken for about 1 hour to extract the anion contents. The resulting extracts were decanted into a 25mL cuvette and inserted in the light compartment of HACH DR 2010 Spectrophotometer for the determination of anion concentrations.

Soil pH

Soil and deionised water in ratio 2:1 suspension was prepared and direct measurement of the pH was carried out using a glass electrode pH meter.

Extractable Heavy Metals

Extractable heavy metals in each soil sample were extracted using a 0.1N hydrochloric acid. The concentrations of the metals in the digestate solutions were measured using Atomic Absorption Spectrometer (AAS) varian SpectrAA 400 Plus. The above soil physico-chemical analytical method is applied to sediment analysis.

Soil Microbiology

Soil samples were collected around the project area for microbial analysis, observing all the relevant quality control procedures for microbial sampling and handling. The soil samples were collected into pre-labelled MacCarney bottles. The samples were then transported to the laboratory, ensuring that they were not contaminated. In the laboratory, the samples were subjected to series of microbial analyses, which included:

- Total Heterotrophic Bacterial (THB) and Fungal (THF) counts
- Total Anaerobic Bacterial (TAB) count
- Identification of microbial isolates

The total counts of heterotrophic bacteria; yeast and fungi were determined by first dissolving 1g of the soil samples in 10ml of distilled water. From the supernatant of the solution an aliquot (0.1 ml) of appropriate dilutions (10^{-2} - 10^{-6}) of the soil was spread on nutrient agar for bacteria, potato dextrose agar for fungi, saubarands dextrose agar for yeasts and MacConkey agar for coliform and incubating at 30°C for 24 hours for bacteria and 28°C for 3 - 7 days for fungi and yeasts. The total counts were estimated manually after the incubation period. Pinkish colonies on MacConkey plates indicated the presence of coliform.

Microorganism identification was carried out by the conventional process: Staining using the Gram's staining technique to differentiate gram-positive microorganisms from gram-negative microorganisms was carried out. The pure bacterial cultures were subjected individually to various biochemical tests, which included oxidase, catalase, motility, nitrate reduction, urease production, gelatin liquefaction, arginine hydrolysis sugar fermentation and acid production. Individual bacterial strains were then identified based on their reactions on the above mentioned biochemical tests. Fungi identification was done by microscopic examination to determine the morphological characteristics of the isolates. Specific sugar fermentation tests were done for identification of the yeast isolates. The above soil microbiological method also applied to sediment microbiology analysis.

Air Quality Assessment

Gaseous air pollutants measured included ammonia (NH_3), Carbon (II) Oxide – Carbon monoxide (CO), hydrogen sulphide (H_2S), Nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and volatile organic compounds (VOCs). In addition, the ambient air was analysed for Total Suspended Particles (TSP). The ambient noise level was also measured at the project location.

The detail sampling methodology adopted is reported in Appendix A2. For all the air pollutants measurements, a sampling period of 8 minutes was adopted while 60 seconds sampling period adopted for noise measurements.

Climate and Meteorological Study

The information presented in this report on the climate and meteorological components of the Oyo State environment was obtained from the Nigerian Meteorological Agency (NIMET).

Plankton analysis

In the laboratory, five drops (using a dropper) of the concentrated sample (10ml) was investigated at different magnifications (50X, 100X and 400X) using a Wild II binocular microscope with calibrated eye piece and the average recorded. The drop count microscope analysis method described by Lackey (1938) and modified by Onyema (2007) was used to estimate the plankton flora and fauna. Since each sample drop from the dropper accounts to 0.1ml, the results on abundance / occurrence were multiplied accordingly to give the values as numbers of organisms per ml which is the standard unit of measurement.

To create a suitable plankton sample mount, a dropper was used to take in at least 1.5ml of the sample after shaking properly. This was then allowed to stand for at least 3 minutes. After which one or two drops of concentrated sample from the dropper was then gently dropped on a glass-slide (7.5 cm by 2.5 cm) while placed on a flat laboratory table and covered with a glass-

slide (2cm by 2cm). The mount was then placed on the microscope stage, fitted in and all transects thoroughly observed for phytoplankton (cells, filaments, colonies) and zooplankton species (e.g. adults and juvenile stages alike). Final data were presented as number of organisms (cells, filaments, colonies and whole organism) per ml. Biodiversity or Biological Diversity is the sum of all the different species of animals, plants, fungi, and microbial organisms living on Earth and the variety of habitats in which they live. Biodiversity is also the variation of life forms within a given ecosystem, biome or for the entire Earth. Consequently, biodiversity is often used as a measure of the health of systems. A diversity index is a mathematical measure of species diversity in a community. Diversity indices provide important information about rarity and commonness of species in a community. The ability to quantify diversity in this way is an important tool for biologists trying to understand community structure. The following diversity indices were used for biological data analysis.

Species Richness Index (d)

The Species richness index (d) according to Margalef (1951) is a measure of diversity and was used to evaluate the community structure. Species Richness is a measure of the number of different kinds of organisms present in a particular area. This index is also referred to as Margalef index. The equation below was applied.

$$d = \frac{S - 1}{\ln N}$$

Where:
d = Species richness index
S = Number of species in a population
N = Total number of individuals in S species.

QUALITY ASSURANCE PROTOCOL

In order to assure and guarantee quality in this study, a number of strategic best practice plans were put in place and strictly adhered to. The quality assurance (QA) plan adopted for the study covered sample collection, handling and laboratory analyses/data management. These include;

Sample Collection/Handling

Prior to mobilization to the Eleyele Dam field studies, sample containers were sterilized / washed using standard methodology and neatly packed. All field sampling and collection instruments were cleaned and re-calibrated after each use in the field. Sample chain-of-custody forms were properly filled to indicate the sample names and locations, preservatives used, analysis required and date of sampling. This was used in the tracking of samples from the point of collection in the field to the laboratory where analyses were carried out. Samples were transferred in coolers to the cold room on board the houseboat at the camp base, from where they were transported to the laboratory after the field exercise.

Laboratory Analyses

QA/QC measures adopted for laboratory analyses were in accordance with FMEnv recommendations and standards.

Other QA measures adopted in this study include:

- Engagement of adequate competent personnel at all phases of the study;

- Strict adherence to standard analytical operating procedures during analyses.

Data Management

Standard data spreadsheets (Excel) were used for recording and transmitting analytical results. SPSS and GIS analyses where carried out using Arcview 3.2 and ArcGIS 9.2. Processing/calculation of results were done in accordance with written standard operating procedures. Final results were issued only after a general QA check and validation were completed.

Appendix 3.2: Pictures of Vegetation Composition in the Project Area

An economic plant (*Psidium guajava*) enumerated in the study area

An economic plant (*Carica papaya*) not in fruit, and Cassia siamea not in flowers enumerated in the study area during the dry season

An economic plant (*Carica papaya*), in fruit, enumerated in the study area during the rainy season

An Aquatic macrophyte (*Nymphaea lotus*) in open flowers enumerated during the rainy season in the study area.

An Aquatic macrophyte (*Nymphaea lotus*) in closed flowers in association with *Alchornea cordifolia* enumerated in the study area during the dry season

An Aquatic macrophyte (*Typha australis*) in association with other aquatic grasses enumerated in the study area during the dry season

Denser and some dry tillers of Aquatic macrophyte (*Typha australis)* enumerated in the study area during the rainy season

An economic plant (*Elaeis guineensis*) in association with *Alchornea cordifolia* on the shoreline enumerated in the study area

An aquatic macrophyte (*Pistia stratoites*) in association with *Typha australis* on the water surface enumerated in the study area

Woody species including climbers growing along the shoreline enumerated in the study area.

Woody species growing in association with aquatic macrophytes along the shoreline and edges of the river enumerated in the study area.

Woody species (*Cassia siamea*) in flowers enumerated in the study area during the rainy season

Farmland hoe to reduce competition with weeds in the study area during the rainy season

An economic plant *Musa sapientum* in association with a climber enumerated in the study area during the rainy season

Appendix 4.1: Individual/Household Interview Schedule Questionnaire

Introduction

- Good day Sir/Madam. We are conducting Environmental and Social Impact Assessment for Emergency Rehabilitation of Eleyele Dam.
- I would like to know your views about the potential environmental, social and economic impact of the project on people in this community, and how any undesirable consequences of the rehabilitation exercise can be avoided/mitigated.
- We have received permission from appropriate authorities to conduct this study. The interview will only take a few minutes. You have been randomly selected for this interview. The information you provide will be very useful in advising appropriate authorities and agencies on modalities for ensuring that the proposed rehabilitation exercise does not have undue adverse effects on people. It will also aid further consultation and engagement with the community in addressing the challenges that the proposed dam rehabilitation exercise may pose to them.
- Your honest and sincere responses will be highly appreciated. You are assured that information given shall be treated with confidentiality and used for the purpose of this research only. If there is any particular question that you do not like to answer, that will, of

CONSENT: Are you willing to be interviewed? Yes ☐ No ☐

Questionnaire number			
Section 1: Survey Identification			
S/No	**Issues**	**Responses**	**Response codes**
1.	Name of Interviewer		
2.	Language of interview	English .....1 Pidgin English .....2 Yoruba.....3 Other language (specify) 4	
3.	Date of interview (ddmm e.g. 2801)		
4.	Time interview started (hhmm, e.g. 0820)		
5.	Time interview ended (hhmm, e.g. 0850)		
Section 2: Socio-Demographic Information of Respondent			
6.	Identity of respondent	Husband .....1 Wife.....2 Senior member of household 3	
7.	Sex of respondent (Interviewer indicate as appropriate)	Male .....1 Female.....2	
8.	How old are you now? (Age last birthday in years)	…….. years	
9.	What is your current marital status?	Single (never married).....1 Cohabiting.....2 Married.....3 Separated.....4	

		Divorced.....5 Widowed 6	
10	What is your ethnic background?	…….	
11	What is your State of origin?	…….	
12	What is your religion?	Christianity.....1 Islam.....2 Traditional religion.....3 Atheist .....4 Other (please specify) 5	
13	What is your highest level of education?	No formal education.....1 Quranic education .....2 Primary.....3 Secondary.....4 Post-Secondary (degree) .....5 Post-Sec (non-degree) .....6 Others (pls specify) 7	
14	Apart from Yoruba, which other ethnic groups live/work in this community?		
15	How long have you been living in this community? (number of years)	……. years	
16	Do you plan to continue to live in this community?	Yes .....1 No.....2	
17	If 'No', please mention why you may move out of this community?		
18	Were you in this community during the flooding event of 2011?	Yes .....1 No.....2	
19	Were you/your household affected in any way by the 2011 flooding?	Yes .....1 No.....2	
20	If 'Yes', How were you affected then?		
21	Has there been any other flooding incident since 2011?	Yes .....1 No.....2 Don't Know.....3	
22	If 'Yes', when?		
23	What is your current occupational status?	Employed/self-employed .....1 Unemployed .....2 Retired.....3 Housewife .....4 Student/Apprentice.....5 Other (please specify) 6	
24	What is the nature of your main work?	Business/Trading.....1 Farming .....2 Fishing.....3 Mechanic.....4 Skilled work (artisanship) .....5 Teaching.....6	

		Civil service employee .....7 Others (pls specify) 8	
25	If Respondent is not the head of household, ask: What is the current occupational status of the head of this household?	Employed/self-employed .....1 Unemployed .....2 Retired.....3 Housewife .....4 Student/Apprentice.....5 Other (please specify) 6	
26	If Respondent is not the head of household, ask: What is the nature of the head of household's main work?	Business/Trading.....1 Farming/Agriculture.....2 Fishing.....3 Mechanic.....4 Skilled work (artisanship) .....5 Teaching.....6 Civil service employee .....7 Others (pls specify) 8	
27	Exactly where do you work?	Within Eleyele.....1 Outside Eleyele, but nearby .....2 Far from Eleyele.....3 Others (pls specify) 4	
28	On the average, how much do you, as a person, receive as income from all sources per month?	N ……..	
Section 3: Household Situation and Facilities			
29	How many members of your household are gainfully employed?	Males = Females =	
30	What is the estimated total income (income from all sources) of your household?	N	
31	What is your estimated total household monthly expenditure on the following? Note: Energy includes electricity, gas, kerosene, etc. for household use	Food ₦.....1 Clothing ₦.....2 Housing/Rent ₦.....3 Transportation ₦ .....4 Schooling/education ₦ .....5 Medical care/health ₦ .....6 Energy .....7 Other (specify) 8	
32	Type of house	Bungalow .....1 2/3 storey building.....2 Other type (specify).....3	
33	Type of material house's walls are made of: (Interviewer observe)	Cement .....1 Wood/planks .....2 Mud/mud bricks .....3 Other (specify) 4	
34	How many rooms are used by your household in this building? (Count living room as one room)	…….. rooms.	
35	Including your own household, how many households live in this compound?	……	
36	Including you, how many people live in this household?	1. No. of males …….. 2. No. of females …… 3. Total …..……..…	
37	Including you, how many people living in this	1. Persons aged 12 yrs or less …	

	household are within these age groups?	2. Persons 13 – 19 …… 3. Persons 20 – 45 …….. 4. Persons 45 – 60 …… 5. Persons over 60 yrs. ……. 6. Total …….	
38	Do you own the apartment/house in which you currently live or are you renting?	Own the house.....1 Rent-paying tenant .....2 Non-rent-paying tenant .....3 Official quarter.....4 Other (pls specify).....5	
39	Do you have electricity in this house?	Yes .....1 No.....2	
40	If "Yes", what is the source of electricity supply to most houses in the community?	PHCN .....1 Private electricity provider.....2 Generator.....3 No electricity.....4 Other sources (specify) 5	
41	Is electricity supply regular in this area?	Yes .....1 No.....2	
42	How do you get most of the water you use here daily?	Yard well/borehole.....1 Community well/borehole.....2 Stream/pond/river.....3 Public standpipe .....4 Yard/Shared standpipe .....5 Water piped into house.....6 Water tanker.....7 Water seller .....8 Other (specify) 9	
43	Is the source of water reliable?	Reliable .....1 Not reliable.....2 Don't Know.....3	
44	Is the water good for drinking?	Yes .....1 No.....2 Don't Know.....3	
45	What type of toilet facility does your household most frequently use? (Tick only one)	WC toilet (private) .....1 VIP Latrine (private).....2 Public toilet .....3 Other types(Specify) .....4 No toilet facility 5	
46	What is the most commonly used mode of solid waste disposal for this household? Or: How does your household dispose of most of its solid waste? (Tick only one)	Dumping ground in neighbourhood 1 Truck pusher/private refuse collector 2 Neighbourhood bin/skip.....3 Bin/drum outside house.....4 Other types(Specify) 5	

47	Which of the following items do you possess/use in your household and how many?	Number of items	Time of usage per week (h)	
	Television set			
	Radio			
	Satellite connection for TV			
	Computer/laptop			
	Internet connection			
	Mobile phone			
	Fridge/freezer			
	Gas cooker			

	Camera			
	Electric fan			
	Audio stereo set			
	Air conditioners			
	Motor cars/vans/vehicles			
	Motor bike			
	Bicycle			
Section 4: Community Facilities				
48	What is the major means of transportation in this community?			
49	Do you have any of the following in this community?	Yes	No	Don't Know
	a) Post office	1	2	3
	b) Recreational center/space	1	2	3
	c) Government/public primary school	1	2	3
	d) Government/public secondary school	1	2	3
	e) Market	1	2	3
	f) Fire station	1	2	3
	g) Police station	1	2	3
	h) Government Hospital	1	2	3
	h) Private hospital	1	2	3
50	Are there street lights in this community?	Yes .....1 No.....2		
51	If "Yes", ask: Do the street lights work regularly?	Yes .....1 No.....2		
52	What are the common economic activities of people in this community?			
53	What kind of activities do male youth in this community engage in mainly?			
54	What kind of activities do female youth in this community engage in mainly?			
55	What kind of activities do male adult in this community engage in mainly?			
56	What kind of activities do female adult in this community engage in mainly?			
57	What are the natural resources that are available in this community?			
Section 5: Awareness about Proposed Rehabilitation of Eleyele Dam				
58	Are you aware about the proposed Rehabilitation of Eleyele Dam?	Yes .....1 No.....2		
59	If "Yes", how did you first know about the planned project?			
60	What is your attitude to the proposed Rehabilitation of Eleyele Dam? (Please give reasons)	Favourable to rehabilitation.....1 Unfavourable to rehabilitation.....2 Indifferent.....3		
61	Give reasons for your response to Q60			

Section 6: Potential Effects of the Proposed Land Reclamation and Mixed Estate			
62	How do you think the proposed Rehabilitation of Eleyele Dam could affect you as an individual? (Probe for effects on daily life activities, economic activities, social activities, etc.)		
63	How do you think the proposed Rehabilitation of Eleyele Dam could affect your family/household? (Probe for effects on daily life activities, economic activities, social activities, fishing access, farm land, water, etc.)		
64	How do you think the proposed Rehabilitation of Eleyele Dam could affect your community? (Probe for effects on daily life activities, economic activities, social activities, fishing access, farm land, water, etc.)		
65	What are the problems that the proposed Rehabilitation of Eleyele Dam could bring to this community? (Probe for impact on sources of livelihood, accommodation, social facilities and infrastructure, etc.)		
66	What other problems do you think could arise from the proposed Rehabilitation of Eleyele Dam?		
67	What solutions can you suggest to solve the above-identified problems?		
68	Do you foresee any possible conflict between the current residents/indigenes of this community and the project?	Yes .....1 No.....2	
69	What do you think should be done to avoid such conflicts?		
70	In what ways do you think the project activities could conflict with the life of the people?		
71	What do you think should be done to avoid such conflicts?		
72	What benefits do you think you and members of your household can derive from the proposed Rehabilitation of Eleyele Dam? (Probe for business and employment opportunities, provision of essential facilities etc.)		
73	What benefits do you think this community can derive from the proposed Rehabilitation of Eleyele Dam? (Probe for business and employment opportunities, provision of essential facilities etc.)		
74	Are there some vulnerable or particularly disadvantaged groups/groups of individuals who may be affected by the proposed rehabilitation exercise?	Yes..... 1 No 2	
75	If 'Yes', please mention such groups.		
76	Where are such groups located?		
77	Are there some socio-cultural artifacts (e.g. shrines or other sacred things) in this community that may be affected by the proposed Rehabilitation of Eleyele Dam?	Yes..... 1 No 2	

78	If "Yes", please mention the socio-cultural artifacts.		
79	Can such socio-cultural artifacts/sacred places be transferred/relocated/replicated in a new location?	Yes .....1 No 2	
80	Do you think there could be some resistance/ objection by people to the proposed Rehabilitation of Eleyele Dam?	Yes..... 1 No..... 2	
81	If "Yes", why do you think people may resist/ object the proposed Rehabilitation of Eleyele Dam?		
82	What do you think can be done to minimize or overcome such resistance/objection?		
83	Do you have any fears or concerns about the proposed Rehabilitation of Eleyele Dam?		
Section 7: Social/Community Network			
84	Are there Community Development Associations (CDAs) or Residents' Associations (RAs) in this community?	Yes .....1 No.....2	
85	If "Yes", please mention the names of the CDAs that you know in this area.		
86	How does/do the CDA(s)/RA(s) contribute to community development? [Prompt if necessary. Ask: What projects do they do in the community? Ask for specific projects they have done in the past two years].		
87	Are there some influential associations/clubs/social groups in this area? (Probe for business/trade/ occupational groups, social groups/clubs, religious groups, etc)	Yes .....1 No 2	
88	If "Yes", please mention the associations/ clubs/social groups in this area.		
89	Who are the members of the executive of these groups/associations?		
90	Do you belong to any of these associations/ clubs/social groups in this area?	Yes .....1 No.....2	
91	If "Yes", please mention the associations/ clubs/social groups you belong to in this area		
92	Are there youth-based groups in this community?	Yes .....1 No.....2	
93	Can you name such youth-based groups that you know exist in this community?		
94	Is there any vigilante group in this community?	Yes .....1 No.....2	
95	If *yes*, who are the people in charge of the activities of the vigilante group?		
96	How is information (such as date of community meetings) communicated to the people in this community?		

97	How are important decisions taken in this community?		
98	If there are disputes between people in this community, how are such disputes usually resolved? (Probe for community conflict resolution mechanisms/structures in the community).		
99	What other comment do you have to add to what we have discussed so far?		

This is the end of the interview. Thank you very much Sir/Ma.

Interviewer record time interview ended.

Appendix 4.2: Business Operators Interview Schedule Questionnaire

Introduction

- Good day Sir/Madam. We are conducting Environmental and Social Impact Assessment for Emergency Rehabilitation of Eleyele Dam.
- I would like to know your views about the potential environmental, social and economic impact of the project on people in this community, and how any undesirable consequences of the rehabilitation exercise can be avoided/mitigated.
- We have received permission from appropriate authorities to conduct this study. The interview will only take a few minutes. You have been randomly selected for this interview. The information you provide will be very useful in advising appropriate authorities and agencies on modalities for ensuring that the proposed rehabilitation exercise does not have undue adverse effects on people. It will also aid further consultation and engagement with the community in addressing the challenges that the proposed dam rehabilitation exercise may pose to them.
- Your honest and sincere responses will be highly appreciated. You are assured that information given shall be treated with confidentiality and used for the purpose of this research only. If there is any particular question that you do not like to answer, that will, of course, be accepted.
- Thank you.

CONSENT: Are you willing to be interviewed? Yes ☐ No ☐

Questionnaire number			
Section 1: Survey Identification			
S/No	**Issues**	**Responses**	**Response codes**
1.	Name of Interviewer		
2.	Language of interview	English .....1 Pidgin English .....2 Yoruba.....3 Other language (specify) 4	
3.	Date of interview (ddmm e.g. 2801)		
4.	Time interview started (hhmm, e.g. 0820)		
5.	Time interview ended (hhmm, e.g. 0850)		
Section 2: Business Information			
6.	Type of business operated by respondent	……..	
7	Identity of respondent	Business owner.....1 Responsible staff .....2 Other category (pls specify) 3	
8	Scale/Volume of business	Small scale (value of goods/equipment less than N5,000) ..... 1 Medium scale (value of goods/equipment N5,000 – N25,000)..... 2 Large scale (value of goods/equipment N25,001 – N50,000) ..... 3 Very large scale (value of goods/equipment over N50,000) 4	
9	Type of business facility	Vendor table..... 1 Vendor stall..... 2 Store shop ..... 3 Artisan table..... 4 Workshop..... 5	

		Transporter (motor bike)..... 6 Transporter (mini-van/taxi)..... 7 Other (specify) e.g. wheel barrow, umbrella shop, etc. 8	
10	Type of material used for shop/stall	Steel.....1 Plywood .....2 Wood.....3 Corrugated iron sheet .....4 Other (specify). 5	
11	Shop/stall/equipment movable or immovable	Movable .....1 Immovable 2	
12	How many people work with you here?	Number of workers ……	
13	Sex of respondent (Interviewer indicate as appropriate)	Male .....1 Female.....2	
14	How old are you now? (Age last birthday in years)	…….. years	
15	What is your ethnic background?	…….	
16	What is your State of origin?	…….	
17	What is your highest level of education?	No formal education.....1 Quranic education .....2 Primary.....3 Secondary.....4 Post-Secondary (degree) .....5 Post-Sec (non-degree) .....6 Others (pls specify) 7	
18	Apart from Yoruba, which other ethnic groups live/work in this community?		
19	How long have you been operating business in this community? (number of years)	……. years	
20	Do you also live in this community?	Yes .....1 No.....2	
21	Were you in this community during the flooding event of 2011?	Yes .....1 No.....2	
22	Were you/your business affected in any way by the 2011 flooding?	Yes .....1 No.....2	
23	If 'Yes', How were you affected then?		
24	Has there been any other flooding incident since 2011?	Yes .....1 No.....2 Don't Know.....3	
25	If 'Yes', when?		
26	On the average, about how much do you make from this business per month?	N ……..	
Section 3: Awareness about Proposed Rehabilitation of Eleyele Dam			
27	Are you aware about the proposed Rehabilitation of Eleyele Dam?	Yes .....1 No.....2	
28	If "Yes", how did you first know about the planned project?		
29	What is your attitude to the proposed Rehabilitation of Eleyele Dam? (Please	Favourable to rehabilitation..... 1 Unfavourable to rehabilitation. 2	

	give reasons)	Indifferent..... 3	
30	Give reasons for your response to Q43		
Section 4: Potential Effects of the Proposed Land Reclamation and Mixed Estate			
31	How do you think the proposed Rehabilitation of Eleyele Dam could affect your business? (Probe for effects on daily life activities, economic activities, social activities, etc.)		
32	How do you think the proposed Rehabilitation of Eleyele Dam could affect your community? (Probe for effects on daily life activities, economic activities, social activities, fishing access, farm land, water, etc.)		
33	What are the problems that the proposed Rehabilitation of Eleyele Dam could bring to this community? (Probe for impact on sources of livelihood, accommodation, social facilities and infrastructure, etc.)		
34	What other problems do you think could arise from the proposed Rehabilitation of Eleyele Dam?		
35	What solutions can you suggest to solve the above-identified problems?		
36	Do you foresee any possible conflict between the current residents/indigenes of this community and the project?	Yes .....1 No.....2	
37	What do you think should be done to avoid such conflicts?		
38	In what ways do you think the project activities could conflict with the life/business of the people?		
39	What do you think should be done to avoid such conflicts?		
40	What benefits do you think you and your business can derive from the proposed Rehabilitation of Eleyele Dam? (Probe for business and employment opportunities, provision of essential facilities etc.)		
41	What benefits do you think this community can derive from the proposed Rehabilitation of Eleyele Dam? (Probe for business and employment opportunities, provision of essential facilities etc.)		
42	Are there some socio-cultural artifacts (e.g. shrines or other sacred things) in this community that may be affected by the proposed Rehabilitation of Eleyele Dam?	Yes..... 1 No 2	
43	If "Yes", please mention the socio-cultural artifacts.		
44	Can such socio-cultural artifacts/sacred places be transferred/relocated/replicated in a new location?	Yes .....1 No 2	
45	Do you think there could be some resistance/ objection by	Yes..... 1	

	people to the proposed Rehabilitation of Eleyele Dam?	No..... 2	
46	If "Yes", why do you think people may resist/ object the proposed Rehabilitation of Eleyele Dam?		
47	What do you think can be done to minimize or overcome such resistance/objection?		
48	Do you have any fears or concerns about the proposed Rehabilitation of Eleyele Dam?		
Section 5: Business Network			
49	Are there trade/business associations in this community?	Yes .....1 No.....2	
50	If "Yes", please mention the names of the trade/business associations that you know in this area.		
51	Do you belong to any of these associations in this area?	Yes .....1 No.....2	
52	If "Yes", please mention the associations you belong to in this area		
53	What other comment do you have to add to what we have discussed so far?		

This is the end of the interview. Thank you very much Sir/Ma.

Interviewer record time interview ended.

Appendix 4.3: Business Operators Interview Schedule Questionnaire

Introduction

- Good day Sir/Madam. We are conducting Environmental and Social Impact Assessment for Emergency Rehabilitation of Eleyele Dam.
- I would like to know your views about the potential environmental, social and economic impact of the project on people in this community, and how any undesirable consequences of the rehabilitation exercise can be avoided/mitigated.
- We have received permission from appropriate authorities to conduct this study. The interview will only take a few minutes. You have been randomly selected for this interview. The information you provide will be very useful in advising appropriate authorities and agencies on modalities for ensuring that the proposed rehabilitation exercise does not have undue adverse effects on people. It will also aid further consultation and engagement with the community in addressing the challenges that the proposed dam rehabilitation exercise may pose to them.
- Your honest and sincere responses will be highly appreciated. You are assured that information given shall be treated with confidentiality and used for the purpose of this research only. If there is any particular question that you do not like to answer, that will, of course, be accepted.
- Thank you.

CONSENT: Are you willing to be interviewed? Yes ☐ No ☐

Questionnaire number			
Section 1: Survey Identification			
S/No	**Issues**	**Responses**	**Response codes**
1.	Name of Interviewer		
2.	Language of interview	English .....1 Pidgin English .....2 Yoruba.....3 Other language (specify) 4	
3.	Date of interview (ddmm e.g. 2801)		
4.	Time interview started (hhmm, e.g. 0820)		
5.	Time interview ended (hhmm, e.g. 0850)		
Section 2: Business Information			
6.	Type of business operated by respondent	……..	
7	Identity of respondent	Business owner.....1 Responsible staff .....2 Other category (pls specify) 3	
8	Scale/Volume of business	Small scale (value of goods/equipment less than N5,000) ..... 1 Medium scale (value of goods/equipment N5,000 – N25,000)..... 2 Large scale (value of goods/equipment N25,001 – N50,000) ..... 3 Very large scale (value of goods/equipment over N50,000) 4	
9	Type of business facility	Vendor table..... 1 Vendor stall..... 2 Store shop ..... 3 Artisan table..... 4 Workshop..... 5	

		Transporter (motor bike)..... 6 Transporter (mini-van/taxi)..... 7 Other (specify) e.g. wheel barrow, umbrella shop, etc. 8	
10	Type of material used for shop/stall	Steel.....1 Plywood .....2 Wood.....3 Corrugated iron sheet .....4 Other (specify). 5	
11	Shop/stall/equipment movable or immovable	Movable .....1 Immovable 2	
12	How many people work with you here?	Number of workers ……	
13	Sex of respondent (Interviewer indicate as appropriate)	Male .....1 Female.....2	
14	How old are you now? (Age last birthday in years)	…….. years	
15	What is your ethnic background?	…….	
16	What is your State of origin?	…….	
17	What is your highest level of education?	No formal education.....1 Quranic education .....2 Primary.....3 Secondary.....4 Post-Secondary (degree) .....5 Post-Sec (non-degree) .....6 Others (pls specify) 7	
18	Apart from Yoruba, which other ethnic groups live/work in this community?		
19	How long have you been operating business in this community? (number of years)	……. years	
20	Do you also live in this community?	Yes .....1 No.....2	
21	Were you in this community during the flooding event of 2011?	Yes .....1 No.....2	
22	Were you/your business affected in any way by the 2011 flooding?	Yes .....1 No.....2	
23	If 'Yes', How were you affected then?		
24	Has there been any other flooding incident since 2011?	Yes .....1 No.....2 Don't Know.....3	
25	If 'Yes', when?		
26	On the average, about how much do you make from this business per month?	N ……..	
Section 3: Awareness about Proposed Rehabilitation of Eleyele Dam			
27	Are you aware about the proposed Rehabilitation of Eleyele Dam?	Yes .....1 No.....2	
28	If "Yes", how did you first know about the planned project?		
29	What is your attitude to the proposed Rehabilitation of Eleyele Dam? (Please	Favourable to rehabilitation..... 1 Unfavourable to rehabilitation. 2	

	give reasons)	Indifferent..... 3	
30	Give reasons for your response to Q43		
Section 4: Potential Effects of the Proposed Land Reclamation and Mixed Estate			
31	How do you think the proposed Rehabilitation of Eleyele Dam could affect your business? (Probe for effects on daily life activities, economic activities, social activities, etc.)		
32	How do you think the proposed Rehabilitation of Eleyele Dam could affect your community? (Probe for effects on daily life activities, economic activities, social activities, fishing access, farm land, water, etc.)		
33	What are the problems that the proposed Rehabilitation of Eleyele Dam could bring to this community? (Probe for impact on sources of livelihood, accommodation, social facilities and infrastructure, etc.)		
34	What other problems do you think could arise from the proposed Rehabilitation of Eleyele Dam?		
35	What solutions can you suggest to solve the above-identified problems?		
36	Do you foresee any possible conflict between the current residents/indigenes of this community and the project?	Yes .....1 No.....2	
37	What do you think should be done to avoid such conflicts?		
38	In what ways do you think the project activities could conflict with the life/business of the people?		
39	What do you think should be done to avoid such conflicts?		
40	What benefits do you think you and your business can derive from the proposed Rehabilitation of Eleyele Dam? (Probe for business and employment opportunities, provision of essential facilities etc.)		
41	What benefits do you think this community can derive from the proposed Rehabilitation of Eleyele Dam? (Probe for business and employment opportunities, provision of essential facilities etc.)		
42	Are there some socio-cultural artifacts (e.g. shrines or other sacred things) in this community that may be affected by the proposed Rehabilitation of Eleyele Dam?	Yes..... 1 No 2	
43	If "Yes", please mention the socio-cultural artifacts.		
44	Can such socio-cultural artifacts/sacred places be transferred/relocated/replicated in a new location?	Yes .....1 No 2	
45	Do you think there could be some resistance/ objection by	Yes..... 1	

	people to the proposed Rehabilitation of Eleyele Dam?	No..... 2	
46	If "Yes", why do you think people may resist/ object the proposed Rehabilitation of Eleyele Dam?		
47	What do you think can be done to minimize or overcome such resistance/objection?		
48	Do you have any fears or concerns about the proposed Rehabilitation of Eleyele Dam?		
Section 5: Business Network			
49	Are there trade/business associations in this community?	Yes .....1 No.....2	
50	If "Yes", please mention the names of the trade/business associations that you know in this area.		
51	Do you belong to any of these associations in this area?	Yes .....1 No.....2	
52	If "Yes", please mention the associations you belong to in this area		
53	What other comment do you have to add to what we have discussed so far?		

This is the end of the interview. Thank you very much Sir/Ma.

Interviewer record time interview ended.

Appendix 4.4: Focus Group Discussion Guide

NOTE TO RESEARCH TEAM
There should be at least two research team members, namely; a moderator and a note-taker.

Each FGD should be made up of 6 – 12 (maximum 15) discussants.

Moderator's guide:
Below is a general guide for the moderator for all the groups. This guide may be modified a little on the field to suit each of the FGDs.

Introduction

- Introduction of research team members (moderator and note-taker)
- The moderator should explain the purpose of the research (see Introductory statement above).
- Re-assure participants of confidentiality; no names will be attached to any written documents and tapes will be kept safe and not shared outside the research team
- Explain the "ground rules":
- There are no right or wrong answers
- It is not necessary to raise hands but only one person talks at a time and don't interrupt each other
- We are recording so that we don't miss any information; please speak clearly and slowly so we get everything
- All opinions are very important to us to help in understanding the situation

Self-introduction by participants in the discussion:

- Ask each participant to introduce himself (FIRST NAME ONLY); record age and other required information about discussants.

YOU MIGHT WANT TO INTRODUCE AN "ICEBREAKER" HERE – NON-THREATENING QUESTIONS THAT WILL HELP TO GET DISCUSSION GOING… SUCH AS WEATHER CONDITION, ETC.

Then, move on to the FGD.

FOCUS GROUP DISCUSSION GUIDE

SECTION A: IDENTIFICATION

VARIABLES	VALUES
Category	Young men.....1 Adult men .....2 Young women.....3 Adult women 4
Community	
Specific venue for FGD	
Number of participants	
Moderator's Name	
Note-taker's Name	
Date of FGD	
Time FGD Started	
Time FGD Finished	
Language of Discussion	English .....1 Yoruba .....2 Other (please specify).....3

Give a general description of:

1. the venue:
   - sitting arrangement,
   - weather condition
2. the participants: occupation
3. level of participation:
   - did everybody participate freely?
   - did any particular person(s) try to dominate?

Give other useful information about FGD.

SOCIO-DEMOGRAPHIC CHARACTERISTICS OF DISCUSSANTS

The following is to be filled for each member of the group.

Characteristics of discussants	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Age															
Current Marital status															
Religion															
Occupation															
Education															

Key

Age - State exact age

Current Marital status 1. Married;2. Single; 3. Divorce/Separated; 4. Widow/widower

Religion - 1. Christian; 2. Moslem; 3. Traditional

Education - 0. None; 1. Primary/Arabic; 2. Secondary; 3. Post-secondary/Tertiary; 5.Other (specify) …….

Occupation - 1. Formal wage; 2. Self-employed; 3. Other (specify) ……

FGD GUIDE

1. How long have you been living in this community? (Number of years)

2. Were you in this community during the flooding event of 2011?
Please describe how the community was affected then.

3. What are the common economic activities of people in this community? Probe for different categories: males, females, youths, adults,

4. Are you aware about the proposed Rehabilitation of Eleyele Dam?
What is your attitude to the proposed Rehabilitation of Eleyele Dam? (Please give reasons)

5. How do you think the proposed Rehabilitation of Eleyele Dam could affect people in this community? (Probe for effects on daily life activities, economic activities, social activities, fishing access, farm land, water, etc.)

6. What are the problems that the proposed Rehabilitation of Eleyele Dam could bring to this community? (Probe for impact on sources of livelihood, accommodation, social facilities and infrastructure, etc.)

7. Who is more likely to be affected – men or women? Why do you say so?

8. In this community, are women treated the same way as men? Do women and men have equal rights?

9. What other problems do you think could arise from the proposed Rehabilitation of Eleyele Dam?

10. What do you think can be done to solve the above-identified problems?

11. What benefits do you think this community can derive from the proposed rehabilitation of Eleyele Dam? (Probe for business and employment opportunities, provision of essential facilities etc.)

12. Do you think there could be some opposition/ objection by people to the proposed Rehabilitation of Eleyele Dam?

13. If "Yes", why do you think people may oppose/ object the proposed Rehabilitation of Eleyele Dam?

14. What do you think can be done to minimize or overcome such opposition/objection?

15. Do you have any fears or concerns about the proposed Rehabilitation of Eleyele Dam?

This is the end of the discussion. Thank you very much Sirs/Mas.

Record time interview ended.

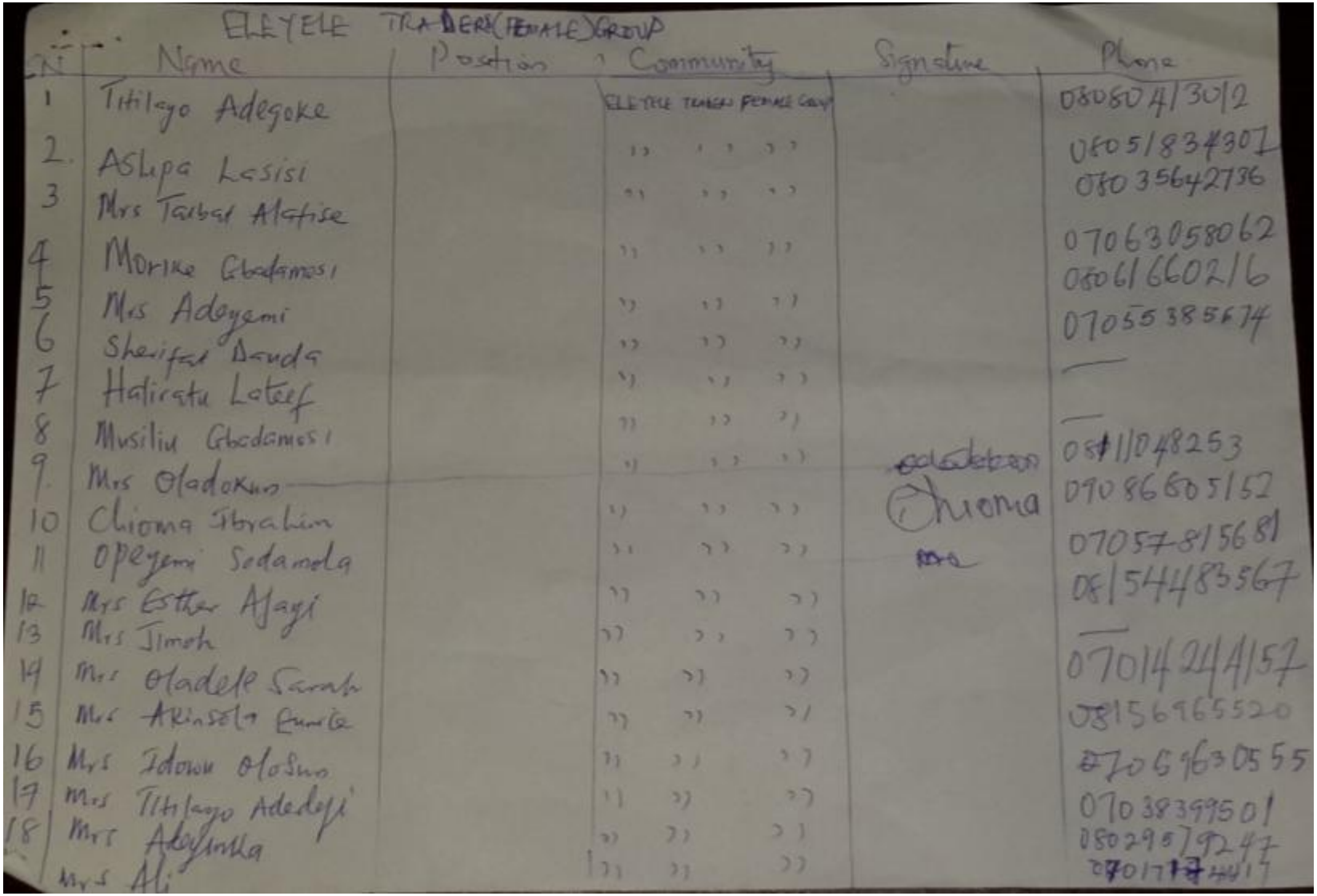
Appendix 4.5: Pictures showing Training and Interview sessions of various groups of Respondents

	
Training programme in session	Training programme in session
	
An interview situation	An interview situation
	
Interview session with a community leader	Interview session with a community leader

	
Interview session with a cassava processor	Interview session with a community leader
	
Adult male FGD in session	Adult female FGD in session
	
Youth male FGD in session	Fishermen's net in preparation for the next catch

	
Interview session with a business operator	Interview session with a business operator

Appendix 4.6: List of Attendance at the Focus Group Discussion Sessions with Various Groups



ELEYELE TRADERS (FEMALE) GROUP

S/N	Name	Position	Community	Signature	Phone
1	Titilayo Adegoke		ELEYELE TRADERS FEMALE GROUP		08080413012
2.	Aslupa Lasisi		" " "		08051834307
3	Mrs Tarbat Alatise		" " "		08035642736
4	Moriike Gbodamosi		" " "		07063058062
5	Mrs Adeyemi		" " "		08061660216
6	Sherifat Dauda		" " "		07055385674
7	Hafiratu Lateef		" " "		—
8	Musiliu Gbodamosi		" " "		—
9.	Mrs Oladokun		" " "		08111048253
10	Chioma Ibrahim		" " "	Chioma	09086605152
11	Opeyemi Sodamola		" " "		07057815681
12	Mrs Esther Afayi		" " "		08154483567
13	Mrs Jimoh		" " "		—
14	Mrs Oladele Sarah		" " "		07014244157
15	Mrs Akinsola Eunice		" " "		08156965520
16	Mrs Idowu Olosuo		" " "		07069630555
17	Mrs Titilayo Adedeji		" " "		07038399501
18	Mrs Adeyinka		" " "		08029579247
	Mrs Ali		" " "		07017174417

ELEYELE WATERSIDE COMMUNITY 404/18

S/N	Name	Position ~~Community~~	Community	Signature	Phone
	Ayoola Fakeye	King of Boys	Eleyele		09057118147
	Gbenga Goodluck	Fisherman	Eleyele		07066540603
	Agbola Ayotunde D	business man.	Eleyele		
	Olusola [illegible]	Consultant	"		08027148036
	Gbenga Fakeye	Fish Seller	Eleyele		08121545725.
	Alodun Babatunde		Eleyele		
	AJAYI OLUWASEGUN	DRIVER	Eleyele		07061534501
	Ojeleye David S.	Fisherman	Eleyele		08102833588
	Olhedenbe Peter	Fisherman	Eleyele		07032415861
			ELEYELE		08073508992
					08068104109

S/N	Name	Position	Community	Signature	Phone
1	Ojeleye David S	fisherman	Eleyele		08037350992
2	Aiyadoju Akinola	fisherman	Eleyele		08054538999
3	Ogedengbe Peter	fisherman	Eleyele		08068104109
4	Davodu Femi	fisherman	Eleyele		08099773160
5	Wasiu Raji	fisherman	Eleyele	RAJI	07053983732

MEN

SN	Name	Position	Community	Signature	Phone.
1	Okanuga Idiola	Farmer	Eleyele		090 [illegible]
2	Abdulai Arausi	Fishman	"		08052107993
3	Adeyele Tunde	Farmer	Eleyele		08099406168 – 08130655977
4	Alh. Sodiq Alaka	Trader	Eleyele		08075072780
5	Taiwo Adedeji	Trader	Eleyele		08025438588
6	Umaru Aliyu	Fisherman	Eleyele		07011202869
7	Ali Mohammed	Fisherman	Eleyele		~~07017144~~ 09017744 17
8	Yahaya Mohammed	Fisherman	Eleyele		08021392798

Appendix 4.7: Profile of Focus Group Discussants

CATEGORY OF FGD: MALE YOUTH
Community: Eleyele community (Waterfront)
Number of participants: 6
Date of FGD: 24/07
Time FGD started: 17.20
Time FGD ended: 17.53
Language of interview: Yoruba

The general description of

1. Venue:
   - Sitting arrangement: Facing one another and moderator standing
   - Weather condition: Very conducive
2. Level of participation: Engaging
   - Did everybody participate freely: Yes
   - Did any particular person try to dominate? None

Give other useful information about the FGDF?

SOCIO-DEMOGRAPHIC CHARACTERISTICS OF DISCUSSANTS

SN	Age	Marital status	Religion	Education	Occupation
1	35	Married	Christianity	Tertiary	Fisherman
2	35	Married	Christianity	Secondary	Fisherman
3	34	Married	Christianity	Tertiary	Fisherman
4	40	Single	Islam	Primary	Fisherman
5	32	Married	Christianity	Secondary	Fisherman
6	36	Married	Christianity	Tertiary	Fisherman

CATEGORY OF FGD: MALE ADULT
Community: Eleyele community
Number of participants: 10
Date of FGD: 24/07
Time FGD started: 11.22
Time FGD ended: 12.07
Language of interview: Yoruba

The general description of

1. Venue:
   - Sitting arrangement: Radial/Random
   - Weather condition: Fair
2. Level of participation: Enthusiastic
   - Did everybody participate freely
   - Did any particular person try to dominate? No

Give other useful information about the FGDF?

SOCIO-DEMOGRAPHIC CHARACTERISTICS OF DISCUSSANTS

SN	Age	Marital status	Religion	Education	Occupation
1	50	Married	Christianity	Sec school	Business man/Trader
2	40	Married	Christianity	Primary	Business man/Trader
3	52	Married	Christianity	Post Sec	Business man/Trader
4	26	Married	Christianity	Post Sec	Others
5	28	Married	Christianity	Post Sec	Formal wage
6	64	Married	Christianity	Post Sec	Formal wage
7	29	Married	Christianity	Secondary	Others
8	38	Married	Christianity	Secondary	Others
9	44	Married	Christianity	Secondary	Others
10	44	Married	Christianity	Primary	Formal wage

CATEGORY OF FGD: ADULT WOMEN
Community: Eleyele community
Number of participants: 15
Date of FGD: 24/07
Time FGD started: 16.19
Time FGD ended: 17.07
Language of interview: Yoruba
The general description of

1. Venue:
   - Sitting arrangement: Circular
   - Weather condition: Fair
2. Level of participation: 100%
   - Did everybody participate freely: Yes
   - Did any particular person try to dominate?: No

Give other useful information about the FGDF?

SOCIO-DEMOGRAPHIC CHARACTERISTICSOF DISCUSSANTS

SN	Age	Marital status	Religion	Education	Occupation
1	38	Divorced	Islam	Primary	Business woman/Trader
2	60	Married	Islam	Primary	Business woman/Trader
3	30	Married	Christianity	None	Business woman/Trader
4	50	Married	Islam	Primary	Business woman/Trader
5	35	Married	Islam	None	Business woman/Trader
6	60	Widow	Islam	None	Business woman/Trader
7	70	Widow	Islam	Primary	Business woman/Trader
8	35	Married	Islam	Secondary	Business woman/Trader
9	80	Married	Islam	Secondary	Business woman/Trader
10	35	Married	Islam	Primary	Business woman/Trader
11	35	Married	Christianity	Primary	Business woman/Trader
12	36	Married	Islam	Secondary	Business woman/Trader
13	45	Divorced	Islam	None	Business woman/Trader
14	35	Married	Islam	Primary	Business woman/Trader
15	40	Widow	Islam	Primary	Business woman/Trader

CATEGORY OF FGD: MALE ADULT
Community: Eleyele community (Waterfront)
Number of participants: 7
Date of FGD: 24/07
Time FGD started: 16.30
Time FGD ended: 16.53
Language of interview: Yoruba

The general description of

1. Venue:
   - Sitting arrangement: Semi circular
   - Weather condition: Very conducive
2. Level of participation: Intense
   - Did everybody participate freely: Yes
   - Did any particular person try to dominate? None

Give other useful information about the FGDF?

SOCIO-DEMOGRAPHIC CHARACTERISTICSOF DISCUSSANTS

SN	Age	Marital status	Religion	Education	Occupation
1	70	Married	Islam	Primary	Fisherman
2	35	Married	Islam	Primary	Fisherman
3	42	Married	Islam	Primary	Fisherman
4	58	Married	Islam	Primary	Fisherman
5	72	Married	Christianity	Secondary	Business man/Trader
6	67	Married	Islam	Secondary	Business man/Trader
7	66	Married	Christianity	Secondary	Business man/Trader

CATEGORY OF FGD: YOUNG MEN
Community: Eleyele community
Number of participants: 9
Date of FGD: 24/07
Time FGD started: 16.30
Time FGD ended: 16.53
Language of interview: Pidgin/English

The general description of

1. Venue: The FGD took place at the recreational centre, Eleyele where youth usually gather to relax and play Table Tennis. Participants stood around the table tennis and everyone participated freely
   - Sitting arrangement:
   - Weather condition
2. Level of participation: Everyone participated freely
   - Did any particular person try to dominate?
   - Give other useful information about the FGDF?

SOCIO-DEMOGRAPHIC CHARACTERISTICSOF DISCUSSANTS

SN	Age	Marital status	Religion	Education	Occupation
1	40	Single	Christianity	Post/sec school	Business man/Trader
2	26	Single	Christianity	Secondary	Business man/Trader
3	25	Single	Christianity	Post/sec educ	Other
4	25	Single	Christianity	Secondary	Business man/Trader
5	21	Single	Christianity	Secondary	Business man/Trader
6	27	Single	Christianity	Post/sec educ	Business man/Trader

CATEGORY OF FGD: MALE ADULT
Community: Eleyele Waterfront
Number of participants: 7
Date of FGD: 24/07
Time FGD started: - 14:15
Time FGD ended: - 15:58
Language of interview: Yoruba

The general description of

3. Venue:
   - Sitting arrangement: Semi circular
   - Weather condition: Very conducive
4. Level of participation: Intense
5. Did any particular person try to dominate? None
6. Give other useful information about the FGDF?

SOCIO-DEMOGRAPHIC CHARACTERISTICSOF DISCUSSANTS

SN	Age	Marital status	Religion	Education	Occupation
1	65	Married	Christianity	Primary	Business man/Trader
2	40	Married	Islam	None	Business man/Trader
3	58	Widowed	Islam	Secondary	Business man/Trader
4	45	Married	Islam	Primary	Business man/Trader
5	50	Married	Christianity	Primary	Business man/Trader
6	48	Married	Islam	Secondary	Business man/Trader
7	43	Married	Christianity	Secondary	Business man/Trader

FGD - YOUTH GROUP Eleyele Dam Rehabilitation Date: July 24, 2016

Individual Youth	Age	Religion	Education	Occupation	Marital Status
Vice Chairman (Youth Group)	35	Christian	Polytechnic	Fisherman	Married
Fisherman - 2	34	Christian	Secondary	Fisherman	Married
Fisherman - 3	34	Christian	Polytechnic	Fisherman	Married
Fisherman - 4	40	Muslim	Pry. 6	Fisherman	Married
Fisherman - 5	36	Christian	Graduate	Fisherman	Married

SOME USEFUL CONTACTS

S/N	Name	Position	Telephone Number
1	Baba Ojobusa	Chairman	
2	Alhaji Sadiq Alaka Alade	Community/Religious Leader	08075072780
3	Mr. Ogunrinde	Influential person	

Appendix 6.1: Waste Management Plan

Poor waste management strategy can be deleterious to the prevailing environmental conditions and could cause social unrest and hinder project development. Waste generated during various phases of the dam rehabilitation project must be properly managed to ensure prudent and responsible collection, segregation, storage, transportation, treatment, recycling and disposal. A waste, be it solid, semisolid, liquid materials or any contaminated solid material must be properly segregated and adequately disposed in accordance with regulatory standards. All Hazardous wastes and domestic wastes must not be disposed of unless adequately treated. All wastes generated from the operations shall be packaged and transported to government accredited waste handlers for treatment prior to final disposal.

Waste Management Guidelines

The handling, storage and disposal of all wastes that will be generated during the life of the project shall be in accordance with IUFMP's approved waste management guidelines. These guidelines shall be binding on all staff and contractors involved in the proposed dam rehabilitation project with respect to the:

- Emission or release of pollutants, exhaust and/or fugitive gases.
- Discharge or spill of effluent such as spent oil into surface water, rivers, streams, swamp or land.
- Discharge of solid wastes (including domestic waste) into surface water, streams or land.
- Generation of noise and vibration.

Wastes Types

All waste falls into one of the following categories:

Inert Waste

Waste that is physically, chemically or biologically inert. Examples include construction debris or landscaping trash.

Non-Hazardous Waste

Waste that is within the legal limits for discharge or release into the environment. The legal limits are defined by Federal Ministry of Environment.

Domestic Waste

Waste that is generated from human activities, including solid (e.g., left-over food, food containers, office waste, etc.), liquid (e.g. used cooking oils, etc.), or sanitary waste (e.g., waste from toilets, bathrooms, and kitchen drains).

Hazardous Waste

Waste that has physical or chemical properties exceeding legal disposal limits. Wastes under this category have the characteristics as defined in national regulations.

Medical waste

Is generated during medical procedures and includes bandages, dressings, surgical waste, tissues, dialysis wastewater, medical laboratory wastes and food waste from persons with

infectious diseases.

Waste Management Process
The waste management strategies is to first inventory and categorize waste and then either minimize or treat prior to final treatment or disposal.

Inventory Wastes
The department/contractor generating the waste is responsible for the waste inventory, which must provide brief information on each waste, including quantity.
The Environmental safeguard specialist shall coordinate the over-all inventory.

Segregate Waste
Waste segregation is critical to the implementation of this procedure
Wastes are to be segregated according to categories at the source/location of generation. Waste bins are to be identified by their colours.
Burnable waste to be incinerated or disposed with other domestic waste must be put into the BLUE coloured bins; metal junk must be put into the YELLOW coloured bins, bottles must be put into GREEN coloured bins.

Waste Management Practice

1. **Batteries (Dry Cell)**

Waste Generating Process or Source: Flashlights and other devices.
Classification and Analyses: This waste is always classified as Non Hazardous.
Restrictions or Cautions: Do Not Incinerate
Waste Minimization Opportunities: Use rechargeable batteries when available and service conditions permit. Purchase long-life batteries.
Waste Management Practices: Treatment – When batteries are collected separately from other waste, stabilize with cement to prevent leaching.
Temporary Storage: When batteries are segregated from regular trash, hold in a covered drum and label: "FLASHLIGHT BATTERIES FOR DISPOSAL". No special requirements when collected with regular trash.
Transportation & Labeling: No special labeling required for transportation.
Responsibilities: Contractor and OYSSWMA.
Required Records: Waste Manifest is required for transportation or disposal of this waste.

2. **Batteries (Nicad & Lithium)**

Waste Generating Process or Source: Portable radios or phones, some navigation equipment
Classification and Analyses: This waste is usually classified as Hazardous. Waste analysis not required.
Restrictions or Cautions: Do not incinerate
Waste Minimization Opportunities: Purchase batteries from vendors that will accept spent batteries returned for recycle. Purchase long-life rechargeable batteries. Purchase low-toxicity batteries.
Waste Management Practices: Recycle – Return to vendor where possible. Treatment – When return to vendor is not possible, stabilize with cement to prevent leaching and dispose at approved dumpsite. See Appendix H for stabilization instructions.

Temporary Storage: Keep spent batteries in metal container until disposed.
Transportation & Labeling: Label waste container: "USED BATTERIES FOR RECYCLE"
Responsibilities: Project Contractor and OYSSWMA.
Required Records: Telecom Supervisor to track waste volumes of scrap batteries recycled.

3. **Used Oils (Lube, Machine, Gear, Motor & Hydraulic Oils)**

Waste Generating Process or Source: Autos, Motorized Equipment, Gear Box Crankcase Fluid, Equipment Lubrication Processes:
Classification and Analyses: This waste is usually classified as Non-hazardous. Waste classification may be based on previous knowledge. If waste classification is not known, request test for Flash Point and or Toxicity.
Restrictions or Cautions: Do not dispose into open drains.
Waste Minimization Opportunities: Reduction: Purchase products with high efficiency.
Waste Management Practices:

- Disposal – by OYSSWMA.

Temporary Storage: Store used oil in oily waste tank/drums. Ensure tank is not filled to the brim.
Transportation & Labelling: Ensure storage tank is clearly marked: "WASTE OIL"
Responsibilities: Project contractor to ensure used oil is managed properly.
Required Records: Waste Manifest *is required* for transportation and recycling of this waste. Record Waste Quantity and Recycle Destination on Waste Tracking Log.

4. **Filters (Auto, Engine, Water)**

Waste Generating Process or Source: Internal Combustion Engine Maintenance, Water filtration
Classification and Analyses: Spent engine filters are usually classified as Non-hazardous after draining used oil from the filter. Spent water filters are usually classified as Non-hazardous. Waste analysis *not required*. Waste classification based on previous knowledge.
Restrictions or Cautions: Non-empty oil filters may contain hydrocarbon residue. Drain oil filters immediately after removing the filter from service.
Waste Management Practices: Treatment – Puncture canister and drain oil out of filter for recovery. It is not necessary to remove paper or fabric filter media from the filter case. Treatment – incinerate non-metal filters. Recycle – Send empty metal filter canisters to scrap metal (crush canister if required). Disposal – Dispose empty plastic or non-metal filter canisters with regular trash.
Temporary Storage: No special requirements – after draining, hold with regular scrap metal or trash.
Responsibilities: It is the responsibility of the Project Contractor to ensure that filters are properly disposed and Documented according to these instructions.
Required Records: Waste Manifest is *required* for transportation or disposal of this waste. Record Waste Quantity and Destination on Waste Tracking Log.

5. **Hazardous Substances (Chemicals)**

Waste Generating Process or Source: Surplus Chemicals
Classification and Analyses: This waste is usually classified as Hazardous. Waste generator is responsible to determine waste classification. Waste classification may be based on previous knowledge. If unknown, request test for Flash Point/pH/Toxicity (TCLP)/chlorinated solvents. Unknown wastes should be considered potentially hazardous until tested or otherwise

demonstrated as not hazardous.
Restrictions or Cautions: Hazard varies. Special PPE when handling this waste may include: Gloves, Goggles/Face Shield, Respirator, Other protective clothing
Waste Minimization Opportunities: Identify other groups that may have use for the chemicals. Return products or materials to the original supplier or other suppliers having a need for the product.
Waste Management Practices: Discuss waste classification Environmental safeguard specialist before shipping to treatment or disposal.
Temporary Storage: Store in original container where available and still in good condition otherwise keep in closed or covered containers or in over pack drums.
Transportation & Labeling: Clearly mark all containers with name of waste and source of waste before transporting to handling or disposal site. Include MSDS while in transit.
Responsibilities: Supervisor of the waste generating unit is to ensure that waste is managed properly.
Required Records: Waste Manifest is required for transportation or disposal of this waste. Record Waste Quantity and Destination on Waste Tracking Log.

6. **Medical Wastes - Solids (Infectious)**

Waste Generating Process or Source: Clinical Treatment, Medical Lab Test
Classification and Analyses: This waste is always classified as Hazardous.
Restrictions or Cautions: Infection hazard. Do not mix waste with normal trash, package to protect from sharps. Special PPE when handling this waste includes: Gloves, Apron, Goggles/Face shield, Protective clothing
Waste Minimization Opportunities: No special minimization yet proposed.
Waste Management Practices: Treatment – Incinerate all medical waste.
Temporary Storage: Store medical waste in yellow plastic bags pending disposal by OYSSWMA.
Transportation & Labeling: Transport medical waste in a waste box. Label waste container: "MEDICAL WASTE – BIO-HAZARD"
Responsibilities: It is the responsibility of the medical personnel at the sickbay to ensure that medical wastes are properly packed for disposal.
Required Records: Waste Manifest *is required* for disposal.

7. Rubbish / Garbage

Waste Generating Process or Source: Office buildings, Warehouse, Canteen
Classification and Analyses: This waste is always classified as Domestic. Waste analysis *not required*.
Restrictions or Cautions: No special restrictions.
Waste Minimization Opportunities: Segregate recyclable materials from trash.
Waste Management Practices: Recycle – Recycle reusable items. Treatment – Shred office paper waste before handing over for disposal by OYSSWMA
Temporary Storage: Keep in closed or covered bins (burnable and non-burnable).
Transportation & Labeling: No special labeling required.
Responsibilities: Project contractor/OYSSWMA.
Required Records: Waste Manifest is *required* for transportation or disposal of this waste. Record Waste Quantity and Destination on Waste Tracking Log.

8. Scrap Metal / Warehouse Junk

Waste Generating Process or Source: Construction Activities, demolition activities, Equipment Repair, Activities, Warehouse Operations
Classification and Analyses: This waste is always classified as Non-hazardous. Waste analysis *not required*.
Restrictions or Cautions: Do not mix scrap metal with rubbish/garbage.
Waste Minimization Opportunities: Reduce quantities through salvage efforts and reuse scrap metal for other projects where feasible.
Waste Management Practices: Recycle – Sell scrap iron for salvage.
Temporary Storage: Send scrap metal to the scrap metal barge at the dock.
Transportation & Labeling: No special labeling required.
Responsibilities: Project Contractor/OYSSWMA.
Required Records: Waste Manifest is *required* for transportation or disposal of this waste. Record Waste Quantity and Destination on Waste Tracking Log. Asset disposal (Recovery) unit is responsible to keep records of sales.

9. Storm Water

Waste Generating Process or Source: Storm water drainages
Classification and Analyses: This waste is always classified as Non-hazardous.
Waste Minimization Opportunities: No special minimization yet proposed.
Waste Management Practices: Disposal – Discharge into adjacent/receiving waters
Temporary Storage: None required
Transportation & Labeling: None required
Responsibilities: Project contractor is to ensure that storm water run-off that exceeds Federal Ministry of Environment limitations is not discharged without treatment.

10. Tires

Waste Generating Process or Source: Vehicles, wheel barrows
Classification and Analyses: This waste is always classified as Non-hazardous. Waste analysis *not required*.
Restrictions or Cautions: No special cautions.
Waste Minimization Opportunities: Re-use where possible etc.
Waste Management Practices: Recycle - Sell tires to scrap buyers for recapping where possible.

Treatment – Chipped tires can be incinerated. Disposal – Cut or chipped tires may be disposed in a Government approved dump site. Avoid stockpiling waste tires in piles – breeding ground for mosquitos.
Temporary Storage: Store waste tires only at location designated by Environmental safeguard specialist.
Transportation & Labeling: No special labeling required.
Responsibilities: Maintenance Supervisor is responsible for the disposal of used tires.
Required Records: Waste Manifest is *required* for transportation or disposal of this waste. Record Waste Quantity and Destination on Waste Tracking Log.

11. Sanitary Wastes (Mobile Toilets)

Mobile toilets should be stationed in a well drained surface and disposed off on a daily basis.

12. Plant debris

These wastes are expected to be generated during site clearing. Trees should be cut into pieces and arranged for sale to interested buyers. Tree branches and debris should be collected together for disposal by OYSSWMA. There should be no incineration of plant debris at project site.

14. Dredged Spoils

This shall be generated from dredging of the reservoir. Excess dredged spoil should be used for landscaping after some level of drying.

Responsible Waste Management Agency

The Oyo State Solid Waste Management Authority (OYSSWMA) shall be responsible for collection and disposal of all wastes generated at the project site. To this end, the IUFMP PIU should formerly engage OYSSWMA to manage all wastes throughout the project implementation especially during the construction phase.

Waste disposal Schedule

S/N	Waste Type	Schedule
1	Domestic wastes	Weekly
2	Sanitary wastes	Daily
3	Plant debris during site clearing	As required by contractor
4	Demolished civil material during excavation and site clearance	as required by contractor
5	Spent oil/used service parts	Monthly
6	Dredged Spoils during dredging of the reservoir	Weekly

Supervision and Monitoring

The Environmental Safeguard specialist shall be responsible for the supervision and monitoring of waste management at the project site. The project contractor shall submit weekly or monthly waste handling record to the environmental safeguard specialist for assessment and monitoring.

Waste Tracking Log

The Waste Tracking Log shall be maintained by waste generating facilities. It is the basis for

reviewing waste inventory and waste identification for waste reduction efforts. It is not necessary to send anyone copies of this log. It should be kept in the facility. HES will review the Log during compliance inspections.

Instructions for Filling Out Log

- **PROJECT NAME**: Name of project e.g. Eleyele dam rehabilitation.
- **QUANTITY**: Cubic meters = Length x Width x Height (if measurement is in feet, multiply by 0.0283)
- **DISPOSAL METHOD**: See specific waste detail sheet for recommended method.
- **DISPOSAL LOCATION**: Location in which waste will be disposed.
- **INITIALS**: Initials of the person filling the log.

PROJECT NAME: _____

	Date	**Waste Type**	**Quantity** (kg,m^3,drums, tanks etc)	**Disposal Method**	**Disposal Location**	**Initials**
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Name of Contractor_____

Signature_____**Date** _____

LIST OF EIA CONTRIBUTORS

Triple 'E' Systems Associates Limited consultants who contributed to various components of the study are:

1.	Prof. Felix Dayo (PhD. Engr.ing & Public Policy)	Project Director
2.	Mr. Lawrence Ibhafidon (MSc. Env. Mgt & Control)	Project Manager
3.	Prof. Omololu Soyombo (PhD. Sociology)	Socioeconomics and Consultation
4.	Prof. Kola Aiyesimoju (PhD Civil Engineering)	Dam Safety Assessment
5.	Dr. Philips Oviasogie (PhD	Soil Study
6.	Mr. Anjorin Saanu (M.Sc. Chemistry)	Water Quality/Laboratory Analysis
7.	Mr. Ubong Effiong (Masters in Environmental Mgt.)	Socio-economics/Health Assessment
8.	Mr. Kayode Dayo (HND Civil Engineering)	Project Description
9.	Mr. Olalekan Adamolekun (B.Sc. Chemistry)	Sediment study/Laboratory Analyses
10.	Mr. Smart Olaiya (M.GIS)	GIS and Landuse
11.	Miss Ngozi Eze (M.Sc. Chemical Engineering)	Air quality/Impact Assessment
12.	Mr. Aina Dipo (Masters in Environmental Mgt.)	Air/water quality insitu measurement